Osteoporosis International

ABSTRACTS OF LECTURES (I–III and L01–L55)

I. DIAGNOSTIC CRITERIA FOR OSTEOPOROSIS – WHERE DO WE STAND?

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Operational definitions of osteoporosis have been available in women since 1994. According to WHO criteria, osteoporosis is defined as a T-score that is equal to, or lower than, 2.5 standard deviations below the average of the young healthy female population. With the proliferation of new technology it has become clear that the T-score does not have equivalent meaning at different sites with different techniques. For this reason it is recommended that the definition of osteoporosis be confined to the use of DXA at the proximal femur. The same absolute value for BMD at this site can be used to diagnose osteoporosis in men.

The clinical significance of osteoporosis lies in the fractures that arise. A limitation in the use of bone mineral density alone to predict fracture is that many fractures will occur in those without osteoporosis. In other words, the detection rate or sensitivity is low. For this reason, treatment strategies need to take into account risk factors that operate independently of BMD and thereby enhance the predictive value of the test. These factors include age, family history of hip fracture, prior fragility fracture, high rates of bone turnover, low body mass index and neuromuscular incompetence. The presence of such factors increases fracture risk over and above that which can be explained on the basis of BMD alone. Since the goal of intervention is to identify and treat individuals at high risk from fracture, diagnostic thresholds differ from intervention thresholds. Intervention thresholds should be based on the absolute risk of fracture, determined by the assessment of all relevant risk factors, including BMD.

II. DESIGN AND INTERPRETATION OF INTERVENTION STUDIES IN OSTEOPOROSIS

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Pharmacological interventions to reduce the risk of fractures are becoming increasingly available giving a wide choice to physicians. For rational clinical decisions that will benefit our patients objective assessment of the data is essential. The correct interpretation of the results of intervention studies involves several methodological issues that need to be considered. These include the following: The design of the study (randomized, controlled trials being the optimal design); the hypothesis to be tested as well as the primary and secondary efficacy endpoints that will be used to test the hypothesis should be prespecified. Studies with endpoints serious clinical outcomes such as fractures or quality of life being more important. The studies should be of sufficient duration to allow a metabolic steady state to be reached in response to the intervention and to satisfy the requirements of regulatory authorities. The number of patients in the study should be sufficient to provide information relevant to clinical practice. This will be determined by the choice of the endpoint (e.g. morphometric vertebral fracture vs clinical fracture) as well by the baseline risk of the patients included in the study. The method and type of the analysis of the results should be also prespecified. An intention-to treat analysis is the most conservative but also the most objective and statistically sound. Additional issues include subgroup analyses, the way fractures are counted (number of patients with fractures versus number of fractures), drop-out rates and blinding of the investigator to efficacy measurements during the trial. Careful evaluation of the methodological section of a scientific publication reporting the antifracture efficacy of an intervention will determine whether it is worth proceeding with reading and most importantly will prevent patients from receiving interventions whose efficacy was assessed by inadequate criteria.

III. TREATMENT OF POSTMENOPAUSAL OSTEOPOROSIS – STATE OF THE ART

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The concept of evidence based medicine should be applied to osteoporosis, and treatments should be judged on their ability to decrease the incidence of fragility fracture in randomized placebo controlled prospective studies. Although many treatments have been suggested in osteoporosis, few have shown anti-fracture efficacy.

Calcium and low dose vitamin D supplementation are valuable in osteoporotic patients and in elderly institutionalized women but in most cases are not enough to decrease substantially fracture risk. In most western countries, hormone replacement therapy (HRT) is considered as the 'gold standard' for the prevention of osteoporosis, although anti-fracture efficacy is mainly derived from cohort and case control studies. A major problem with HRT is the low compliance, resulting in cessation of treatment within one year in about half of patients. The recent development of combined continuous preparations with low doses of estradiol, can reduce significantly vaginal bleeding and are likely to improve long term compliance. There are, however, women who cannot or do not want to take HRT, especially because of the fear of breast cancer, and effective alternatives are necessary.

A new class of agents, the selective estrogen receptor modulators (SERMs) has been recently developed. The first agent in this class to be widely available is raloxifene (Evista®). Raloxifene prevents postmenopausal bone loss, induces an early (1 year) and sustained (up to 4 yr), reduction of new vertebral fracture (by 30 to 50%) in postmenopausal osteoporotic women, without reducing non vertebral fractures. In contrast to HRT,

Raloxifene does not stimulate the endometrium and reduces markedly the risk of breast cancer.

Bisphosphonates are the most potent inhibitors of bone resorption that have been used in a variety of metabolic bone diseases, including osteoporosis. Etidronate, a first generation and weak bisphosphonate, has been shown to prevent bone loss in osteoporotic patients, but there is no convincing evidence of reduction of osteoporotic fractures. Alendronate (Fosamax®) is the first bisphosphonate widely available for which there is consistent and convincing evidence of anti fracture efficacy. Similar efficacy has been shown more recently with another bisphosphonate, risedronate (Actonel®). In patients with osteoporosis, both reduce the incidence of vertebral fractures by about 50% and the incidence of non vertebral fractures (including the hip) by 30% to 50%. The antifracture efficacy is consistent across studies and occurs early, within 12 to 18 months of therapy according to the type of fracture. Both also prevent post-menopausal bone loss in early postmenopausal women, and represent an interesting alternative to hormone replacement therapy (HRT) in those women how cannot or do not want to take HRT, especially because of the fear of breast cancer.

Nasal calcitonin is a safe alternative for the treatment of osteoporosis, but the data demonstrating an anti-fracture efficacy are less convincing. The PROOF study suggests that the dose of 200 IU/day – but not other doses – reduces the risk of new vertebral fractures by 30%, without an effect on non vertebral fractures. Contrasting with the abundance of treatments that can inhibit bone resorption, few treatments have been shown to stimulate bone formation. Fluoride is a potent mitogen for the osteoblasts and increases markedly axial bone mass but does not reduce vertebral fracture rate. PTH increases markedly bone mass and the antifracture efficacy of daily s.c. injection of 1-34 PTH has been recently demonstrated in a large phase III clinical trial, with a 70% reduction of new vertebral fractures and a 50% reduction of non vertebral fractures Combinations of antiresorptive and bone forming agents deserve further attention.

In conclusion, the primary and secondary prevention of osteoporosis fractures is now possible, due to new efficient therapies. A broader detection of osteoporosis is necessary to implement therapeutic strategies in order to decrease the number of osteoporotic fractures.

L01. MODIFIABLE RISK FACTORS OF OSTEOPOROSIS

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Fracture risk is evaluated by BMD and by the registration of risk factors. The importance of the risk factors can prevail over that of BMD. Only family history, body height, length of femoral neck and age are unchangeable. Many others can and should be modified, for decreasing fracture risk. Most trivial, the influence of sex, i.e. menopause, can be almost reversed by ERT when maintained into the seventies, and the effects of aging (Vitamin D insufficiency, protein malnutrition, risk of fall) can also be partially corrected by Vit.D and protein supplementation, and targeted correction of risk factors for fall. Prolonged cortico-therapy, which invariably leads to osteoporosis, can be counterbalanced by several drugs, esp. bisphosphonates, when given preventively. Low calcium intake is usually caused by lactase deficiency and/or nutritional habits. The latter can be modified, although promotion of dairy products has cultural limits, and despite the unjustified opposition of anticholesterol activists. Normalizing calcium intake by nutritional means or by supplementation is efficient. More important would be the improvement of a health conscient life style, which according to epidemiological studies, combines physical activity, calcium intake, ERT, and no smoking. For the latter, a decrease of fracture risk has been demonstrated after cessation of smoking. Optimal nutrition which not only concerns calcium, would probably be more important. High intake of potassium, and of fruits and vegetables, as well as of non animal proteins, is not only associated with higher BMD, but also with lower fracture risk. These surprisingly strong associations are due to the decrease of the nutritional acid load. Indeed, high intake of alkali inhibits bone resorption and might offer a highly effective mean of prevention of osteoporosis.

L02. BONE HISTOMORPHOMETRY IN OSTEOPOROSIS. EFFECTS OF TREATMENT

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Transiliac bone biopsy is an important tool for diagnosis and research in osteoporotic patient. Bone histomorphometry consists of measuring static parameters reflecting the bone structure and microarchitecture in cancellous and compact bone, the bone remodeling (resorption and formation) and dynamic parameters as the rate of osteoblast activity by using double tetracycline labeling. It is the only method suited to evaluate tissue and cell changes at the level of the intermediary organization of bone, i.e. the osteon in cortical bone and the basic structure unit (BSU) or cancellous bone packet in spongy bone. Quantitative micro-radiographs and back scattering can be also used on bone sections for measuring the degree of mineralization of bone which is influenced by the remodeling rate. A valid use of iliac bone histomorphometry implies to satisfy important conditions: a sufficient quality of the samples, a sufficient inner diameter of the trephine and a limitation of two biopsies per patient (one on each side). Age-related changes in bone is characterized by a loss of bone with trabecular thinning more marked in females than in males. The amount of bone formed in each remodeling unit decreases. After the menopause, the activation frequency and the resorption are augmented. Consequently, the risk of trabecular perforation is increased. This results in the loss of the trabecular connectivity which is one of the determinant of the mechanical strength of bone. Bone histomorphometry is also used for evaluating the histological positive and side-effects of treatment on bone diseases. Recently, the effects of alendronate have been evaluated by histomorphometric analysis of iliac biopsies from patients with postmenopausal or steroid-induced osteoporosis. The use of bone histomorphometry in both human trials and experimental studies in animals are required for the evaluation of the effects on the quality of bone of antiosteoporotic drugs and to understand the mechanisms of action of these compounds at the bone tissue level.

L03. BIALYSTOK OSTEOPOROSIS STUDY (BOS): EPIDEMIOLOGY OF LOW TRAUMA FRACTURES IN THE FEMALE POPULATION

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Background: The primary task of therapeutic intervention in osteoporosis is fracture prevention. Epidemiological evaluation of fracture risk factors brings direct information on population studied.

The aim of BOS is to evaluate known risk factors of low trauma fractures in a female population of 300 000 inhabitants of the city of Bialystok and surrounding regions of Podlasie.

Population characteristics and methods: The study is based on random selection including 1005 women over 45 years of age, proportionally to age sections in definite age-groups. The trial was collated by the Statistical Department of Marshal's Authorities, precisely under the rules of epidemiological study. Proper random selection was a requisite in keeping within the 3% bounds of error. The questionnaires with 19 groups of questions

concerning diet, life style, past history of any illnesses including fractures were filled out by participants of the study in the assistance of medical students. DXA BMD of the lumbar spine and the hip by the QDR4500 Hologic apparatus were measured.

Results: Osteoporosis, osteopenia and normal population were defined according to WHO criteria of the neck BMD. In a group of 727 women who were submitted to DXA examinations 108 patients had a BMD $>-2,5$ SD (14,8%), 313 had a BMD between $-1,0$ and $-2,5$ SD (43,05%), and 306 had normal a BMD between $+1,0$ and $-1,0$ (42%). Osteoporotic patients were older than osteopenic and normals. 222 of 727 (30,5%) experienced low trauma fractures in the past (118 wrist, 5 hip, 8 vertebrae, 21 ribs, all = 268 fractures). This group had a statistically significant (p 0,001) lower bone mass in all regions of measurement. In a group of women with osteoporosis the percent of fractures was significantly higher than that in osteopenic and normal subjects and fractures occurred more commonly after the age of 60.

Conclusions: Incidence and localisation of fractures need to be analysed for a definition of 'low trauma'.

L04. INCIDENCE OF OSTEOPOROSIS IN THE POPULATION OF KRAKOW BASED ON SCREENING EXAMINATIONS

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The Polish Osteoporosis Foundation and the Osteoporosis Center in Kraków have undertaken densitometric evaluation of over 60 000 patients (of these over 13 500 patients had spine and hip measurements). From this group 6745 women from the Kraków region who presented to the Center after a media campaign were enrolled in the study. The age group of these patients ranged from 20-80 years (average 57.7 years).

Methods: All patients were subjected to a questionnaire relating amongst others to: risk factors, pain, diet, menopause and information about previous fractures. After this the subjects underwent densitometry with the spine L2-L4 and hip regions were evaluated using the DXA method. The Lunar DPX-IQ apparatus was used. In most patients ultrasound evaluation was also undertaken (this data is not included in our paper). The WHO (1994) criteria were implemented when evaluating normal bone density, osteopenia and osteoporosis. The patients were broken down into decades according to age and the results are outlined in the table below.

Age	Number of patients	Number of women with osteoporosis	Osteoporosis [%]
20-29	81	7	8,6
30-39	187	18	9,6
40-49	1222	117	9,5
50-59	2163	538	24,9
60-69	2103	903	42,9
70-79	801	352	43,9
80-	102	56	**54,9**

The average incidence of osteoporosis in the whole group was 29.9%. In women over the age of 50 normal bone mineral density was found in 24%, osteopenia in 38.5% and osteoporosis in 37.5% of patients.

Conclusion: The results obtained in our local study do not differ significantly from those cited in the European population. At present our Center is taking part in a large national study (EPOLOS) but the results of this study are yet to be published.

L05. PREVALENCE OF OSTEOPOROSIS AND SECULAR TRENDS OF HIP FRACTURE INCIDENCE IN MEN IN THE CZECH REPUBLIC

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Methods: Bone mineral density was assessed in an age-stratified random sample of 429 men and 713 women from two cities (Prague and Litomerice) at the lumbar spine, proximal femur and total body by dual X-ray absorptiometry and at the distal forearm by single X-ray absorptiometry. The proportion of men and women in each age group with bone density below specified levels at any of these skeletal sites was projected to the population structure of the Czech Republic. Data on hip fracture incidence in men and women from 1965 to 1999 in Czech men and women were obtained from the central register.

Results: Overall, in 1997, an estimated 428 000 women and 195 000 men over age 50 had osteoporosis and another 680 000 women and 435 000 men had osteopenia. Hospital discharges for hip fracture in the Czech population of 10 million increased over a 30 years period by 15-fold. Population aging explained for 48% and 69% of this increase in men and women, respectively.

Conclusions: The results of this population-based cross sectional study in the Czech Republic document a prevalence of osteoporosis and osteopenia which is comparable with that published for the Netherlands and the United States. An increase in incidence rates above that due to population aging, may increase future fracture rates still further. The results offer a basis for economical considerations in diagnosis, treatment and consequences of osteoporosis.
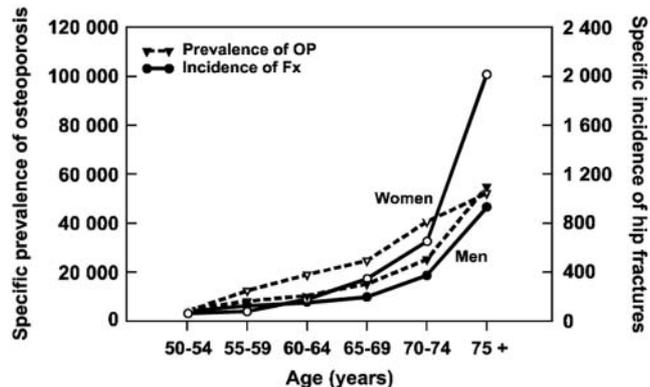
L06. THE NUMBER OF NON-SPINE FRACTURES AND ITS FINANCIAL CONSEQUENCES IN HUNGARY

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Aims: Following the establishment of the Hungarian Osteoporosis Network for diagnosis and treatment of osteoporosis it is often asked what the practical benefit of the management of this disease is. Several questions can only be answered knowing the accurate number of low-trauma fractures followed by a cost/benefit calculation. We aimed to account the osteoporosis related fractures in Hungary in comparison with regional and international incidence rates. A secondary aim was to compare costs coming from the management of fractures with costs of diagnostic and treatment procedures of osteoporosis.

Methods: Incidence of hip, distal radius and proximal humerus fractures were examined on the basis of a national medical

database on hospitalized patients between 1996–1999. Costs were calculated using data of National Institute of Traumatology in 1999. Other sources of costs as acute complications, rehabilitation, social care or extra costs of the families were not taken into consideration. Financial support for the diagnosis and treatment of osteoporosis given by the National Health Insurance were compared with the direct costs of the fractures.

Results: 15 000 hip fractures, 25000 distal radius fractures and 10000 proximal humerus fractures related to osteoporosis occur yearly in Hungary (total population: 10 000 000). The overall yearly cost of the direct fracture treatment is about 12 billion HUF (= 40 million USD). Diagnosis and treatment of osteoporosis is covered by 5.5 billion HUF (= 18 million USD).

Conclusions: The incidence of hip fractures in Hungary has doubled during the last ten years, however, it is still lower than in Northern Europe or in North America. The incidence of distal radius fracture is only one third of respective data from Switzerland and there is no increase in the last decade. The total cost of osteoporosis management (diagnosis + treatment) seems to be less than half of the direct fracture costs (without vertebral fractures, without rehabilitation and other non-medical costs of fractures). It is not a real hope to reach a positive cost/benefit ratio but any deceleration in the growing incidence of fractures promise an improvement of this ratio in osteoporosis.

L07. CURRENT DEVELOPMENT OF IMAGING OF OSTEOPOROSIS

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Today there are non-invasive methods of measuring not only BMD but also intrinsic bone structure. There is in common use a wide range of DXA densitometers which allow for BMD measurements with high precision (1–4%) and accuracy (2–10%). The basic disadvantage of DXA is that the measurement is in only one plane, which reveals no information on the thickness of the bone and does not distinguish trabecular and cortical bone. This is one of the reasons for discrepancies in measurements in different skeletal sites in the same patient. QCT is free from these disadvantages but, due to costs, is rarely applied to the central skeleton. However, it is used with great success for forearm measurements. Estimating mineral density in a single voxel allows measurement of volumetric BMD (individually for trabecular and cortical bone) and also allows calculation of the mechanical strength of bone.

Fan beam densitometers, with their increased resolution, considerably improve image quality. This makes possible the use of densitometers for morphometric measurements of spine (MXA) and can replace traditional radiograms with their high radiation exposure and technical difficulties. Advantages of MXA are low exposure, and elimination of geometric deformation and magnification, which is indispensable for radiograms. Particularly significant is the movable 'C' arm, which allows lateral projection without changing the position of the patient (Hologic).

Noninvasive and/or nondestructive imaging techniques can provide structural information about bone, beyond simple bone densitometry. While the latter provides important information about osteoporotic fracture risk, many studies indicate that BMD only partly explains bone strength. Quantitative assessment of macro-structural characteristics such as geometry, and micro-structural features such as relative trabecular volume, trabecular spacing, and connectivity may improve our ability to estimate bone strength.

Methods for quantitatively assessing macrostructure include (besides conventional radiographs) computed tomography, particularly volumetric quantitative computed tomography (vQCT). Methods for assessing microstructure of trabecular bone noninvasively and/or nondestructively include high resolution computed tomography (hrCT), micro computed tomography (μCT), high resolution magnetic resonance (hrMR), and micro magnetic resonance μMR. Volumetric QCT, hrCT and hrMR are generally applicable in vivo; μCT and μMR are principally applicable in vitro. Despite progress, problems remain. The balance between spatial resolution and sampling size, or between signal-to-noise and radiation dose or acquisition time, needs further consideration, as do complexity and expense vs availability and accessibility. Clinically, challenges for bone imaging include balancing the advantages of simple bone densitometry vs the more complex architectural features of bone, or the deeper research requirements vs broader clinical needs. Biological differences between the peripheral appendicular skeleton and the central axial skeleton must be further addressed. Finally, the relative merits of these sophisticated imaging techniques must be weighed with respect to their applications as diagnostic procedures requiring high accuracy or reliability versus their monitoring applications requiring high precision or reproducibility.

L08. THE ROLE OF PERIPHERAL MEASUREMENT TECHNIQUES IN THE ASSESSMENT OF OSTEOPOROSIS

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A great variety of peripheral measurement techniques have been developed for the assessment of osteoporosis. This includes X-ray based techniques such as peripheral Dual X-ray Absorptiometry (pDXA), peripheral Quantitative Computed Tomography (pQCT) and Digital X-ray Radiogrammetry (DXR) as well as Quantitative Ultrasound (QUS) approaches for the assessment of the calcaneus, phalanges, radius, and other skeletal sites. Osteoporosis is a systemic disease and thus changes in skeletal status can be expected both at central as well as peripheral bones. However, both peak bone mass and the rates of bone loss may differ among sites and in general less than 50% of the variability of bone mineral density (BMD) at the central sites of the spine and proximal femur can be predicted based on peripheral measurements. Therefore, an accurate diagnostic assessment of central BMD can only be achieved using site matched measurements.

Peripheral measurements can be used to assess fracture risk. Together with other risk factors, a staging of the severity of the disease is possible, albeit with lower gradients of risk when compared to central techniques. Peripheral measurement devices have particular value as first stage risk assessment tools that provide independent and quantitative information on fracture risk that cannot be obtained from clinical risk factors alone. In order to interpret the measurement results the relationship with prevalent fractures and with the risk of incident fractures needs to be established. Since such relationships are subject group dependent, comparative assessment with an established device is critical to judge the performance of an innovative device that is to be validated. Such data will allow to calculate absolute risk levels for any given measurement result. This will permit use peripheral devices for clinical decision making.

For monitoring, differences among techniques need to be considered. Not only the skeletal site but also the type of bone measured, i.e. trabecular versus cortical bone, will affect the measurement result. Recently, it has been shown that bisphosphonate treatment, for example, may also affect material properties of bone. It remains to be investigated whether such changes can reliably be measured in the peripheral skeleton.

L09. BONE LOSS IN WOMEN WITH RHEUMATIC DISORDERS

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Inflammatory joint diseases are generally associated with increased bone loss, which can be generalised and focal. Conversely, osteoarthritis and Paget's disease can have higher BMD.

In early rheumatoid arthritis (RA), our studies have shown that significant bone loss can be detected with phalangeal ultrasound. 60 female patients, disease duration from less than 6 months to 4 years (44 < 2yrs),were recruited from an early synovitis clinic. A group of 39 women with established RA of more than 5 years were also studied. Finger ultrasound measurements were made with an IGEA DBM Sonic, and the results were compared with other clinical tests performed on the same clinic visit, or within a few weeks of the test. The results showed that in patients with < 2 yrs duration the mean Z score = –1.7, in the 2–4 yr duration group, mean Z = –1.1 and in the established RA mean Z = –2.2 indicating that bone loss at this site occurs very early in the disease.

In established RA we have investigated the effect of methotrexate MTX used to treat aggressive disease over a period of 3 yrs. Using DEXA of the total body, spine, hip and forearm, 116 female patients were studied, including biochemical bone markers. The patients were stratified into four groups from start of therapy to long term MTX use. HRT and steroid users were excluded. No correlation was found between BMD, markers, and duration of therapy. The only significant change detected was in proximal forearm where BMD was lower in the group on sustained treatment $p < 0.0001$ In contrast the ultra distal region was spared. No significant effect on bone formation or resorption using blood markers or histomorphometry was found.

In polymyalgia rheumatica (PMR) we compared treatment with the conventional cortico-steroid Prednisolone at 15 mg/day with Deflazacort 18 mg/day, reducing to 10 mg/d and 12 mg/d respectively after 4 weeks. 1 yr. later most of the 20 patients had reduced to 5mg/d. Deflazacort at 6mg/d was found to be equi-potent to Prednisolone at 5 mg in controlling PMR. No adverse effect on BMD was found in either group.

In Ankylosing Spondylitis AS 66 females and 132 aged matched controls were studied using DEXA of the total body hip and spine. A sub group of 23 also have ultrasound measurement of the calcaneum (Hologic Sahara) The AS group had significantly lower hip BMD than the controls. Femoral neck, total hip and total body BMD showed significant correlation with disease duration. (p = 0.001–0.005) BUA at the heel was increased and SOS was significantly decreased in the AS group. No correlation was found with CRP and bone markers, with either method for BMD estimation. While decreased hip BMD has been found in almost all patients with AS, this is not normally detectable at the spine due to the presence of peri-spinal ossification. In an earlier study in patients with AS but without spinal involvement we were able to show early bone loss to significant levels.

Conclusion Bone densitometry is a useful tool in clinical rheumatology. Studies involving 300 patients have been assessed by QUS and DEXA. Accelerated bone loss is a feature of these diseases and can occur early in the disease. Some treatments, high doses of cortico-steroids > 7.5mg/d can increase bone loss, but with careful dose regimen, iatrogenic bone loss can be minimised.

L10. PRODIGY QUANTITATIVE LATERAL VERTEBRAL ASSESSMENT (LVAQ) – ACCURACY AND PRECISION

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Low bone density and prevalent vertebral fractures, the classic hallmark of osteoporosis, are associated independently with a dramatically increased risk of future vertebral and non-vertebral fractures. The advent of the GE LUNAR PRODIGY bone densitometer has made accurate measurement of vertebral deformities a reality through its quantitative assessment application, LVAq. The PRODIGY utilizes a narrow-angle (4°) fan-beam to acquire high-resolution dual-energy images, which can be used for qualitative and quantitative determination of deformation as well as lateral spine BMD. Scans of the lumbar spine can be acquired in less than 90 seconds and the lumbar and thoracic spine in about 180 seconds. Accuracy of the LVAq measurements were determined by comparing LVA results with biomechanical measurement of vertebral heights *in vitro*. Error was found to be less than 1 mm. We also compared PRODIGY LVAq with GE LUNAR EXPERT-XL morphometry data using the European COMAC phantom, and a GE LUNAR lateral spine phantom. Excellent comparability was found (r = 0.99, p = 0.3), which indicates the large EXPERT-XL morphometry reference data can be used. Vertebral height precision *in vivo* was determined from repeat observations of 5 patients with repositioning. Semi-automated analysis tools were used to calculate intra- and inter-individual variation using four different operators (untrained, following written procedures) measuring ten vertebral bodies multiple times.

	SD	%CV
Between Scan	0.5 mm	2.3 %
Intra-Operator	0.5 mm	2.5 %
Inter-Operator	0.6 mm	2.9 %

These results indicate the precision error is comparable to that of repeat measurements using standard lateral radiographs (%CV = 3–4%).

L11. BONE MINERAL DENSITY AND QUANTITATIVE DIGITIZED X-RAY IMAGE ANALYSIS REFLECTS THE MECHANICAL PROPERTIES OF CALCANEAL TRABECULAR BONE

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Densitometric and optical density of radiograms variables were assessed to provide new information about the potential role of quantitative X-ray image analysis in fracture risk prediction. We assessed whether the quantitative X-ray image and densitometric variables derived from measurements of intact calcaneal bones were associated with their mechanical properties. We obtained 15 intact cadaveric calcanei, including 14 men and 1 women, of a mean age of 43,3 years (range 19–78 years). Harvested calcanei were X-rayed in a standard lateral view. Plain images were digitized with a high-resolution CCD camera and stored as GIF89 files. Relative optical density values were measured with the RODIA System and expressed as percent of density pattern. We measured the bone mineral density (BMD) of the calcaneal body using dual-energy X-ray absorptiometry. Cubes of trabecular bone were then removed from the calcaneus at approximately the same location as the DXA and RODIA measurements were obtained, and the elastic modulus of the trabecular bone specimens were measured by compressing them in the superoinferior direction. We found that bone mineral density (BMD) variables were strongly correlated with the mechanical properties of calcaneal trabecular bone (r2 = 0,83, p < 0.0001). Relative optical density values variables were moderately correlated with the mechanical properties of calcaneal trabecular bone (r2 = 0,67, p < 0.0001). We found also that Relative optical density values

were strongly correlated with the bone mineral density (BMD) variables of calcaneal trabecular bone (r2 = 0,88, p < 0.0001). Densitometric measurements obtained by direct densitometry or indirect by relative optical density image analysis of digitized X-ray were associated with elastic modulus of trabecular bone. Our results indicate that relative optical density value measurements of the intact heel are associated with the mechanical properties of calcaneal trabecular bone and, in some cases, provide information similar to that provided by BMD measurements.

L12. BONE DENSITY AND OTHER RISK FACTORS FOR NON-SPINE FRACTURE IN MEN AND WOMEN: RESULTS FROM THE EUROPEAN PROSPECTIVE OSTEOPOROSIS STUDY (EPOS)

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Non-spine fractures in men and women over 50 years of age result in considerable morbidity, in some cases long term loss of function and have considerable economic consequences; yet the factors which determine risk of fracture in populations are poorly understood. Men and women aged 50–79 years were recruited from population registers in 32 European centres. Subjects were invited to attend for an interviewer administered questionnaire which included questions about various lifestyle and hormonal factors. Subjects were followed up using a postal questionnaire to ascertain the occurrence of incident fractures. Self-reported fractures were confirmed, where possible, by radiograph, attending physician or interview. The relationships between baseline predictors and future risk of distal forearm and other types of fracture were assessed using Cox proportional hazards models. Over 13 000 men and women (mean age 63 years) were included in this analysis. During a median follow-up time of 3.0 years, 152 women sustained a distal forearm fracture. After age adjustment, frequent walking (>1 hour per day) was associated with an increased risk of fracture (P < 0.01) as was an older age at menarche (P = 0.05) (O'Neill et al ASBMR 2001). There were also significant differences in risk between investigational centres which were not accounted for by risk factors identified from the questionnaire. About half the cohort had a measurement of spine or hip bone density using DXA, the results of which were cross calibrated with the European Spine Phantom. In this presentation the effect of low BMD on non-spine fracture risk, with and without adjustment for lifestyle and hormonal risk factors, will be discussed.

L13. TREATMENT RESULTS OF TRAUMATIC INJURIES OF THE LOCOMOTOR SYSTEM RESULTING FROM OSTEOPOROSIS IN OWN MATERIAL

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Fractures in patients with osteoporosis are a common clinical symptom of this disease. Within the Department of Orthopaedics of Warsaw Medical University there is a scheme of the therapeutic process regarding traumatic injuries of the locomotor system resulting from osteoporosis, This paper is a retrospective evaluation of treatment results of this scheme in the years 1997–2000.

In the period of evaluation 1580 distal radius fractures in 1406 women (88.99%) and 174 men (11.01%) were treated. There is a rule of conservative treatment. Primary unstable cases, and those in which a primary satisfactory reduction was not successful after two, repeated maneuvers, underwent surgery (110 cases –7%). Subjective results of the treatment were evaluated.

64 patients with compressive vertebral fractures were treated in the years 1997–2000. 51 of them were supplied with a Jevett's frame. The average duration of this immobilization was 9,4 weeks (5–13,2 weeks).

230 proximal femur fractures, in which surgical treatment is obligatory, were evaluated for the period of 1997–2000. 216 patients underwent surgery (93,9%). 14 (6,1%) were treated non-surgically. Very good functional results (hip flexion >70 deg., shortening <2 cm) were achieved in 28% of cases. Good or satisfactory results (above conditions and temporary pain) – in 51%.

In the group of 36 proximal humeral fractures, 10 patients were treated surgically – 8 underwent intramedullary nailing using the Rush method. Hemiarthroplasty of the shoulder joint was performed in 2 patients.

L14. PROGNOSIS OF A FRACTURE RISK BASED ON BMD EXAMINATION OF A DISTAL PART OF THE FOREARM

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Introduction: According to the IOF the results of densitometric examinations should be expressed by the risk coefficient of the fracture. The aim of the following study was to assess the usefulness of the forearm examination in the prognosis of the fracture.

Materials and methods; In 6256 women from 61 towns of northern Poland aged 40–90 voluntarily reporting to our Out-patient's clinic had a BMD examination of the forearm by the DTX 100 apparatus after answering a questionnaire in which each subject had been asked about the fractures due to a low trauma after the age of 40. We compared the results of the BMD examination of the distal forearm in women with and without a fracture in some of the life decades.

Results: Among 1135 women with t-score of the distal or ultradistal area of the forearm lower than or equal to –2.5SD a fracture was reported by 363 subjects what constitutes around 32.0% of the whole studied group. Among 5121 subjects with a t-score greater than –2.5 a fracture was present in 538 persons which is 10.5 %. BMD results in each age group of subjects without a fracture was higher than in the group with fractures. The differences were statistically significant (p < 0.0005). The results of the measurements are shown in the table below.

Age	No fractures			Fractures			Difference
	N	BMD	SD	N	BMD	SD	
40-49	1676	0,479	0,048	91	0,458	0,052	4,4%
50-59	1799	0,453	0,059	204	0,418	0,062	7,7%
60-69	1307	0,405	0,066	365	0,376	0,064	7,2%
70-79	537	0,365	0,072	212	0,334	0,063	8,5%
80-89	35	0,319	0,073	29	0,297	0,062	6,9%

Conclusions: A 3-fold higher percentage of subjects with a fracture among the women with a low forearm BMD result in comparison to the 'healthy' subjects and the differences between BMD in some age groups suggest that the forearm examination might be a good predictor of fracture but the assessment of a fracture risk coefficient is possible only after many years of studies following the risk of fracture.

L15. PREVENTION OF PROXIMAL FEMORAL FRACTURES

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Proximal femoral fractures (PFF) are the most severe complications of osteoporosis. They are associated with a high rate of life risk threat and cause the highest economical and social burdens of osteoporosis. The number of PFF will increase further with the extension of the human lifespan. It is estimated that in the year 1990 1.66 mln fractures occurred and in 2050 the predicted value is 6.25 mln fractures. The life risk of a fracture in women is about 16.5% and the mortality rate after fracture reaches 10–25%. PFF are the effect of falls on which so-called clinical risk factors play an important role. These are: age, poor gait and body balance, poor sight, sedative medication. The so-called skeletal risk factors are: low bone mineral density, previous fracture, high bone turnover, bone geometry (long femoral neck).

Prevention of PFF can be successful as far as it is possible to eliminate or decrease the risk factors. Treatment with bisphosphonates increases BMD and decreases bone turnover. The HIP (Hip Intervention Program) investigation was performed to prove the efficiency of residronate, a new generation bisphosphonate, in the prevention of PFF. 9331 women were included into the trial. They were randomised as, double blind placebo control investigations. In the treatment group a daily dose of residronate (2.5 mg or 5.0 mg) and a supplement of calcium and vitamin D3 was given. The placebo group received only calcium and vitamin D3. The investigation was performed in two groups. Into group I women of age 70–79 yrs with advanced osteoporosis (T$<$–3.0) were qualified. Group II included women with risk factors of PFF independent of BMD.

After 3 years follow up PFF occurred in 232 women. In group I PFF were seen in 1.9% of patients in comparison with 3.2% of group II (decrease 40%, p = 0.009). PFF were more frequent in patients who sustained previous vertebral fractures (in treatment group 2.3%; in the placebo group 5.7%; decrease 60%, p = 0.003). No effect of residronate was found on the frequency of PFF in group II (in treatment group 4.2%; in placebo group 5.1%). It was proven that residronate is an efficient drug in prevention of PFF in women suffering from osteoporosis however it was not seen in the elderly with clinical factors.

Independently from pharmacological intervention an essential role in the reduction of risk of PFF is prevention of falls by changing internal factors (improvement of gait, body balance, etc.) and external circumstances (removing obstacles in and around the home).

L16. INFLAMMATIORY MEDIATED AND GLUCOCORTICOSTEROID INDUCED OSTEOPOROSIS

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The study in chronic autoimmune diseases revealed abnormal bone mass values in 30–50% of individuals not treated with glucocorticosteroids (Gks). In highly active forms of these diseases it is difficult to establish whether the loss of bone mass is a consequence of inflammation or caused by Gks therapy. Proinflammatory cytokines and Gks operate on different levels producing opposite effects.

The most marked bone loss takes place in the first 6 months of Gks therapy, thereafter gradually diminishing. The dose of prednisone not exceeding 7 mg/24 hrs has been considered as 'safe' in terms of bone remodeling. The fracture risk factor however, does not correlate with the results obtained in densitometry.

Based on our own experience with two hundred patients with rheumatoid arthritis and SLE the most common location of fractures were vertebrae and the incidence of these was equally distributed among Gks treated and non treated patients.

Following seven years of therapy with low doses of prednisone the values of bone mass loss and the percentages of fractures did not differ between individuals treated in comparison to the group of patients matched by sex and age – not treated with Gks.

L17. OSTEOPOROSIS AND ENDOCRINE DISORDERS

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It seems that each of the endocrine diseases have an influence (more or less) on bone turnover. The frequency of hyperparatyroidism is relatively high but the process of reaching the diagnosis is rather poor. World-wide use of bone densitometry allows for earlier recognition of the disease. The most frequent endocrine reasons of osteoporosis are disturbances in the levels of sex hormones i.e. anorexia nervosa, premature ovarian failure, Klinefelter or Kallmann's syndroms. It is well known that diseases of pituitary gland leading to hypogonadism are responsible for decreasing bone mineral density. Exposure to supra-physiological levels of cortisol resulting in endogenous over-production (Cushing's syndrome and disease) depending on disease duration may lead to osteopenia and osteoporosis. Similar dependence are often observed in incidentaloma and islet cell adenomas.

In the last years the possibilities of imaging and biochemical diagnostics of endocrine diseases are higher. The duration of symptoms of the disease process to reaching a diagnosis is shortened. The possibility of treatment of osteopenia or osteoporosis is high.

L18. CHANGES IN BONE TISSUE IN THYROID GLAND DISORDERS

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NO ABSTRACT SUBMITTED

L19. EPIDEMIOLOGY OF RISK FACTORS OF OSTEOPOROSIS IN WOMEN AND THEIR BONE MINERAL DENSITY

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509 women aged 35 to 80 years were invited to attend for osteoporosis screening. All patients had a bone mineral density (BMD) measurement of lumbar spine and hip (neck) using DEXA. All subjects completed an risk factor questionnaire.

Results

- Lumbar spine t-score

Age group	t-score $>$–1	–1 $<$t-score $>$ –2,5	t-score $<$–2,5
35-44	80,91% (89)	17,27% (19)	1,82% (2)
45-54	63,96% (71)	27,93% (31)	8,11% (9)
55-64	31,43% (44)	39,29% (55)	29,29% (41)
65-80	22,3 % (33)	33,11% (49)	44,59% (66)
Total	(237)	(154)	(118)

- Neck t-score

Age group	t-score $>$–1	–1 $<$t-score $>$–2,5	t-score $<$–2,5
35-44	79,09% (87)	20% (22)	0,91% (1)
45-54	76,58% (85)	22,52% (25)	0,9% (1)
55-64	51,43% (72)	38,57% (54)	10% (14)
65-80	26,35% (39)	55,41% (82)	18,24% (27)
Total	(283)	(183)	(43)

There was a **significant positive association** between BMD and weight, height, BMI, HRT, calcium intake. There were a **significant negative association** between BMD and: age of first and last menarche, years since menopause, years of menarche, height loss, cigarette smoking, caffeine consumption, family history of hip fracture.

L20. CHANGES IN BONE MINERAL DENSITY IN POSTMENOPAUSAL WOMEN TREATED WITH CONTINOUS HORMONAL REPLACEMENT THERAPY

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The postmenopausal osteopenia or osteoporisis in women results most commonly from hormonal disturbances such as hypoestrogenism. The gold standard in the treatment postmeno-pausal osteoporosis is hormone replacement therapy (HRT).

The aim of the study was an estimation of the various regimens of continuous hormone replacement therapy on bone mass density in postmenopausal women.

Material and methods: 52 postmenopausal women (aged 47-63 years, mean 54,1 ± 4,1 years) treated with various continuous HRT. 28 patients orally received 2 mg 17β-estradiol and 1 mg noretisterone acetate (Kliogest® Novo Nordisk), 12 women received tibolon 2,5 mg (Livial® Organon) and 12 women transdermal 50 μg 17β-estradiol/day and 5 mg norethisteron acetate orally (Estraderm TTS 50® Novartis, Norethisteron® Jelfa). Before and after 12 months of treatment lumbar densitometry (Lunar DPX) was performed.

The results are shown in the figure: After 12 months of treatment bone density increased significantly in all women accordingly 3,9%; 3,7% and 3,9%. There were no statistically significant differences between all treatment regimens.

Conclusions: Continuous hormone replacement therapy in-creased bone mineral density in postmenopausal women. All regimens used showed similar effectives in osteopenia and osteoporosis treatment.
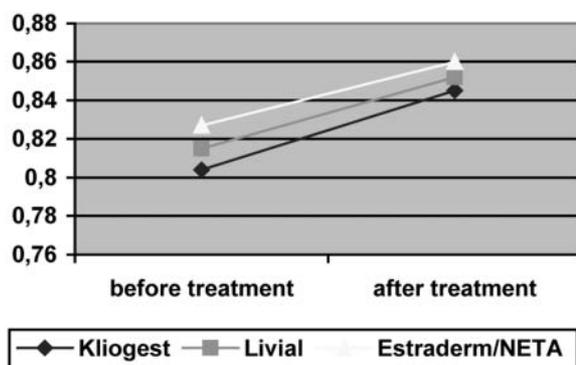
L21. MENARCHE, MENOPAUSE, NORMAL AGING, AND BONE STATUS OF INHABITANTS OF WROCŁAW

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The study was carried out in order: 1) to evaluate which factor, aging itself or the menopause, revealed the more detrimental effect on bone mineral content (BMC) of healthy women; 2) to assess the influence of the menarcheal age, the total number of reproductive years and the length of the period after menopause

on BMC. Material comprised a group of 968 females (715 pre- and 253 postmenopausal), aged 20–62, healthy inhabitants of the city of Wrocław, Poland. Trabecular, cortical and total BMC at the ultra-distal radius were measured by pQCT (Stratec 960). Age, age of menarche, age at menopause, a total number of reproductive years and a period after menopause were obtained through a questionnaire. The inter-group differences in BMC were tested using a two-way analysis of variance ANOVA. The fact of menopause significantly speeded up the decline in BMC and the impact of menopausal hormonal alterations was much stronger than that of the chronological age (the effect of menopause on trabecular BMC F=17,50; p. $<$ 0,001, cortical BMC F=5,71; p.=0,02 and total BMC F=11,41; p. $<$ 0,001). Among premenopausal women the positive influence of earlier menarcheal age on both trabecular, cortical and total BMC was revealed (for trabecular BMC F=7,77; p. $<$ 0,001, cortical BMC F=3,63; p.=0,03 and total BMC F=5,76; p=0,003). On the contrary, among postmenopausal women their bone status was determined mainly by the length of the period after menopause (for trabecular BMC F=5,92; p.=0,003, cortical BMC F=10,01; p. $<$ 0,001 and total BMC F=11,52; p. $<$ 0,001) and the chronological age of examined women (for cortical BMC F=4,73; p.=0,003 and total BMC F=5,42; p.=0,001).

L22. BONE MINERAL DENSITY (BMD), BONE METABOLISM PARAMETERS AND THE LEVELS OF DHEAS, BMI AND WHR IN POSTMENOPAUSAL WOMEN

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It seems that the decreasing of BMD connected with menopause do not occur in obese women or with the high level of DHEAS. The aim of the study was to find the connection between BMD in the femoral neck, bone mineral parameters and the levels of DHEAS, BMI and WHR in postmenopausal women. 120 non-smoking, healthy postmenopausal women (age 55.95+/-7.06 yrs, BMI-27.79+/-4.38 kg/m2, WHR-0.82+/-0.067) were examined. BMD in femoral neck was measured using DEXA method (DPX +, LUNAR, USA) and the levels of osteocalcin, DHEAS by the RIA method, and alkaline phosphatase using the Elisa method. We found statistically significant correlations between BMD and BMI (r = 0.53; p = 0.0001), WHR (r = 0.21; p = 0.0025) i DHEAS (r = 0.21; p = 0.0026). The total group was divided into two groups with BMI $<$ and $>$ 27 kg/m2 (n=56 vs 64) we found a statistically significant higher BMD in women with higher BMI (p = 0,00001). There were no differences in bone metabolism parameters. The total group was divided into two groups with WHR $<$ and $>$ 0.8 (53 vs 67) we found a statistically significant higher BMD (p = 0,04) and lower levels of osteocalcin (p = 0.009) in women with a higher WHR. The total group was divided into two groups with DHEAS $<$ and $>$ 1000 ng/ml (n = 64 vs 56) we found no statistically significant differences. Conclusions: The higher level of BMD in the femoral neck in postmenopausal women is strongly connected with a higher BMI and fat distribution (WHR). The level of endogeous DHEAS seems to be without influence on BMD in postmenopau-sal women.

L23. BONE MASS DENSITY IN YOUNG WOMEN WITH MENSTRUAL DISORDERS

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The physiologically normal bone growth process during child-hood and puberty is very important in determining of bone mass and bone density in adults. This process is dependent on several hormonal factors like growth hormone and sex steroid levels.

We studied 120 young women aged 16–25 years, who applied to Department of Gynecological Endocrinology University of Medical Sciences of Poznan because of secondary amenorrhea. We evaluated: the length of secondary amenorrhea, body mass index (BMI), 17β-estradiol, serum testosterone level and bone mineral density in the lumbar vertebrae with the use of Dual-Energy X-ray Absorptiometry (DEXA – Lunar DPX).

The mean age of the studied women was 19,6 years. In the group of women with secondary amenorrhea lasting 3–12 months we obtained the following results: Z-score: –1,33, 17β-estradiol serum level: 0,026 ng/ml; serum testosterone level: 0,29 ng/ml. In the group of women with secondary amenorrhea lasting 12–24 months: Z-score: –1,32; 17β-estradiol: 0,025 ng/ml and testosterone: 0,21 ng/ml. In the group of women with secondary amenorrhea lasting longer than 24 months: Z-score: –1,12; 17β-estradiol: 0,024; testosterone: 0,19 ng/ml. In each group we found a statistically relevant correlation between BMI and Z-score ($p < 0,01$) and between serum 17β-estradiol level and Z-score ($p < 0,01$).

We also noticed that in several cases the Z-score value was lower than –2,5 (minimum: –5,11).

L24. BISPHOSPHONATES: NEW DEVELOPMENTS IN THE MECHANISMS OF ACTION AND THE CLINICAL USE IN OSTEOPOROSIS

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Introduction: Bisphosphonates are today the main class of drugs used in metabolic bone disease. Eight are commercially available for various bone diseases, especially Paget's disease, tumor bone disease, and osteoporosis.

Mechanisms of action: Great progress has been made recently in the understanding of the mechanism of action of the bisphosphonates. Thus, it was found that they probably act on bone resorption through two main mechanisms.

The compounds without a nitrogen such as etidronate, clodronate and tiludronate are incorporated into the phosphate chain of ATP-containing compounds, so that they become nonhydrolyzable. The new P-C-P containing ATP analogs inhibit osteoclast function and may also lead to apoptosis and osteoclastic death.

On the other hand nitrogen containing bisphosphonates, which make the largest number of those used clinically today, were found to inhibit the mevalonate pathway by inhibiting farnesyl pyrophosphate synthase. This leads to a decreased formation of isoprenoid lipids such as farnesyl- and geranylgeranylpyrophosphates. These are required for the post-translational prenylation (transfer of fatty acid chains) of proteins, including the GTP-binding proteins Ras, Rho, Rac, and Rab, which are important for many cell functions. Disruption of their activity will induce a series of changes leading to decreased activity, probably the main effect, and to earlier apoptosis in several cell types, including osteoclasts. In osteoclasts the lack of geranylgeranylpyrophosphate appears to be responsible for the effects. Of considerable interest is the fact that when various bisphosphonates of various potency to inhibit bone resorption were investigated, their effect on the mevalonate pathway corresponded now quite well to that of their inhibitory effect on bone resorption. This was not the case with previous postulated mechanisms.

Clinical use in osteoporosis: Bisphosphonates are today increasingly used for the treatment and prevention of osteoporosis. Due to their inhibitory effect on bone resorption they decrease bone turnover and decrease or prevent completely the loss of bone in this disease. This is visualized by measuring the evolution of BMD. Sometimes BMD is even increased, which is not necessarily due to more bone, but as recently shown, to an increase in mineralization following the decrease in bone turnover.

The effect on BMD, as demonstrated in recent years, is present in various types of osteoporosis, in elderly patients, as well as in males. An decrease in fracture rate by about one half has now been demonstrated both with alendronate and risedronate in adults. Of great interest is that children with osteogenesis imperfecta also respond positively to these compounds with respect to fracture rate.

Adverse events: Bisphosphonates are very well tolerated. Upper gastrointestinal disturbances are the most common complaint and occur especially with the bisphosphonates containing a nitrogen. It has recently been shown that these disturbances are less frequent when alendronate is given orally once weekly at a dose of 70 mg, instead of 10 mg daily. Since this regimen is also more convenient for the patient, it will become soon the preferred mode of administration of bisphosphonates in osteoporosis.

L25. RATIONALE FOR THE USE OF BISPHOSPHONATES IN THE 'HUMAN CLINIC'

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The target points for bisphosphonates in the bone tissue relate to its influence on the metabolism and the function of osteoclasts including the process of apoptosis. These effects lead to the reduction of bone metabolism, increased mineralization in the remodeling spaces and in effect to the increase of the target level for bone mass. Experimental studies with bisphosphonates revealed that higher mineralization of the bone correlates to its higher mechanical resistance. These observations are the rationale for the documentation of clinical studies that showed a significant decrease of fracture risk in many parts of the skeleton after bisphophonate administration in populations with different age and sex characteristics. In the last several years the number of newly available bisphosphonates increased significantly. These drugs are at present the objects of clinical studies. In the spectrum of use of registered and available bisphosphonates the attempts to optimize its administration are of particular importance (once weekly dosing, interchangeable dosing, intravenous administration). The broader spectrum of indications especially in children with osteogenesis imperfecta and in men is also interesting.

L26. ANTIRESORPTIVE THERAPIES: ARE THEY DIFFERENT?

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Summary of presentation: Approved agents for osteoporosis

For prevention: Bisphosphonates (Etidronate, Alendronate, Risedronate), Estrogen, SERM – Raloxifene

For treatment: Bisphosphonates (Etidronate, Alendronate, Risedronate) Raloxifene, Calcitonin

Estrogen: early increase in BMD, sustained effect not documented. Fracture trials limited to one RCT (Luffkin,1992 with very small numbers), mostly observational data

SERMs- Raloxifene: early increase in BMD, early reduction in bone turnover markers, early reduction in clinical vertebral fractures and sustained effect in radiographic vertebral fractures, no effect on nonvertebral fractures

Calcitonin: Little effect on BMD or bone turnover markers,early trend toward reduction in vertebral fracture, no effect on nonvertebral fractures. Bisphosponates – most data available on III generation bisphosphonates like alendronate and risedronate. Alendronate: early increase in BMD and reduction of bone turnover markers, sustained or increased gains in BMD and reduction of bone turnover markers over 8 years, early reduction in clinical spine fractures (1 year), hip fracture and all fractures (1.5 year), sustained reduction in morphometric vertebral fractures and hip fractures over 4 years.

Once a week 70 mg dose after 2 years is giving results in BMD identical to 10 mg daily dose, with positive effect on tolerability and safety.

Risedronate: early effect on BMD and bone turnover markers, sustained or increased gains in BMD over 3 years, early effect on morphometric vertebral fractures (1 year), sustained effect on morphometric vertebral and nonvertebral fractures through 3 years, weekly dose not available yet. Early and sustained effect of antiresorptive therapies according to the level of evidence: BISPHOSPHONATES (III generation), SERM- RALOXIFENE, Calcitonin, Estrogen

L27. EFFECTS OF TREATMENT WITH SODIUM ALENDRONATE IN MEN WITH PRIMARY OSTEOPOROSIS

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Therapeutic management of osteoporosis in men raises a number of controversies, for the majority of available pharmacological agents, used in the treatment of osteoporosis, have been registered, taking into account post-menopausal women only.

The goal of the study was an evaluation of the effects, resulting from an administration of sodium alendronate in men with primary osteoporosis, as well as an assessment of the tolerance to that drug.

Patients and methods: Thirty six (36) men with primary osteoporosis, diagnosed by densitometry (DEXA-DPX, Lunar) of the femoral bone neck according to WHO criteria, were included into the study; the mean age of the patients was 71.5 yrs with seven (7) patients revealing a previous history of fractures. All patients were divided into two groups. The patients of Group I were administered sodium alendronate (in a dose of 10 mg/day), calcium (calcium carbonicum, 1000 mg; as converted into elementary calcium), and vitamin D3 (cholecalciferol in doses of 1000 U/day) supplements. The patients of Group II received calcium and vitamin D3 supplements only, administered in doses analogous to those in Group I. Following twelve (12) months of the therapy, densitometric examination was repeated, in order to evaluate BMD changes.

Results: In Group I, BMD increased by 0.03 g/cm^2 (p $<$ 0.05) between the first and the second densitometric evaluation, while decreasing by 0.01 g/cm^2 in Group II, however, the threshold of statistical significance was not attained in the latter case. No new fractures occurred in any of the studied patients, the tolerance of the applied treatment being fairly good in both groups.

Conclusion: Sodium alendronate, when applied to men with primary osteoporosis, increases BMD.

L28. CALCITONIN IN THE MANAGEMENT OF OSTEOPOROSIS – PRESENT AND FUTURE

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As life expectancy continues to increase, the economic and social burdens of classic old-age diseases such as osteoporosis become ever more acute. Osteoporosis is a relatively 'silent' condition requiring conservative management for maximum patient acceptance.

Calcitonin has advantages over some other antiresorptive agents in being a natural hormone with a physiological-type action and in having analgesic activity, etc. Its safety level is also generally high, especially in the case of the intranasal form, with which no food or drug interactions have yet been reported.

Historically, the principal disadvantage of calcitonin has always been the fact that it could only be given by injection, impairing patient acceptance. A major step towards overcoming this problem was taken in 1987 with the introduction of a nasal-

spray form of salmon calcitonin, which is now available in many countries. It is currently the most-used form and a significantly reduced osteoporotic fracture rate has been reported among patients treated with it. It is better tolerated than the original parenteral form, ensuring good patient compliance and thus enhancing the level of efficacy.

With the same objectives in mind, an oral form of salmon calcitonin is now being developed, using a new technology whereby the drug is transported across the gastrointestinal-tract wall by means of a specific carrier. Animal and human toxicity studies have shown positive results, and work is currently concentrated on engineering a dosage form with ideal pharmacokinetic and pharmacodynamic properties suitable for clinical testing. If this is successful, oral calcitonin will prove a significant breakthrough in the future management of osteoporosis. In addition, the technology involved might find additional applications to other peptide drugs for the treatment of osteoporosis and other diseases.

L29. IS AN INCREASE IN BONE MINERAL DENSITY NECESSARY TO REDUCE THE RISK OF BONE FRACTURES

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Bone mineral density is a substantial determinant of fracture risk. It was suggested, however, that many additional factors play a role in the development of skeletal fractures. These factors affect bone geometry and microarchitecture as well as bone matrix properties. Excessive bone remodelling observed within a few years after the menopause can lead to decreased mineralization of bone matrix, increased probability of perforation and creation of stress risers of trabecular plates. High bone turnover due to estrogen deficiency or immobilization promotes apoptosis of osteocytes, bone cells serving as mechanosensors and playing an important role in maintaining skeletal integrity. Increased number of superosteons with giant canals resulting in increased porosity and significant reduction in elasticity of cortical bone seams to play an important role in the etiology of hip fractures.

Treatment with high doses of sodium fluoride demonstrates that the magnitude of increase in bone mineral density is not always a good predictor of bone strength. Long-term therapy with anti-resorptive drugs such as estrogen, raloxifen, calcitonin and bisphosphonates results in a reduction in vertebral fracture risk at least twice as great as would be predicted from the changes in spinal BMD. The improvement of bone quality may be the result of a reduction in the activation frequency and in the size of remodelling space, the increase in the mean degree of mineralization of bone matrix and the prolongation of osteocyte life span. It has to be stressed however, that excessive suppression of bone remodelling allows microdamage to accumulate thus leading to increased bone fragility.

L30. NASAL SPRAY SALMON CALCITONIN IN THE TREATMENT OF POSTMENOPAUSAL OSTEOPOROSIS: PRESENT AND FUTURE THERAPEUTIC USAGES

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Salmon calcitonin possesses a therapeutic rationale for the treatment of postmenopausal osteoporosis, as it is an inhibitor of osteoclastic bone resorption. Nasal spray salmon calcitonin (NS-SCT) has been shown to improve or preserve bone mineral density, and to be comparatively easy to administer and well tolerated without significant adverse effects. There has always,

however, been a question regarding NS-SCT's ability to prevent fracture.

The recently published PROOF study (Chesnut CH et al, American Journal of Medicine, September, 2000) was designed to answer the question of whether NS-SCT can prevent fracture at the spine. Data from this five year trial indicate a 36% reduction in new compression fractures at the spine in the 200 I.U. NS-SCT dosage group, as compared to placebo. This was obtained in women at high risk for osteoporosis, i.e., postmenopausal women with a mean age of 68, with 1–5 prevalent vertebral fractures. The study was not designed a-priori to define the effect of NS-SCT on hip fractures; nevertheless an interesting observation from the PROOF trial is that there were five new hip fractures in the 200 I.U. NS-SCT dosage group compared to nine in the placebo group. In the PROOF trial modest but significant (from baseline) effects were noted on bone mineral density at the lumbar spine; a modest but significant effect on markers of bone resorption (the serum c-telopeptide) were noted from baseline and as compared to placebo. The effect on fracture reduction at the spine was persistent and continuous throughout the five year treatment with nasal spray salmon calcitonin, as compared to placebo, indicating no evidence of resistance to the effect of NS-SCT with continued usage.

Therefore NS-SCT significantly reduces spine fracture; its mechanism of action in such fracture reduction however remains somewhat unclear, as the effect on both bone markers of turnover (bone resorption) and bone quantity (bone mineral density) remains modest, particularly as compared to bisphosphonates. A new concept is that hormonal agents such as NS-SCT may work to reduce fracture more by an effect on bone quality (particularly micro architecture and strength) than on quantity (bone mineral density). That concept is currently under evaluation in an ongoing ninety-one patient study, the QUEST trial, to determine the effects of 200 I.U. NS-SCT versus placebo in preventing trabecular micro fracture and preserving bone quality, as well as quantity, over time.

For the future there are many potential interesting developments for salmon calcitonin. These include the development of an oral calcitonin, potentially of great value in the prevention of bone loss, and as well the establishment of the interesting observation from the PROOF trial of an apparent effect on hip fracture, i.e., the exploration with a prospective study to define the effects of NS-SCT on hip fracture reduction. Indeed, the next few years will be most exciting in the development of salmon calcitonin for management of postmenopausal osteoporosis.

L31. BIOCHEMICAL ASSESSMENT OF BONE METABOLISM IN PATIENTS AFTER HEART TRANSPLANTATION

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NO ABSTRACT SUBMITTED

L32. CLINICAL EFFECTS OF RALOXIFENE IN POSTMENOPAUSAL WOMEN WITH OSTEOPOROSIS

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Late postmenopausal complications include osteoporosis, worsening of lipid profile and increased risk of breast cancer. Hormone Replacement Therapy (HRT) prevents some of these causes of morbidity and provides other symptomatic benefits more typical of early postmenopausal years. However, the compliance to HRT is relatively poor and in the long term it is associated with increased risk of endometrial and breast cancer. For these reasons most women take HRT only for a few years after menopause with little effect on the late postmenopause-linked morbidity.

A global preventive approach for these causes of morbidity

should include a bone anti-resorptive therapy, a lipid-lowering agent and a careful monitoring of the breast situation. A convenient global approach to the most scarring cause of morbidity in elderly women can be provided by the Selective Estrogen Receptor Modulators (SERMs)

Raloxifene is a SERM and it has been recently approved for the prevention of non-traumatic vertebral fractures in postmenopausal women at increased risk for osteoporosis. Acting as an estrogen agonist in the skeleton, in postmenopausal women raloxifene decreases bone turnover within premenopausal range and fully prevent the early and late postmenopausal bone loss. More importantly, Raloxifene was also shown to prevent new vertebral fractures in one of the largest study never performed, the Multiple Outcomes of Raloxifene Evaluation (MORE), a placebo-controlled, double-blind randomised trial of 7705 postmenopausal women with osteoporosis. The women, a mean age of 66.5 years and with hip or spine T-score <-2.5 and/or prevalent vertebral fractures, were assigned to receive either placebo or 60 mg or 120 mg of raloxifene. All women were provided supplemental calcium (500 mg/day) and vitamin D (400 IU/day). After 4 years, raloxifene 60 mg (the approved dose) reduced the risk of new vertebral fractures by 36% (RR 0.64, 95% CI 0.53, 0.46; p $<$ 0.001) in women without prevalent baseline fractures and by 34% (RR 0.66, 95% CI 0.55, 0.81; p $<$ 0.001) in women with prevalent baseline fractures compared with placebo. The reductions in vertebral fracture risk observed for the 120 mg dose in both women with and without prevalent baseline fractures was similar. There was no difference in the proportion of women reporting non-traumatic, non-spine fractures among those receiving raloxifene vs. placebo. BMD at the hip and spine increased in raloxifene users by 2–3% compared with placebo after 48 months (p $<$ 0.001). Raloxifene therapy lowered (cumulative effect) by 75% the incidence of multiple vertebral fractures and by 68% the incidence of clinical vertebral fractures within the first year of treatment. This antifracture efficacy was maintained through to the forth year and the fracture incidence was significantly lowered for each year interval.

In the osteoporosis prevention study Raloxifene significantly decreased LDL-Cholesterol, while maintaining unaltered both serum total HDL-C and serum triglyceride levels. Raloxifene also lowered levels of lipoprotein(a) and fibrinogen, both biochemical markers of cardiovascular risk. These effects of Raloxifene will be addressed in a specific cardiovascular outcomes trial: the Raloxifene Use for The Heart (RUTH) trial. The incidence of Estrogen-Receptor positive (ER+) breast cancer was lowered by 84% after 4 year of raloxifene therapy as compared to placebo (3.7% vs. 0.6%), but the incidence of ER- breast cancer was the same in the 2 groups (0.4%).

In summary, Raloxifene therapy for 4 years maintains BMD in healthy postmenopausal women and reduces the risk of new vertebral fractures by about half in postmenopausal women with osteoporosis, while improving the lipid profile and lowering breast cancer risk.

L33. TIBOLON IN TREATMENT OF OSTEOPOROSIS

Krzyczkowska – Sendrakowska M

NO ABSTRACT SUBMITTED

L34. THE ROLE OF VITAMIN D AND ITS METABOLITES IN PREVENTION AND TREATMENT OF OSTEOPOROSIS

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Vitamin D can be obtained by endogenous synthesis or dietary intake, and its nutritional status can be evaluated by the determination of serum levels of 25-hydroxyvitamin D (25OHD). The use of vitamin D and its metabolites in the treatment of osteopathies was previously restricted to the treatment of

diagnosed vitamin D deficiency, such as rickets and osteomalacia as well as to renal osteodystrophy. Vitamin D has been used in the treatment of osteoporosis with vitamin D deficiency resulting in secondary hyper-parathyroidism and a permanent increase in bone resorption. Therapy with vitamin D and its active metabolites is suggested in older patients without overt vitamin D deficiency. Age-related decreases in skin synthesis of vitamin D, insufficient exposure to ultraviolet light in the presence of low nutritional vitamin D intake, decreased intestinal calcium absorption, age-related decline of kidney function, reduced activity of renal 1α-hydroxylaze and resistance of tissues to 1,25 (OH)$_2$ vitamin D are clear indications for the use of vitamin D and its 1-α hydroxylated metabolites or analogues. Postmenopausal estrogen deficiency results in reduced hydroxylation of 25OHD to 1,25(OH)$_2$ vitamin D, decreased intestinal calcium absorption and hypercalciuria leading to a negative calcium balance and osteoporosis. Sex hormone deficiency can result in a propensity to falls and increased fracture rate. Controlled clinical trials suggest that vitamin D and 1α-hydroxy vitamin D should be used in the treatment of patients with osteoporosis combined with vitamin D deficiency; in the prevention and treatment of steroid-induced osteoporosis; as supporting therapy in combination with bisphosphonates, calcitonin, HRT and SERMs; and as mono-therapy in patients with senile osteoporosis.

The studies dealing with the effect of treatment with vitamin D metabolites on bone loss and fracture rate in established osteoporosis produced conflicting results. Subsequent clinical trials performed according to RCT rules are still necessary.

L35. OSTEOPOROSIS AND RISK OF FRACTURES, CURRENT PROBLEMS (DILEMMAS): WHAT, WHEN HOW AND WHO DO WE TREAT?

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The issue of the moment is to clarify the methodology defining osteoporosis and the risk of fractures and direct it together with the method of treatment towards prevention of fractures instead of just fulfilling the densytometric criterion. The borderline for osteoporosis is a BMD T-score of the femoral neck of –2.5 measured by the DXA method. Other sites for examination and techniques don't allow for the diagnosis of osteoporosis but may be of some prognosis to the risk of fractures. These result from both low bone density and clinical risk factors independent of BMD and together may be decisive in the need, method and level of treatment. Antiresorptive treatment (estrogens, bisphosphonates) is not effective since it does not prevent fractures in persons with normal bone density with a high risk of fractures due to different reasons other than low bone density. The younger the age of low BMD detection, the higher the risk of fracture until the end of the statistical age and therefore earlier beginning of antiresorptive treatment is required. On the other hand the same -2.5 T-score means a different risk of fracture for a person at the age of 65 (during 5 years 3.2%) and at the age of 80 (over 16%). Thus with the mean 10-year risk of fractures of 10% we are prone to treat people under 65 with a 5% risk and people over 75 with a 15% risk The choice of drug is determined by individual needs of the patient and exceeds the antiresorptive treatment. It also requires safety, efficiency in prevention of fractures and compliance of the patient. The assessment of the efficacy and the usefulness of the drug for an individual patient requires knowledge of clinical trials proving its usefulness. We should take into account the risk of fractures in a studied population, the method which was implemented to assesss the drug's efficacy in prevention of fractures and its therapeutical gap (therapeutical concentration/range). Our approach results from the fact that we do not treat the T-score but prevent fractures and adjust the method of treatment to the needs of the individual patient and not to osteoporosis.

L36. OSTEOPOROSIS IN MEN

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NO ABSTRACT SUBMITTED

L37. ASSESSMENT OF THE INFLUENCE OF RISK FACTORS ON THE DEVELOPMENT OF OSTEOPOROSIS IN MEN – AN EPIDEMIOLOGICAL STUDY

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Osteoporosis in men is less frequent than in women. It is estimated that 1/5 to 1/3 of fractures of femoral neck concern men.

The aim of the study was the assessment of bone mineral density in the male population. The study was based on a random selection including 237 men in the Wroclaw region.

Methods: 237 men over 35 years of age were tested. Participants were divided in 4 groups: 35–44 years, 45–54 years, 55–64 years and over 65 years. Bone mineral density measurement was performed with the DEXA method (DPX-IQ, Lunar). All men completed a questionnaire which consisted of questions concerning risk factors including: life habits, fractures, diet, nicotine smoking, alcohol intake, coffee, body mass, height and coexisting illnesses.

Results and conclusions: Mean t-score values are presented in the table.

Age (in years)	L2-L4	SD±	neck	SD±
35 –44	–1,03	1,18	–0,57	1,07
45–54	–1,11	1,37	–0,96	1,08
55–64	–1,07	1,76	–1,04	1,02
65 and more	–1,21	1,74	–1,57	1,11
SUM	–1,11	1,50	–1,04	1,13

There was a statistically significant correlation between bone density and height, body mass, BMI. There was a negative correlation between decreased height, smoking time, coffee drinking and bone density.

L38. INCREASED BMI AND WHR VALUES, AND REDUCED BMC AT THE ULTRA-DISTAL RADIUS IN THE COURSE OF MALE AGING

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Aims of the study: 1) an evaluation of relationships between BMI and WHR, and bone mineral content (BMC); 2) a comparison of BMC a) between overweight men (BMI $\geqslant$ 27) and non-obese subjects, b) between abdominally obese males (WHR $\geqslant$ 0,95) and men without visceral adiposity; 3) an estimation of relative risk of osteopenia with regard to BMI and WHR values in a population-based sample of Polish males.

Patients comprised a group of 272 healthy men, aged 20–60, inhabitants of Wroclaw in the Lower Silesia region of Poland. Trabecular, cortical and total BMC at the ultra-distal radius were assessed by pQCT (Stratec 960). BMI and WHR were used as parameters of general obesity and fat distribution, respectively. Relationships between variables were established by linear regression. The differences in BMC depending on BMI and WHR were tested by an analysis of co-variance (ANCOVA). A logistic regression allowed to estimate the relative risk of osteopenia (T-score $<$–1,0) with regard to BMI and WHR. BMI

was positively related only to trabBMC (r=0,17; p.=0,03). Men of BMI⩾27 had only a higher trab BMC when compared to non-overweight subjects (F=5,38; p.=0,02). BMI (BMI⩾27 *versus* BMI<27), controlled for WHR, did not affect a relative risk of male osteopenia. WHR was inversely related to trabBMC (r=–0,30; p.<0,001), cortBMC (r=–0,30; p.<0,001) and totalBMC (r=–0,34; p.<0,001). Men of WHR⩾0,95 had all densitometric parameters reduced when compared to men of WHR<0,95. Abdominally obese males (WHR⩾0,95), controlled for BMI, had an increased relative risk of being osteopenic within trabecular (OR=1,40; 95% CI=1,01–1,94), cortical (OR=1,82; 95% CI=1,29–2,57) and total BMC (OR=1,61; 95% CI=1,14–2,26). BMI, as a predictor of bone mineral content at the ultra-distal radius, was rather of minor significance, whereas visceral adiposity (assessed by WHR) was accompanied by male osteopenia.

same the mean volumetric mineral density (g hydroxyapatite per cm^3) can be noninvasively determined by quantitative computer tomography or by calculation of density in two projections as so called bone mineral 'apparent' density (BMAD in g/cm^3). The later contribute significantly in mechanical resistance evaluation when taking into account size component measurements (SSI-strength strain index). Nevertheless even when areal BMD values are informative in general strength prediction its interpretation is affected by several additional factors. The skeleton of growing child is heterogeneous in dynamics of its development. Sex, calendar and bone age as well as pubertal stage and sex data must be considered in the undertaken analysis. An important adjunct for these issues is the development of ultrasound data with utilization of possible discrimination of cortical and trabecular bone data.

L39. EFFECTIVENESS OF ETIDRONATE AND ALENDRONATE IN THE TREATMENT OF OSTEOPOROSIS IN MALES: A PROSPECTIVE OBSERVATIONAL STUDY

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Optimal treatment for osteoporosis (OP) in males is uncertain. Etidronate (E) and alendronate (A) are two bisphosphosates available in most countries for the treatment of osteoporosis (OP). From CANDOO, our prospective observasional database of patients with OP who are being followed at our academic tertiary care centre, we extracted the records of males who had had an initial bone mineral density (BMD) determination (immediately prior to any bisphosphonate therapy) and a follow-up BMD after 1 yr. Males treated with calcitonin, fluoride or another bisphosphonate were excluded. We divided them into 4 groups: E users for at least 1 y (n=91), A users for at least 1 y (n=33), switchers (S) (users of E for at least 2 y followed by a switch to A for at least 1 y) (n=18), and controls (calcium or vitamin D only, n=97). At baseline, lumbar spine (LS) and femoral neck (FN) BMD t-scores in the 3 treatment groups did not differ significantly but all were significantly lower than in the control group (except for the LS t-scores in A). At 1 y, LS BMD increased significantly within the A (mean; SEM = 6.3;0.6%), E (3.9;0.6%) and S (6.6;1.3%) groups. Femoral neck (FN) BMD increased in the A and E groups. All LS increases were significantly greater than the changes in the control group (p<0.001 by Tukey's paired comparison test), and only the A group had a statistically significant increase in FN BMD compared to the C group. We conclude that both A and E can increase BMD in males with OP or osteopenia. In this study, A was associated with a slightly greater mean increase in BMD than E.

L40. DENSITOMETRY IN CHILDREN

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Bone mass of the whole skeleton as well as its selected areas depends directly upon volume or size of analyzed segments and the density of the mineralized tissue contained within its periosteal envelope. The techniques of single and dual energy absorptiometry provide measurements of so called areal or surface bone mineral density (BMD, in g hydroxyapatite per cm^2). The values generated by this technique are dependent upon both size and integrated mineral density of the scanned segments. In the overview of available techniques areal BMD has been shown to be directly related to bone strength. By the

L41. A PROSPECTIVE ASSESSMENT OF BONE MINERAL DENSITY IN GIRLS WITH ANOREXIA NERVOSA

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The goal of the investigations was a prospective evaluation of bone mineral density in girls with A.N.

Material and methods: The analysis included 31 girls, aged 11–21 years, with diagnosed A.N. All patients were subjected to lumbar spine densitometry (DEXA), anthropometric measurements (BMI) and serum estrogen determinations. Follow-up examinations were performed 6,12,18,24,30 and 36 months later.

Results: 1/Initial densitometry performed in 31 girls showed decreased bone mineral density in 18 patients: in 12 girls the value of BMD Z-score for L2-L4 was below (-)2SD, while in 6 it ranged between (-)1SD and (-)2SD. No osteopenia was noted in the remaining 13 girls. The mean BMD value for all patients equaled 1.011 g/cm^2. After 6 months of follow-up, the mean BMD value was 0.9133g/cm^2, after 12 months 0.964g/cm^2, after 18 months 0.953g/cm^2, after 2 years 0.966g/cm^2, and after 30 months 0.999g/cm^2. Thirteen patients were followed up for 3 years; five of them showed a considerable BMD increase with values greater than these observed initially, yet all continued to have osteopenia. All the girls in this group menstruated. In 4 girls the BMD value showed no improvement, these girls refused therapy. Three of them were diagnosed with primary amenorrhea. The remaining 4 girls showed no osteopenia. After 3 years the mean BMD value for the group of 13 girls was 1.022g/cm^2. 2/ We observed a steady increase in mean BMI and estrogen values, with no correlation with BMD values. An association was observed between the duration of amenorrhea and BMD values.

Conclusions: Bone mineral density in anorectic patients is decreased within the first 18 months of anorexia duration despite the increasing body mass and estrogen levels. BMD value is affected by the duration of anorexia and amenorrhea, thus hormonal supplementation should be introduced as early as possible. Girls with A.N. and decreased bone mass should be subjected to densitometry when they achieve their peak bone mass.

L42. TREATMENT OF OSTEOPOROSIS AND OSTEOPENIA IN CHILDREN – OWN EXPERIENCE

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The aim of the study was to evaluate the effect of combined therapy (calcium-rich diet, physical rehabilitation, pharmacotherapy) in children with decreased mineralization of the skeleton.

The examined group comprised 45 children aged 6.5 to 18 years (28 boys and 17 girls). Secondary osteoporosis and osteopenia were recognized respectively in 13 and 2 of the 15 children. Primary osteoporosis and osteopenia were estimated respectively in 16 and 14 of the 30 children. Patients had been treated for 6 months to 4 years.

The total group received calcium and vitamin D supplements. In the majority of treated children a calcium-rich diet and physical rehabilitation adjusted to the advancement of the disease were applied. In some cases additionally calcitionin or fosamax was also used.

The applied treatment led to the improvement of skeletal mineralization in 70% (30/45). It was estimated at bone densitometry (DEXA method, total body and spine). We would like to notice that an improvement was observed in 23 of the 30 children with primary, but only in 7 of 15 patients with secondary disease. In the remainder of the children there was no improvement; some of them had even lower values of Z-score than at the beginning of therapy. It was probably caused by an especially severe course of secondary osteoporosis in those patients.

L43. EVALUATION OF CHANGES IN THE MUSCULO-SKELETAL SYSTEM IN CHILDREN WITH HYPOTHALAMIC-HYPOPHYSEAL INSUFFICIENCY BEFORE AND AFTER GROWTH HORMONE TREATMENT

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The aim of the study is the evaluation of bone mineral disturbances and body composition changes in children with somatotropic hypopituitarism (SH) prior to and in the course of 2-year growth hormone therapy.

The study included 25 children aged 5–15 years (6 girls and 19 boys) with diagnosed somatotropin hypopituitarism. Total body and lumbar densitometry (L2-L4) employing the DEXA method (DPX-IQ Lunar) was performed before growth hormone (GH) therapy and every 12 months over a two-year treatment duration. The assessment included changes in skeletal and lumbar bone mineral density, BMI, lean body mass, fat tissue, total body and lumbar bone mineral content, as well as total bone calcium content. All children were subjected to auxologic evaluation every 3 months. Their bone age was assessed according to Greulich-Pyle, and pubertal stage according to Tanner.

Results: In the course of growth hormone treatment both girls and boys showed a significant improvement of bone mineral density, especially in the lumbar spine, as well as a significant increase of lean body mass and non-significant increase of fat body mass. An increase was also noted in skeletal bone mineral components.

Conclusions: Before GH treatment, children with somatotropic hypopituitarism show decreased bone mineral density for chronological, height and bone age, as well as poorly developed muscle mass. Bone mineral density and muscle mass increase already after the first year of growth hormone therapy. At puberty bone mineral density approximates values normal for bone age.

L44. VITAMIN D3 RECEPTOR GENE AND ESTROGEN RECEPTOR GENE POLYMORPHISM IN THE POPULATION WITH OSTEOPOROSIS

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Studies of the etiology of osteoporosis are the most important for proper prophylaxis and treatment. It has been generally accepted, that the clinical picture of osteoporosis is conditioned by genetic factors, general state of health and environmental factors acting during the lifespan. Genetic factors may decide about peak bone mineral density, thus their determination would be helpful in establishing the individual risk of osteoporosis. Our knowledge about these risk factors can help us to change the course of the disease. Vitamin D3 and estrogens play an important role in bone metabolism. Thus, the aim of our study was to estimate vitamin D3 receptor gene (VDR) and estrogen receptor gene (ER) polymorphisms in patients with primary postmenopausal and senile osteoporosis and to investigate the relationships between genotype and bone mineral density (BMD). The studies referred to 43 women with low BMD and 20 healthy controls. BMD was determined in lumbar spine (L1-L4) using DEXA. In all cases VDR polymorphism (for TaqI, ApaI and BsmI) and ER polymorphism (for PvuII, XbaI and FokI) was studied. Results of genotype investigations are given in the table below:

Genotype	TT	Tt	tt	AA	Aa	aa	BB	Bb	bb	FF	Ff	ff
I	50.0	33.3	16.7	16.7	46.6	36.7	16.7	36.7	46.6	33.3	36.7	30.0
II	46.2	46.2	7.6	23.1	61.5	15.3	7.7	61.5	30.8	25.0	50.0	25.0
K	60.0	30.0	10.0	20.0	30.0	50.0	10.0	40.0	50.0	30.0	50.0	20.0

Genotype	PP	Pp	pp	XX	Xx	xx
I	23.3	46.7	30.0	13.3	46.7	40.0
II	30.8	38.4	30.8	15.4	46.2	38.4
K	50.0	40.0	10.0	10.0	60.0	30.0

I, osteoporosis;II, osteopenia; C, control group (%)

We have found a statistically significant correlation between BMD and Pvu II ER polymorphism.

L45. BONE TURNOVER MARKERS CAN AID FRACTURE RISK ASSESSMENT IN POSTMENOPAUSAL WOMEN

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According to current views, bone turnover markers may be considered as a risk factor, which is independent of the current BMD value. Therefore efforts are undertaken to find the best marker or their combination to assess that risk. The task of this study was to devise an algorithm aimed at unveiling a pair of markers which could best characterize bone turnover (in a group of 120 postmenopausal women with lumbar spine TS BMD < -2.0), from a panel of 4 resorption (NTx, CTx, PYR, d-PYR) and 3 formation (b-ALP, BGP, PINP) markers. The procedure was started by a cluster analysis for each of the 12 pairs of markers, resulting in obtaining of 12 divisions into subgroups with a high ('H') and low ('L') bone turnover. The quality of the division was verified for each pair by comparing mean BMD's (L2-L4) for the L and H subgroups, accounting for the effect of age and body mass. The division obtained for the NTx/b-ALP pair of markers was most effective (delta) and having the highest significance (t test). This was confirmed by random splitting of the whole study group into 2 equal subgroups, in which a cluster analysis was

performed again. Similar distribution of H and L cases around a division line drawn with the use of the upper premenopausal limits of both markers. At present it is unreasonable to expect the exact calculation of bone loss velocity basing on bone marker values. Nevertheless, using the proposed algorithm, there seems to be a good chance of obtaining a means to classify individual patients as low or high turnover cases – a condition which is recently recognized as independent from BMD, fracture risk factor.

L46. ALENDRONATE IN TREATMENT OF POSTMENOPAUSAL OSTEOPOROSIS AND ITS COMPLICATIONS

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Bisphosphonates are a new class of medicaments having a pronounced antiresorptive effect on bone tissue. Fosamax (alendronate sodium, trademark of MSD) is an amino-bisphosphonate acting as a powerful and specific inhibitor of osteoclast-induced resorption of bone tissue. To study the efficacy of Fosamax in the treatment of post-menopausal osteoporosis and its complications (vertebral fractures) 25 women aged 56–75 years (mean age – 63,6±1,2 years) were examined. Osteoporosis and its complications were diagnosed by means of ultrasound and roentgenography of the thoracic and lumbar spine. 11 patients (44,0%) had vertebrae fractures of a clinoid type and compression. To evaluate structural-functional state of bone tissue the 'Achilles+' (Lunar Corp., Madison, WI) ultrasound densitometer was used. Speed of sound (SOS, m/sec), broadband ultrasound attenuation (BUA, dB/MHz) and Stiffness index of bone tissue (SI, %) were determined. Fosamax was prescribed in a dose of 10 mg, in the morning, on an empty stomach, 1/2 hour before the meal. Ultrasonometry and evaluation of pain syndrome pronouncement were carried out in 1, 3, 6, 12 months from the beginning of treatment. 25 patients (I group) were taking the drug for 3 months, 17 patients (II group) were taking it for 6 months, 11 patients (III group) were taking it for 1 year. Patients ceased taking drug because of financial difficulties and not because of absence of effect or side effect. 9 women taking Fosamax for 1 year were examined at 12 months after the end of treatment (they were included in the IV group). Fosamax considerably reduced the pronouncement of pain syndrome and greatly improved structural-functional state of bone tissue: I group – SOS (before treatment – 1513±4 m/sec; in 3 months – 1514±4 m/sec); BUA (before treatment – 91,0±2,1 dB/MHz; in 3 months – 93,4±2,2 dB/MHz); SI (before treatment – 64,5±2,1%; in 3 months – 66,5±2,3%); II group – SOS (before treatment – 1512±6 m/sec; in 6 months – 1514±6 m/sec); BUA (before treatment – 90,4±2,5 dB/MHz; in 6 months – 96,8±3,2 dB/MHz; p=0,019); SI (before treatment – 64,0±3,0%; in 6 months – 68,7±2,9%; p=0,012); III group – SOS (before treatment – 1516±7 m/sec; in 12 months – 1518±6 m/sec); BUA (before treatment – 91,9±2,5 dB/MHz; in 12 months – 99,5±2,8 dB/MHz; p=0,030); SI (before treatment – 66,2±3,1%; in 12 months – 71,2±2,7%; p=0,036); IV group – SOS (before treatment – 1522±8 m/sec; in 12 months – 1525±8 m/sec; in a year after the end of treatment – 1516±10 m/sec); BUA (before treatment – 90,0±2,2 dB/MHz; in 12 months – 99,4±2,9 dB/MHz; in a year after the end of treatment – 97,6±4,5 dB/MHz; p<0,05 compared to the parameter before treatment); SI (before treatment – 66,8±3,2%; in 12 months – 73,1±2,6%; in a year after the end of treatment – 69,6±4,3%).

Results of our studies show the efficacy of Fosamax in treatment of postmenopausal osteoporosis and its complications. The drug increases bone mineral density, improves its solid characteristics, which is followed by a considerable decrease of a pain syndrome pronouncement and in an increase in functional abilities of patients.

L47. COMPUTER EVALUATION OF MANDIBLE BONE STRUCTURE IN WOMEN WITH OSTEOPOROSIS

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The correlation between the density of the trabecular structure of skeletal bone and the cancellous bone of the mandible has not yet been fully established. Much research has been undertaken in order to unequivocally define this dependence.

The aim of the study was to attempt a comparison of the internal structure of the mandible in relation to the whole skeleton.

In a group of women aged 50–60 years lumbar spine densitometry was done on the Lunar DPX-IQ apparatus. On the basis of T-score results a group of 15 women were defined, according to WHO criteria as having osteoporosis, and 15 women with a normal bone mineral density as the control group.

After this evaluation a digitalized radiograph of the mandible was taken at the region of the 45 and 44 teeth.

The resultant bitmaps were analyzed in a given area and the trabecula were assessed for quantity and quality. For objectivity, computer image analysis was undertaken using the 'Trabecula' program. This program searches for trabecula on the radiogram, then plots their map and determines numerically their amount and structure.

The use of computed image analysis: densitometry, digital radiography and the algorithm of the Trabecula program allows for the objective evaluation and reproducibility of the investigation. Differences in the morphometrical parameters of trabecula were observed between the studied and the control group. On the basis of obtained results a correlation between the internal structure of the mandible and bone mineral density was found.

L48. NORMAL AND OSTEOARTHRITIC ARTICULAR CARTILAGE

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Articular cartilage is an enigmatic tissue that is just beginning to reveal some of its secrets. It can tolerate an overload many times higher than body weight. The matrix contains more than 70% water and is composed mainly of collagen and proteoglycans. The integrity of the matrix is maintained by the activity of the chondrocytes. The major collagen of matrix is type II which forms 80–90% of the total content. The major proteoglycan of cartilage is aggrecan. Cartilage also contains two low-molecular-weight proteoglycans: chondroitin sulphate and dermatan sulphate, decorin and biglycan. The components of the cartilage matrix are constantly turned over. Several hormones and parahormones such as insulin-like growth factor I stimulate chondrocyte proliferation and collagen II and proteoglycan synthesis. The state of articular cartilage depends on the balance between synthesis and degradation.

The main feature of osteoarthritis (OA) is the imbalance between these processes. Metalloproteases (matrixins), mainly stromelysine and gelatinase are thought to play a crucial role in the cartilage degradation in OA. They are inhibited by Tissue Inhibitors of MetalloProteases (TIMPs) and activated by many factors i.e. other proteases, cytokines (mainly Il_1) and different adhesive molecules. In OA cartilage the matrixins are highly activated. It is associated with inadequate TIMP production. Some changes of the synthesis are also noted – for example chondrocytes in OA synthesized principally the L_1 proteoglycan core protein.

Current concepts suggest a specific role for the aging process wherein formation of Advanced Glycation End – products (AGEs) increase with age resulting in increased cross-linking of the matrix components and activate cytokines.

Some explanations of the genetic predispositions to OA have been also proposed. Genetic defects in some components of the cartilage, mainly collagen type II (also collagen t. X and progeolycans) have been described. The most common mutation demonstrated is an error in one base leading to a substitution of cysteine for arginine in the collagen matrix.

Synovial membrane and bone tissue undoubtedly play a role in the pathogenesis of OA. Nevertheless articular cartilage is the most important place of these disturbances. Good knowledge of all pathological phenomena's in OA cartilage is crucial for the efficacious treatment of this disease.

L49. SYNOVIAL FLUID IN OSTEOARTHRITIS

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Degenerative disease of joints involves a process of articular cartilage damage associated with secondary lesions in bone epiphyses, leading to anatomical damage of the joint, its impaired function and to pain. The lesions may be accompanied by an inflammatory process in the synovial membrane, reflecting immune reactions to the released cartilage antigens or a reaction to the presence of crystal. Synovial fluid exhibits a non – inflammatory character (type I). In some cases however, lowered viscosity and increased protein content may be observed as well as increased numbers of cells (up to 8000/mm³) mainly lymphocytes. In the sediment, fragments of destroyed cartilage, bone and calcium pyrophosphate or hydroxapatite crystals may be detected.

L50. PHARMACOLOGICAL INTERVENTION IN OSTEOARTHRITIS

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Therapeutic targets in OA include the following protection: primary (remove the cause), secondary (treat the OA process), and tertiary (treat the consequences of OA). Secondary protection must consider: 1. Mechanical/surgical intervention, 2. Drugs, local or systematic, and 3. Combination of drugs and mechanical methods. The first duty in OA management is patient education, pain relief and optimalisation of functioning. Current consensus demands to distinguish drugs directed at symptoms called 'Symptom modifying drugs' and/or at pathology of OA called 'Structure/disease modifying drugs'. Glucosamine sulphate, hyaluronian, diarhcein, chondroitin sulphate, collagen hydrolysates represent the first group. Veno-active drugs such as aescine, hydroxyrutoside and trybenoside as well as antyoxydative vitamins such as Vit. C, E, A and almost all of the bone resorption inhibitors are tested. Symptomatic medications used in OA include also simple analgesics, low analgesic or higher anti-inflammatory doses of NSAID, antispasmodics, narcotic analgesics and topical capsacein. Targets for drugs of the second group are inhibition of cartilage degradation: cytokine and protease inhibition, stimulation of the repair process and reduction of subchondral bone remodelling. Up to now there are not drugs able to stop or reverse OA pathology, but glucosamine sulphate, sulphated and non-sulphated glycosaminoglycans, bone related active agents, enzyme inhibitors, stem cell grafts and cytokine/growth factors are intensively tested. In these presentation

antioxidants, neutralisers of active oxygen particles and bone resorption inhibitors deserve a special emphasis.

L51. GLUCOSAMINE SULFATE THE FIRST PROVEN TREATMENT FOR DISEASE (STRUCTURE) MODIFICATION IN OSTEOARTHRITIS

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Introduction: The goal of pharmacological treatment of osteoarthritis (OA) is to control symptoms (pain and limitation of function) and possibly also to retard or stop joint deterioration progression. Therefore drugs for the treatment of OA are classified as symptom and structure modifying drugs in OA.

Several clinical studies have proven glucosamine sulfate (GS) to relieve symptoms in OA. These clinical and also preclinical results suggested that GS can influence the biology of joint structures.

Glucosamine is an aminomonosaccharide occurring naturally in almost all human tissues, largely in proteoglycans of articular cartilage. The normal source of glucosamine is endogenous biosynthesis from glucose. Exogenous GS is the preferential source for proteoglycan biosynthesis. GS is consequently incorporated into proteoglycan molecules (1) and shows a special tropism for cartilaginous tissues (2). Also sulfate ions are essential for glycosaminoglycan and proteoglycan synthesis and contribute to the inhibition of cartilage degrading enzymes.

Preclinical experiments: GS stimulates proteoglycan synthesis in human osteoarthritic chondroctyes in vitro (3,4,5) and decreases the metalloproteinases, stromelysin and collagenase (4,5,6). Glucosamine also inhibits compression induced catabolic changes in chondrocyte biosynthesis and gene expression in bovine articular chondroctyes (7). In rat articular chondrocyte cultures glucosamine prevented dose-dependently the inhibitory effects of IL-1β (8). In vivo in animal OA models the in vitro results were confirmed and reflected in reduced cartilage destruction (9,10,11).

Clinical proof: Encouraged by the favourable preclinical results with GS indicating a normalisation of OA dysregulated cartilage metabolism, two clinical long-term trials of 3 year duration were carried out to examine the effect of GS on the progression of knee OA joint structural changes and symptoms. In the studies 212 resp. 202 patients with knee OA (ACR criteria) were randomly assigned, in a double-blind fashion, to the continuous treatment with oral GS, 1500 mg once-a-day, or placebo for 3 years. Weight-bearing, antero-posterior radiographs of each knee were taken at enrolment and after 1 and 3 years in the first study, in the second study after 1, 2 and 3 years, standardising patient positioning and radiographic procedure. In the first study total mean joint space width (JSW) of the medial compartment of the tibio-femoral joint was assessed by digital image analysis by a validated computerised algorithm, while in the second study the minimum JSW of the narrowest medial joint space was measured visually by a 0.1 mm graduated magnifying glass. Symptoms were scored at each 4-month visit by the (total) WOMAC and Lequesne indices. The two groups were comparable for demographic and disease characteristics in both studies. In the first study (12) the placebo-treated patients had an average joint space narrowing (JSN) of approximately 0.08-0.1 mm/year, while no JSN occurred in the GS group. A slight worsening in symptoms was evident at the end of the treatment with placebo, compared to the improvement observed after GS. In the second study (13) the 3-year JSN observed with placebo was approximately 0.2mm and was significantly higher than with GS for which like in the first study no JSN occurred in average. Symptoms improved in both groups, but significantly more with GS than with placebo. The improvement tended to be proportionally higher on the Lequesne index than on the WOMAC.

Conclusions: The clinical results have shown that GS has disease modifying properties in OA by inhibiting further degeneration of articular cartilage. They also confirmed that the natural JSN in knee OA is slow but can be prevented by GS that also induces a significant symptom improvement.

L52. TREATING CHONDRAL AND OSTEOCHONDRAL LESIONS OF THE KNEE WITH AUTOLOGOUS CHONDROCYTE TRANSPLANTATION

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In Sweden more than 1000 patients have been treated with Autologous Chondrocyte Transplantation (ACT) since 1987.

Two hundred and nineteen patients underwent ACT between 11/87 and 2/96 and 213 were assessed after 2–11. Second-look arthroscopy in 46 patients and 19 biopsies taken from the transplanted area were evaluated. The stiffness of the repair tissue was tested with an electromechanical indentation probe in 14 patients. Sixty-one patients with a long-term follow-up (5–11 years) were assessed and the results were compared to the results at the 2-year follow-up.

The patients were divided into femoral condyle (FC), n=57; femoral condyle with ACL repair (FC+ACL), n=27; osteochondritis dissecans (OCD), n=32; patella (PAT), n=32; trochlea (TRO), n=12; and multiple lesions (MUL), n=53. Good/excellent results (Cincinnati Rating) were achieved in 90% (FC), 74% (FC+ACL), 84% (OCD), 69% (PAT), 58% (TRO), and 75% (MUL) of patients. Histologic evaluation showed hyaline-like repair tissue in 80% of the biopsies and there was correlation between hyaline-like repair tissue and good/excellent results. The stiffness was 2.7N in hyaline-like repair tissue and 1.2N in fibrous repair tissue, compared to 3.1N in normal tissue. The 46 patients with second look arthroscopy were evaluated using a score for defect fill, integration, and macroscopic appearance (maximum score=12). FC showed a mean score of 10.3, FC+ACL mean score 10.9 and OCD mean score 10.5. Sixty-one patients with long term follow-up had their results after 2 years compared to the results at the last follow-up (5–11 years, mean 7.4). At 2 years 50 were graded good or excellent and at last follow-up 51 were graded Good or Excellent.

The repair tissue after treatment with ACT is similar to hyaline cartilage in histologic and mechanical characteristics, resulting in good clinical outcomes in more than 75% of patients. The results are best in lesions on the femoral condyle. The results are consistent in a long-term follow-up.

L53. THE OSWESTRY EXPERIENCE WITH AUTOLOGOUS CHONDROCYTE TRANSPLANTATION

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Autologous chondrocyte transplantation has been performed in the specialist orthopaedic hospital in Oswestry, UK since 1997. The procedure has now been performed in 87 patients many of whom had had unsuccessful preior surgery to treat chondral defects. We have used cells grown in the hospital's own accredited laboratory. Fifty-four patients have been reviewed at more than one year after surgery.

Our experience is largely with femoral condylar defects of around five square centimetres, but the procedure has been performed for much larger lesions and also for selected defects in the ankle, hip and elbow. We have modified the original Gothenburg technique in some cases, allowing us the opportunity inspect and repair some of the periosteal patches arthroscopically at three weeks after first stage suture as well as biopsying them at one year. We have also combined ACT with osteochondral autograft (mosaicplasty plugs) to treat deeper lesions involving the subchondral bone.

The outcomes have been assessed by Lysholm score, arthroscopy and arthroscopic biopsy as well as magnetic resonance imaging at one year and form part of an on-going research project.

L54. TREATMENT POSSIBILITIES IN ARTICULAR CARTILAGE LESIONS

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The aim of the study is to present modern treatment opportunities in joint cartilage lesions and the results of authors own research in this field. In several experimental studies (on rabbits) the chondrogenic potential of the perichondrium, periosteum, bone marrow, osteochondral pulp, and autologous chondrocytes was investigated. After a follow-up period of 4, 8, and 12 weeks assessment was carried-out with the use of macroscopic and microscopic methods of evaluation.

Periosteal and perichondrial resurfacing. Bone marrow stimulation. In each of the methods the joint contour was restored. The regenerative tissue filling the defect resembled joint cartilage. In microscopic evaluation the groups with chondrogenic tissue transplants gave better results both in terms of the quality of tissue filling the defect and restoration of the subchondral bone. No differences were observed between the results of perichondrial and periosteal transplants. The results of bone marrow stimulation were inferior in both macro and microscopic evaluation.

Autologous osteochondral pulp transplantation. Both macro and microscopic evaluation of the regenerated tissue after reconstruction of the hyaline-like cartilage was present. Areas of osteocyte necrosis surrounded by young chondrocytes confirmed the chondrogenic potential of the pulp.

Autologous chondrocytes transplantation. Autologous chondrocytes for transplantations were received from 14–21 day in-vitro cultures. In macroscopic evaluation the regenerated tissue resembled the adjacent cartilage. In microscopic evaluation the regenerated tissue had hyaline-like features with good integration and regular cell columns.

Conclusions. All investigated methods of cartilage reconstruction gave a hyaline-like cartilage filling the defect.

Clinical application of periosteal and perichondrial resurfacing (preliminary report). Periosteal or perichondrial resurfacing was applied in 7 patients with deep cartilage lesions involving 2–10 cm^2. In all cases significant clinical improvement was observed.

L55. IMMNOHISTOCHEMICAL ANALYSIS OF HUMAN AND BOVINE CHONDROCYTES IN CULTURE

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Human chondrocyte culture offers a new approach for treating chondrocyte- mediated cartilage degradation associated with various human arthropaties including osteoarthritis. Cultured chondrocytes have served as useful models for studying chondrocyte differentiation and the effect of cytokines and growth factors that control the maintenance or suppression of differentiated cartilage phenotype. The use of chondrocytes of human origin has been problematical, because the source of the cartilage cannot be controlled, sufficient numbers of cells are not readily obtained from random operative procedures and the phenotypic stability of adult human chondrocytes is lost quickly. The aim of our study was to compare normal, untransformed human and bovine chondrocytes from primary cell cultures. Human articular cartilage was obtained from knee joints after surgery for joint replacement or at autopsy. Bovine articular cartilage from knee joints was obtained from the local slaughterhouse. The isolation of the chondrocytes was optimised by the use of trypsin and collagenase. After enzymatic digestion of both cartilage types cell suspensions were transferred in to culture

flasks with a culture medium (Dulbecco's MEM) containing 10% foetal bovine serum (FBS), Fungizone (0,5 ug/ml), gentamycin (50 Ug/ml) was incubated at 37°C in an atmosphere of 5% CO^2 in air on average changed every 3–4 days. When cultures reached the confluent phase all flasks were passaged. Cell viability was tested with the trypan blue exclusion test. Staining for metachromatic matrix (using Alcian Blue) was positive for human as well as for the bovine chondrocytes. S-100 protein was localised both in human and bovine chondrocytes (detection with peroxidase-labeled antybody to S-100).

Conclusion: On the basis of chondrocyte analysis using immunohistochemical staining, it seems that bovine chondrocyte cultures are a good model for the study of physiology and pathology of chondrocytes.

ABSTRACTS OF POSTERS (P001–P108)

P001. IS THIS A NECESSITY TO CREATE POPULATION, DENSITOMETRIC REFERENCE NORMS FOR DXA EXAMINATIONS?

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Introduction: According to the IOF recommendations 2000(1), it is recognized that densitometric norms are those obtained in the NHANES III study and performed using HOLOGIC(2) in the femoral neck region. We studied a female population of the Podlasie region to compare BMD values gained by us to norms given by the producer of the Hologic apparatus.

Material and Methods: Using the Hologic QDR 4500SL we measured bone mineral density in 2153 women aged 20–90 years, not treated and void of diseases influencing bone metabolism. A group of women aged 20–40 years, conditioning young adult values therefore T score, were recruited among healthy nurses and officials of our Hospital. The performed BMD measurements were compared with data from 1991 given by the Hologic producer and those obtained in NHANES III (1997) in each age decade.

Results are shown in the table below.

	PL			NHANES III 1997		Hologic 1991		PL vs. H 1997	PL vs. H 1991
Age	N	BMD	SD	BMD	SD	BMD	SD		
20-29	18	0,870	0,08	0,849	0,11	0,894	0,1	2,41%	–2,76%
30-39	124	0,855	0,13	0,831	0,11	0,871	0,1	2,81%	–1,87%
40-49	409	0,824	0,13	0,803	0,11	0,826	0,1	2,55%	–0,24%
50-59	424	0,797	0,12	0,732	0,11	0,766	0,1	8,16%	3,89%
60-69	659	0,713	0,10	0,682	0,11	0,700	0,1	4,35%	1,82%
70-79	507	0,704	0,09	0,618	0,11	0,636	0,1	12,22%	9,66%
80-89	12	0,606	0,09	0,569	0,11	0,581	0,1	6,11%	4,13%

Conclusions: The small difference (max. 2.81%) of BMD values in the age group 20–39years (young adult values therefore T-score) does not implicate a necessity to create local reference norms which confirm IOF recommendations.

P002. CHARACTERISTICS OF TRABECULAR BONE STRUCTURES IN POSTMENOPAUSAL AND SENILE OSTEOPOROSIS

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The aim of the study was to estimate changes in trabecular bone structure caused by postmenopausal and senile osteoporosis

and select the parameters allowing to differentiate between examined structures.

The study was performed on 30 transillial bone specimens taken from patients with postmenopausal osteoporosis (10) and senile osteoporosis (13) and on normal bone specimens taken at autopsy (7). Microradiograms of specimens were processed into digital images by means of CD camera and ADC and analyzed using Zbin 2.5 and Multiscan software.

The following parameters were measured: BV/TV – trabecular bone volume, p – horizontal to vertical trabeculae area ratio, f – network connections index. The correlation between these parameters were examined.

The ranges of measured values of BV/TV and p parameters for three examined groups differ. The mean value of network connections index f, calculated for bone structures with senile osteoporosis, is higher than the same mean value for post-menopausal osteoporosis. The measured correlation coefficient significantly differentiates three tested groups. A strong correlation between the BV/TV and network connections index for normal structures (r > 0.80) is observed. The same correlation for senile and postmenopausal osteoporosis is very small (r < 0.42).

P003. BONE MINERAL DENSITY AND CALCIUM INTAKE FROM MILK AND DAIRY PRODUCTS IN 40–55 YEAR OLD WOMEN

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The purpose of the study was the assessment of calcium intake from milk and its products and its effect on bone mineral density in perimenopausal women.

The study included 112 women aged 40–55 years. Bone densitomery of the lumbar spine (BMD-AP), femoral neck (BMD-N), Ward's triangle (BMD-W) and greater trochanter (BMD-TR) were done with the Hologic 4500A unit. Daily intake of calcium from milk and dairy products (CaML) was assessed using a food-frequency questionnaire. The statistical analysis of the results was achieved with the aid of the Staistica PL (StatSoft) software.

In postmenopausal compared with premenopausal women a significantly lower BMD-AP was found (1,007±0,146 vs. 0,904±0,189 g/cm^2) and BMD-N (0,944±0,114 vs. 0,808±0,111 g/cm^2). A significant positive correlation between CaML and BMD-AP in postmenopausal women (r=0,486, p < 0,05) but this correlation was absent in premenopausal women (r=-0,185, NS). A significant negative correlation was found between age and: BMD-AP, BMD-N, BMD-W (r=–0,288, p < 0,05; r=–0,452, p < 0,05; r=–0,339, p < 0,05 respectively). No significant difference was found between daily calcium intake with milk and its products between premenopausal and postmenopausal women (592,1± 367,2 vs. 593,5±403,5 mg/d).

Age and loss of gonadal function have the greatest effect on the bone mineral density in perimenopausal women.

Low calcium intake can be the factor accelerating loss of bone in the lumbar spine in postmenopausal women.

P004. NUTRITIONAL RISK FACTORS OF OSTEOPOROSIS AT ELDERLY PEOPLE

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All over the world, including Poland, vital statistics show a continuous growth in the elderly population. Osteoporosis is one of the diseases whose frequency increases with the age. Owing to

the importance of the problem, osteoporosis, together with cardiovascular and neoplastic diseases, is currently looked upon as one of the civilization-related illnesses, remarkably dependent on so-called life-style. A nutritional pattern is one of the vital – although still underestimated – elements of life-style.

In view of this aspect, the study was carried out to determine the nutritional risk factors in the development of osteoporosis of elderly people, i.e. the age group for whom osteoporosis results in a decrease of quality of life and creates a serious therapeutic problem.

When assessing the nutritional pattern in the selected elderly population, the value of intake of basic nutritional components, minerals (calcium, magnesium and phosphorus) and vitamin D was thoroughly examined.

The study was carried out in a group of 600 people, the citizens of Poznań at the aged above 65 yrs. The individual nutritional pattern among the group was assessed by a 24h recall method. The data analysis, concerning the quality and quantity composition, was conducted with the use of a computer program which is the extended version of 'Tabele skł_adu i wartości odżywczej produktów spożywczych'. The data obtained in the study were subsequently compared with dietary norms recommended by the Polish Instytut Żywności i Żywienia.

The examined group of subjects were found to follow several irregularities in dietary practices. Among others, the imbalance of basic components (proteins, fats and carbohydrates), deficiency of vitamin D, calcium and magnesium at the excessive intake of phosphorus were observed in the daily diet.

This study confirmed the improper pattern of consumption in elderly people may promote the presence and intensification of osteoporotic changes and as such motivates a drawing of further attention to the need for change of improper nutritional habits.

P005. CALCIUM, MAGNESIUM AND PHOSPHORUS CONSUMPTION OF ELDERLY PEOPLE LIVING IN THE PROVINCE OF WARMIA AND MAZURY

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An adequate level of minerals present in food is necessary for the regular functioning of the human body. Both an insufficient and excessive concentration of macro- and microelements results in body function disturbances, causing numerous diseases. The aim of this paper was to analyse the levels of selected mineral consumption by the elderly.

The investigation was carried out in 1999 and comprised subjects between 75 and 80 years of age permanently living in the province of Warmia and Mazury. In total, 160 males and 194 females were examined. The average consumption of nutrients was estimated by the 24-hour recall method. After including the standard loss, it was compared with a consumption norm at a safe level. The average consumption of the selected minerals i.e. Ca, P and Mg was compared between the sex groups including the selected classes of norm completion (66.7%, 90% and 110%). Statistical analysis of the examination results was performed with the use of Statistica v.5.5 software with a significance level of $p \leqslant 0.05$.

In the group of the examined males, in comparison to the examined females, a significantly higher degree of the norm completion for energy (85% and 77% of norm, respectively), protein (114% and 94% of norm, respectively) and fat (110% and 94% of norm, respectively) was observed. In both sex groups, an insufficient degree of norm completion for carbohydrates (73% of norm, males and females), calcium (49% and 37% of norm) and magnesium (70% and 64% of norm) and too high a degree of norm completion for phosphorus (164% and 105% of norm) was found. The average consumption of calcium and magnesium was obtained for 66–82% and 55–59% of the examined subjects

respectively. This indicates the high risk of mineral insufficiency (below 66.7% of the norm). Consumption of phosphorus higher then 110% of the norm was observed for 43–78% of the examined subjects.

The observed low intake of calcium and magnesium and too high an intake of phosphorus may be of a high risk of deficiency and evidence unfavourable dietary habits.

P006. OSTEOPOROSIS IN ELDERLY PATIENTS OF INTERNAL-GERIATRIC UNIT DURING ONE YEAR FOLLOW UP

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Background: Osteoporosis is rarely the main cause of hospitalization in elderly patients who are admitted rather because of bone pain. Adults with chronic internal diseases appearing simultaneously are usually the reason for admission.

Aim: We analyzed the final diagnosis in 60 years old patients who were hospitalized on the internal-geriatric unit of a multidisciplinary hospital in a suburb of a large city, depending on the frequency of osteoporosis and coexisting diseases.

Material and methods: In a group of 316 patients hospitalized from 1.01 to 31.12.2000 there were 36 patients with osteoporosis (T-score <2.5) who were analyzed according to coexisting diseases (polypathology).

Results: Among 36 patients who were aged up to 60 years (only women!) and the remaining 27 patients who were older than 60 years old (26 women and 1 man). The most frequent osteoporosis containing diagnosis in the younger group were gastrointestinal diseases (77%) and spondyloarthrosis (44%) and in the older group – cardiovascular diseases (81%).

Conclusions: A high frequency or digestive diseases in younger patients with osteoporosis proves the importance of nutritional malfunctions in pathogenesis of osteoporosis during ones whole life. In the older group of patients a significant prevalence of circulatory system diseases and their coexistence with osteoporosis may be interpreted in two ways: as an influence of circulatory insufficiency in the pathogenesis of osteoporosis or as a case of physical immobilization on the demineralization process of bone. Aging is the period of life characterized by low functional activity (polypathology) and poor quality of life, which in turn influence the state of bone.

P007. BIALYSTOK OSTEOPOROSIS STUDY (BOS): WOMEN WITH CORONARY HEART DISEASE HAVE LOWER BONE MASS

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Background: Some studies provide data suggesting that osteoporosis in women is often associated with coronary atherosclerosis (1,2) which would indicate a common pathway of both diseases. We have looked into this hypothesis in women participating in the Bialystok Osteoporosis Study (BOS).

Materials and Methods: 727 women , residents of the Podlasie region were randomised for the study and completed a questionnaire concerning their medical history. 173 had coronary heart disease (CHD) diagnosed for several years (at least five). Women were under the care of general physicians. Bone mineral density was performed in all 727 women at the hip and lumbar spine using HOLOGIC QDR 4500 apparatus.

Results: Women with CHD had statistically significant (p=0,002) lower bone mineral density in the hip as compared with those without a history of CHD.

Data are shown below:

Mean T score	No CHD	CHD	Correlation
Neck	−1,08	−1,42	p=0,002
Total hip	−0,11	−0,259	p=0,1
L1-L4	−1,12	−1,3	p=0,15

Conclusion: This analysis would support an opinion that menopause as a common cause of bone loss and atherosclerosis in the studied population.

P008. BIALYSTOK OSTEOPOROSIS STUDY (BOS): LOW BODY MASS INDEX (BMI) IS ASSOCIATED WITH LOWER BONE MINERAL DENSITY IN WOMEN

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Introduction: Low weight below 57 kg is in some epidemiological studies recognised as a risk factor for osteoporosis. We have evaluated this finding in our population on a representative sample of women from the region of Bialystok representing inhabitants of the city and surrounding countryside. The aim of this report is to compare body mass index and bone mineral density.

Materials and Methods: 727 women aged $\geqslant 45$ years were selected and randomised for our epidemiological study. The subjects underwent bone mineral density measurement (BMD) of the hip and spine by DXA using the QDR4500 Hologic apparatus. Weight, height and body mass index were then calculated.

Results showed, that women with a low body mass index, < 20 kg/m^2 have a statistically significant lower mean bone mineral density in all three regions of the skeleton.

Mean BMD	BMI > 20kg/m^2 n=646	Low BMI < 20kg/m^2 n=81	p
T-score neck	−1,12	−2,41	p=0,001
T-score total	−0,09	−1,79	p=0,000
T-score L1-L4	−1,13	−2,16	p=0,008

Conclusions: This analysis strongly supports data from other populations indicating that low body mass index is also associated with low bone mass.

P009. GROWTH HORMONE, INSULIN-LIKE GROWTH FACTOR AND PROLACTIN CONCENTRATION IN WOMEN WITH OSTEOPENIA AND OSTEOPOROSIS

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Introduction: Growth hormone (GH) indirectly influences bone tissue through the insulin- like growth factor IGF-1; these factors increase bone remodeling and bone mineral density (BMD). Prolactin (PRL) inhibits the osteoblasts.

Aim of the study: The aim of the study was to evaluate the concentrations of insulin-like growth factor, growth hormone and prolactin in relation to bone mineral density of lumbar vertebrae L1-L5.

Materials and methods: Eighty one women aged 51,6 +/- 3,9 years in the early phase of physiological menopause and a negative metabolic disease history, were enrolled into the study.

All women were divided into 3 groups according to WHO criteria and basing on initial results of densytometric studies of bodies of the lumbar vertebrae L1-L5 in the antero-posterior view; the groups differed insignificantly as far as age was concerned. The groups were as follows: I- control; II- osteopenia; III- osteoporosis. Radioimmunological assays were applied to evaluate IGF-1 and prolactin concentrations.

Results: The concentration of IGF-1 in osteoporotic women was statistically significantly lower (p < 0,005), while in the group with osteopenia the IGF-1 concentration was insignificantly lower (p > 0.87) than in group II. Baseline prolactin concentrations were insignificantly lower when compared to the control group. Prolactin concentrations in group III were also insignificantly lower than in the control group. A percent increase of prolactin concentration following the metoclopramide test in osteoporotic women was significantly higher (p < 0,002) than in patients with osteopenia (p < 0,03) in comparison to the control group.

Conclusion: Decreased bone mineral density of the bodies of the lumbar vertebrae is accompanied by a drop in the concentration of growth hormone and insulin-like growth factor, and by an increase of prolactin concentration.

P010. INFLUENCE OF IGF-I AND IGFBP-3 ON BONE MINERAL DENSITY IN POSTMENOPAUSAL WOMEN

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Serum concentration of insulin-like growth factor-I (IGF-I) decreases with age but the link between IGF-I and postmenopausal osteoporosis remains controversial. IGFBP-3 is the IGF-I binding protein, which prolongs the half-life of IGF-I and serves as a metabolic reservoir of IGF-I.

The goal of this study was to determine the effect of IGF-I and IGFBP-3 on bone mineral density in postmenopausal women.

Patients and methods: The study included sixty two (62) postmenopausal women, mean age 69,8 years. All the women were examined to exclude other risk factors of osteoporosis. Bone mineral density (BMD) was measured in the femoral neck, using dual-energy X-ray absorptiometry (DPX, Lunar, USA). The obtained results were evaluated according to WHO criteria of osteoporosis. IGF-I and IGFBP-3 were measured by RIA (IGF-I Biosource Europe S.A., Belgium; IGFBP-3 Immunotech, France).

Results: Serum concentrations of IGF-I and IGFBP-3 were significantly lower in the group of osteoporotic women (p < 0.005) and correlated positively with BMD of the femoral neck (r=0.43).

Conclusion: Our study indicates that low concentrations of IGF-I and of its binding protein in postmenopausal women may be responsible the loss of bone mineral density, thus leading to osteoporosis development.

P011. RECREATIONAL PHYSICAL ACTIVITY BEFORE AND AFTER 30 YEARS OF AGE AND THE TEMPO OF AGE-RELATED BMC REDUCTION IN MEN

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The aim of the study was to evaluate whether recreational physical activity before and after 30 years of age affected the tempo of age-related BMC reduction in men. In a group of 239 healthy men, aged 35–63, inhabitants of Wrocław (Poland), trabecular, cortical and total bone mineral content (BMC) at the ultra-distal radius were measured using pQCT (Stratec 960). The tempo of age-related BMC reduction was assessed using the

standardised coefficients β of linear regression: a) in 2 subgroups of men who before 30 years of age had (or had not) practised any sport during at least a 2-year period, b) in 2 subgroups of men who for at least 2 years practised (or did not) any form of physical activity in their leisure time. The tempos of age-dependent BMC decline among men practising *versus* non-practising physical activity in their leisure time systematically were the following: β=−0,40 *vs* β=−0,47 for trabecular BMC, β=−0,28 *vs* β=−0,36 for cortical BMC and β=−0,35 *vs* β=−0,43 for total BMC (the differences in β coefficients were statistically significant). The tempos of age-dependent BMC decline among men practising *versus* non-practising any sport before the age of 30 were the following: β=−0,25 *vs* β=−0,27 for trabecular BMC, β=−0,21 *vs* β=−0,23 for cortical BMC and β=−0,28 *vs* β=−0,31 for total BMC (the differences in β coefficients were statistically insignificant). Systematic physical activity (after 30 years of age) slowed down the tempo of BMC reduction in the course of male aging, whereas the practising sport before the age of 30 did not affect the dynamics of age-related changes of BMC at the ultra-distal radius in men.

P012. VALUE OF THE DENSITOMETRIC MEASUREMENT OF THE FOREARM IN THE DIAGNOSIS OF OSTEOPOROSIS

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In the diagnosis of osteoporosis the main emphasis lately has been placed on the assessment of fracture risk. According to the recent recommendations of the WHO working group the primary criterion for osteoporosis diagnosis is densitometric measurement (DEXA method) of the proximal femur, which also predicts femoral neck, wrist and vertebral fracture risk . The aim of this study was the assessment of forearm densitometric measurement results in the diagnosis of osteoporosis based on proximal femur densitometric measurements.

To establish the value of forearm densitometric measurements, 6000 women, aged 26 to 88 years (mean age 56,6), the measurement of the forearm (Osteometer DTX-200 (DEXA) – the distal and ultradistal segments) and proximal femur (DPX-IQ Lunar- neck, Ward's triangle, trochanter, shaft and total BMD measurements) were performed at the same time.

To establish the diagnostic value of the forearm measurement , the forearm measurement results of each patient were compared to the results of proximal end of femur results of this patient. Measurement in which diagnosis or exclusion of osteoporosis was confirmed by measurement of the proximal femur was considered as a compatible result .

83 % of reults were compatible when comparing the results of axial and peripheral densitometric measurements in women. The best correlation was achieved in the age group 20–39 years (92%) and 80–89 years (100%). In the other groups the correlation was between 75–87%. Moreover, high correlation indices were found between measurements in Ward's triangle and ultradistal segment of the forearm (r=0.78), neck area and ultradistal segment of the forearm and the Ward's triangle and distal segment (r=0.75).

The densitometric measurement of the forearm still remains a valuable, inexpensive and precise method of osteoporosis diagnosis.

P013. ERRORS IN BONE MINERAL DENSITY MEASUREMENT BY THE DEXA METHOD

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One of the most important examinations in the diagnosis of osteoporosis is densitometry of the proximal femur. This allows

for assessment of relative and absolute risk of neck and intertrochanteric fracture, and also is the basis for initiation of treatment.

Nevertheless, bone mineral density measurements in the proximal femur areas i.e. neck, trochanter, Ward's triangle, shaft, and total may be disturbed by the incorrect or forced alignment of the extremity in zero or even external rotation, which is often the case in osteoarthritis of the hip. In order to obtain a satisfactory result it is a condition to align the lower extremity in a 15° rotation.

The aim of the study was to evaluate the variability in bone mineral density measurements of the proximal femur depending on the rotation of the lower extremity, and also to evaluate the measurement error depending on the technique used.

14 patients aged 46–72 years were examined on the DPX-IQ apparatus where densitometry of the proximal femur was done in 15° internal rotation (normal), zero rotation and 15° external rotation.

A variability of results was seen in all fields depending on the rotation of the extremity. External rotation of 15% gave a overestimation in the neck region of an average 6%. Lower results were seen in the neck at zero rotation. Other fields also showed variability depending on the rotation of the extremity.

During measurements carried out by three technicians whilst repositioning the patient a diagnostic error in differing areas of the proximal femur of 1–6% (av. 3%) was observed. The greatest error was observed in the area of the major trochanter.

Assessment of bone mineral density in the area of the proximal femur gives a precise and reproducible measurement under the condition that the extremity is properly aligned in internal rotation. A fixed positioning of the extremity in external rotation in patients with osteoarthritis of the hip significantly influences the results.

P014. ERRORS MOST OFTEN OBSERVED IN DENSITOMETRIC DIAGNOSIS OF OSTEOPOROSIS

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On the basis of the literature it can be assumed that the most useful in diagnosis of bone metabolic disturbances in osteoporosis is dual energy X-ray absorptiometry /DEXA/. This diagnostic procedure promoted by established knowledge is easily accessible and is performed with aid of very sophisticated and efficient equipment. Unfortunately, it is not free of errors which may affect the final results of the study.

Generally, on the basis of our own experience the most often observed errors in diagnostic densitometric techniques were presented. In the study the DPX-L apparatus of the Lunar Corporation was used.

The errors were divided into three groups. The first group included those depended on the investigated object. The next depended on the process of data analysis and the last included errors caused by other factors. In the first group we took into account factors which could increase (+) or decrease (–) the final outcome as: degenerative changes (+), scoliosis (+), the presence of foreign bodies such as metal (–), healed fracture (+), presence of pathological structures (+ or –), osteoporotic fractures (+) and incorrect placing of the investigated object on the table (+ or –). Errors of data analysis included incorrect age, height, and body mass which influenced the Z-score index, those referring to the patients sex affecting T-score and Z-score indices and incorrect setting of the investigated areas. Other errors of the densitometric technique included lack of or improper calibration of the measuring apparatus and computer program errors.

Particular errors were responsible for result falsification between 1 and 37%. An accumulation a few errors changed the accuracy of the study to even above 100 percent. These errors were most often observed in the study of the lumbar region of the spine.

The DEXA apparatus results repeatability /stated in the equipment features description/ range from 0,9 to 2,5% of coefficient of variation for particular skeleton regions. Result precision range from 3 to 5%. This indicates that following very strict diagnostic procedure rules, the difference in obtained findings may amount to several percent. We can not exclude the influence on the final outcome the errors which are characteristic for the above mentioned three groups. We are convinced that the DEXA method is excellent and very useful in the diagnosis of osteoporosis, in static bone evaluation. However, its value has its limits in monitoring the dynamic bone transformations (for example in efficiency treatment assessment), even at 1–2 year intervals.

P015. APPLICATION OF THREE–DIMENSIONAL (3D) CT IMAGING IN DIAGNOSIS OF OSTEOPOROSIS

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Bone densitometry possesses several limitations: (1) comparison of the precision of measurements with the rate of bone loss indicates that successive examinations are possible every 2–3 years, (2) certain drugs have been shown to increase bone mass, yet are not protective against fracture.

It may be concluded that densitometric quantities are insufficient to characterize mechanical properties of a complex system like trabecular bone. In this study the usefulness of selected descriptors of trabecular bone structure in the diagnosis of osteoporosis was tested. Twenty vertebral bodies (L3) collected from cadavers (males, age (24-81)y) were subjected to investigations. On the basis of DXA measurements the material was divided into two groups. The first group was composed of 10 cases (T-score >-2.5) without pathological alterations while the second consisted of 10 cases (T-score $\leqslant -2.5$) with osteoporotic changes. The 40–50 (2D) sections were measured for each vertebral body. Following this the 3D structure of the vertebral body was reconstructed on the basis of the serial 2D images. The following descriptions of trabecular bone architecture were considered: (bone volume)/(total volume), mean trabecular length, asymmetry coefficient, star volume of the marrow cavity, Euler's number, which is a measure of the connectivity of the structure. All calculations were performed with algorithms developed in our laboratories. It was found that the description of the osteoporotic changes by means of the structural quantities constitutes a promising diagnostic tool especially for older individuals.

P016. COMPUTER ANALYSIS OF BONE STRUCTURE ON THE RADIOGRAPH. CORRELATION WITH BONE MINERAL DENSITY AND HISTOMORPHOMETRY

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The aim of the study was to devise an objective method of the bone structure measurement on the radiogram and the evaluation of correlation parameters obtained during bone mineral density and bone histomorphometric assessment. 57 forearms of men (victims of sudden death) at an average age of 47,1 yrs were selected.

A standard radiogram of the right forearm was taken in the AP plane. A selected area of epiphysis of bone was digitalised. From the same location reflected on the radius full thickness bone samples were taken for measurement of bone mineral content and histomorphometry. Bone mineral content was determined by physical means and was expressed as bone ash mass in relation to bone volume and mass. In the histomorphometric study the following were assessed: volume of mineralised bone, trabecular width and osteoid volume. Bone structure image on the radiogram was quantitatively measured using the authors own program – Trabecula (IBM PC) and the professional Quantitrab program. The algorithm of Trabecula described bone structure by features of radiological trabeculae such as: number, width, density. The Quantitrab program estimated non-trabecular zones. Average bone mineral content in the trabecular bone was 0.264 g/cm^3 and in cortical bone 0.758 g/cm^3. Histomorphometric measurements showed volume of mineralised bone – av. 15,6%; trabecular width – av. 159 μm. Computer analysis of the radiological image found the following averages: trabeculae number 8.51, width 0.61 mm, density 31.8%. The Quantitrab program calculated: number 17.1, area 61.3%, periphery 566 anizotropy 0.81.

A significant correlation was found between structure parameters on the radiograph with bone mineral content and histomorphometric measurements.

P017. COMPUTER AIDED ASSESSMENT OF FEMORAL NECK BONE STRUCTURE IN OSTEOPOROSIS AND OSTEOARTHROSIS

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In the course of osteoporosis (OP) and osteoarthrosis (OA) changes in calcaneous bone structure which can be visualised at the radiogram appear. These disturbances are of particular importance in the femoral neck region, because of the risk of osteoporotic fractures. Evaluation of the X-ray image makes qualitative assessment of bone tissue possible, this is however a subjective method and as such quantitative assessment is not possible. The aim of this study is an objective, quantitative assessment of calcaneous bone structure in the proximal aspect of the femur in patients with osteoporosis and osteoarthrosis.

Standard pelvic radiograms, in which the structure of the femoral neck was visible, were evaluated. The standard measurement areas were established in the radiograms: Ward's triangle, major trochanter, compressive and extensive trabeculae. With the aid of a CCD camera digitalisation of the image with the established parameters was performed and data was processed using the Trabecula program. The following parameters of radiographic trabeculae were assessed: number, density, height and width.

Results: In the OA group density, height and number of trabeculae were shown to be higher in comparison to the OP group.

P018. MATHEMATICAL ANALYSIS OF BONE MICROSTRUCTURE OF PATIENTS WITH CLINICALLY SUSPICIOUS OSTEOPOROSIS USING FAST FOURIER TRANSFORMATION ANALYSIS AND FRACTAL DIMENSION

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Introduction: Current methods that measure bone mass alone show a substantial overlap of the measurements of osteoporotic patients who fracture with those that do not. Algorithms of digital image processing used for X-ray image analysis provides additional diagnostic and prognostic factors of bone structure which are responsible for development of osteoporosis. Mathe-

matical analysis could implement automatic analysis of the screening process to select patients to naturally occurring groups.

Purpose: This study was performed to evaluate osteoporotic changes using the 2D fast- Fourier Transformation spectrum analyses, image histogram analyses and morphological fractal dimension of planar macro-radiography examination.

Method and Materials: This study consisted of 170 patients with a clinical suspicion of osteoporosis and 70 patients as control; (this group consists of: normal 27, osteopenia 34, osteoporosis 10). All had macro-radiography (magnification 3x) planar X-ray study of both hips. All data were digitised and further analyses-selected region of interest that covered Ward's triangle of the femoral neck was performed in each case. All patients had clinical suspicions verified using conventional densitometry (DXA).

The groups considered 'Neck' T-score (WHO criteria of osteoporosis), making up the first group where T-score >1.5 (27 patients), second $-2.5 <$ Tscore < -1.5 osteopenic (34 patients) and third T-score < -2.5 osteoporosis (10 patients).

Results: All parameters were evaluated using discriminant function analyses which select patients into three different groups: normal, osteopenic and osteoporotic. Classification matrix of selected groups was as follows: correct classification of the normal group 93%, osteopenic group 94% and osteoporotic group 93%. Overall diagnostic accuracy of the test was 93%. Differences between groups of subjects were significant (chi test $p < 0.05$).

Conclusions: This study confirmed that quality analyses of trabecular bone structure of the hip described using digital image processing to analyses planar X-ray examination provides correct information about osteoporotic changes within the bone.

P019. CORRELATION BETWEEN FAST FOURIER TRANSFORMATION PARAMETERS OF RADIOGRAPHIC IMAGES OF TRABECULAR BONE MICROSTRUCTURE AND BMD

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Purpose: The aim of this study was to present parameters of bone microstructure. The method was based on the: 2 dimensional FFT analysis, fractal dimension and analysis distribution histogram of intensity microradiographic image of trabecular bone microstructure. We compared all parameters with BMD using correlation analysis (Pearson's linear correlation coefficient).

Materials and Methods: We analysed 40 microradiograms of femoral head trabecular bone obtained from 40 patients. All samples were obtained from the same area of the femoral head. The samples were cylinders with a 10 mm diameter and a height of 12 mm, they were extracted by a trepan. Microradiograms were registered on mammographic films. For imaging we used a microfocal X-ray tube (focus diameter 13μm, 25kV). Magnification microradiograms was 5x and spatial resolution 40 pl/mm. Image parameters was evaluated in each case and used: 23 – 2D FFT parameters; fractal dimension; image histogram parameters: mean, energy, entropy, gradient, skews, kurtosis, standard deviation. For all parameters were computed mean and standard deviation. All samples had standard DEXA technique studies using 'small animals' software on the LUNAR DPXL.

Results: We obtained high correlation between parameters of bone microstructure described by FFT energy spectrum and BMD – lrl=0.880 (p $< 0,01$). Correlation between fractal dimension and BMD was lrl=0.822 (p < 0.01). In the analysis distribution histogram of intensity a high correlation was found between gradient intensity and BMD – lrl=0.867 (p < 0.01), a small correlation between standard deviation intensity and BMD – lrl=0.734 (p < 0.01) was also found.

Conclusion: The study shows that the presented analysis of trabecular bone microstructure described morphological trabecular bone fractures. There is great necessity of a method of non-destructive investigation of bone microstructure. The presented image parameters were treated as the image descriptors and were set into the feature vector for discriminant analysis.

P020. INFLUENCE OF ASYMETRIC LOWER EXTREMITY LOADING ON CHANGES IN BONE DENSITY IN PATIENTS WITH COXARTHROSIS

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Difficulties in evaluation of bone density in patients with unilateral, advanced coxarthrosis lead to incorrect diagnostic and therapeutic conclusions.

The aim of the study was to analyze the influence of the duration and character of hip loading limitation on bone density. 124 patients with unilateral coxarthrosis (91 women aged 52–68 years and 33 men aged 61–72 years), who qualified for total hip replacement, were evaluated. Causes and stages of the arthrotic process and bone loss risk factors were analyzed. Character of hip loading limitation was evaluated with the aid of a questionnaire considering the duration of crutch use, foot pressure and mobility in daily activity. Bone density measurement by the DEXA method was performed on the DPX-IQ (Lunar Corp.) in both proximal femur and lumbar spine. The results were evaluated with multielement cross-link analysis for the determination of different factor correlation.

As was revealed, proximal femur bone density in the contralateral (to arthrotic one) hip rises in response to the duration of load limitation. Femoral neck BMD exceeds the mean L2-L4 BMD when crutches are used for at least 3 years.

The results helps to evaluate the densitometric data and to clarify the diagnostic criteria of bone loss in patients with unilateral coxarthrosis.

P021. DIAGNOSTIC PROBLEMS IN BONE DENSITY EVALUATION IN PATIENTS WITH OSTEOCHONDRODYSPLASIAS

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Osteochondrodysplasias, primary bone formation disorders, are included to the group of metabolic bone diseases. Decreased height, deformations of long bone epiphysis, vertebral deformation and disturbances of segmental formation of the locomotor system (i.e. shortened thumbs) are typical clinical symptoms of this disease.

There are 5–7 new patients with osteochondrodysplasias yearly attached to the group observed in the Department. We found a regularity beginning from 1998 where most of the patients, finally diagnosed as osteochondrodysplasia, are referred for diagnosis with low bone mass and a suspicion of osteoporosis.

The aim of the study was to present the clinical manifestation of 11 cases of osteochondrodysplasias, including radiological findings, dual-hip and lumbar spine BMD, parameters of calcium – phosphorus and vitamin D metabolism and selected markers of bone turnover. 6 men age 21–47 years and 5 women (35–55 years) were evaluated. Z-score parameter exceeded –1 SD in all patients. No abnormalities in calcium – phosphorus metabolism were found.

Based upon the bone density analysis we found a decreased BMD in all patients diagnosed as osteochondordysplasia. There

is no positive correlation between the grade of osteopenia and exposition of radiological findings of this disease.

There is a need for specific analysis of densitometry in young patients with decreased height (less than 160 cm), because of possible presence of disorders suggesting osteochondrodysplasia.

P022. COMPARISON OF RESULTS OBTAINED BY QUANTITATIVE ULTRASOUND AND DENSITOMETRIC MEASUREMENT OF THE SKELETON

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From the beginning of the 80's the role of quantitative ultrasound examinations (QUS) as an alternative method to X-ray absorptiometry in the diagnosis of osteoporosis has been on the rise. During the last decade there have been many publications in which risk of osteoporotic fracture has been determined based on ultrasound parameters e.g. BUA (broadband ultrasound attenuation) and SOS (speed of sound). A high correlation between US results and spinal and hip DXA have been shown. There are however, reports questioning the usefulness of ultrasound methods in the diagnosis of osteoporosis.

The aim of our study was to analyze the value of the ultrasound examination of the heel, proximal III phalanx of the hand and distal radius in the diagnosis of osteoporosis and also to compare these results to densitometry of the spine and proximal femur.

Material: The studied group comprised 112 subjects who were invited by letter into the study. There were 58 females aged 21–77 years (av. 48.6) and 54 males aged 21–81 years (av. 51.04). After taking a medical history and physical examination all patients underwent the ultrasound and DXA examinations. For the ultrasound the Omnisense – Sunlight apparatus was used to measure SOS of the distal radius, SOS of the III proximal phalanx of the hand. The Lunar Achilles Plus apparatus evaluated SOS and BUA of the heel. For densitometry of the spine and proximal femur the Lunar DPX-IQ densitometer was used.

Results: We found the lowest correlation between the SOS of the radius and BMD of the neck $R^2=0,023$ and the SOS of the phalanx and BMD of the neck $R^2=0,052$. The highest correlation was found between the BMD of the neck and BMD of the L2-L4 region of the spine ($R^2=0,46$) and BMD of the neck and BUA of the heel ($R^2=0,22$).

Conclusions: A weak correlation was observed between ultrasound and densitometric evaluation.

P023. COMPARSION OF VELOCITY DETECTED BY AXIAL ULTRASOUND BONE TRANSMISSION AND DXA MEASUREMENTS

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Objective: To compare a new type of quantitative ultrasound system and DXA measurements in various skeletal sites. This new QUS device with a single transmitter/receiver probe has the ability of measuring ultrasound velocity along bone.

Patients and Methods: A group of 30 Caucasian patients (22 female and 8 male) were involved in the study. The average age was 54.0 ± 8.2 yrs (range 43 to 69). The SOS was measured at the proximal phalanx III (SOS-Phx) and distal radius (SOS distal) using different probe sizes (Omnisense™, Sunlight Ltd). Forearm BMD (FA-BMD) was evaluated using the DTX-200 and the femoral neck BMD (FN-BMD) and lumbar spine L2-L4 BMD (LS-BMD) using the ECLIPSE. QUS parameters of the left heel (BUA and SOS) were detected by DTU-ONE.

Results:

Sites	r	p value
SOS distal – LS-BMD	0.376	0.128
SOS distal – FN-BMD	0.286	0.096
SOS distal – FA-BMD	0.326	0.293
SOS-Phx – LS-BMD	0.270	0.073
SOS-Phx – FN-BMD	0.400	0.319
SOS-Phx – FA-BMD	0.243	0.237
SOS distal – SOS heel	0.496	0.083
SOS-Phx – SOS heel	0.576	0.075

Conclusions: We have found a weak correlation between QUS and DXA. This may be explained by the fact that QUS parameters determinate both the density and the elasticity of bone. Additional clinical studies are needed to obtain a value of multi-site velocity measurements of bone.

P024. DXA AND QUS MEASUREMENTS IN PATIENTS WITH ANKYLOSING SPONDYLITIS (AS)

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Objective: Assessment of bone mineral density (BMD, g/cm^2) of the forearm (FA-BMD), femoral neck (FN-BMD) using the DXA technique and the evaluation of broadband ultrasound attenuation (BUA, dB/MHz) and speed of sound (SOS, m/s) of the heel using the QUS technique in patients (pts) with AS.

Patients and Methods: 59 AS patients were involved in the study: 53 male and 6 female, average age (40.0 ± 8.2 yrs), range 29 to 49. Average disease duration was 160.6 ± 98.0 months, range 18 to 420 months. AS pts were compared to 60 healthy controls (HC): 50 males and 10 pre-menopausal females (average age 38,2 ± 7.4 yrs). FA-BMD (distal radius) was evaluated using the DTX-200 (Osteometer Medi-Tech A/S Denmark) and FN-BMD using ECLIPSE (Norland Medical Systems, Inc., Fort Atkinson, WI). QUS parameters of the left heel (BUA and SOS) were measured by DTU-ONE (Osteometer Medi-Tech A/S Denmark).

Results:

	FA-BMD g/cm^2	FN-BMD g/cm^2	BUA dB/MHz	SOS m/s
AS n=59	0.512	0.786	48.9	1548
HC n=60	0.532	0.901	49.7	1553
P	NS	0.001	NS	NS

Conclusions: AS patients are related only to low bone mass of femoral neck. This group of relatively young patients with a chronic inflammatory process is at an increased risk of hip fracture. QUS measurements of the heel and DXA of forearm do not appear to be a good predictor for screening of AS pts with osteoporosis.

P025. ULTRASONIC WAVE PROPAGATION ANALYSIS FOR ASSESSMENT OF LONG BONE FRACTURE HEALING MODEL IN VITRO

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Quantitative determination of fracture healing has gained great interest in the field of bone biology. Parametric assessment

should bring more objective data concerning the fracture healing progress. Ultrasonic wave propagation analysis was evaluated as a noninvasive technique for the assessment of bone mechanical properties and fracture healing. We have developed a physical model of fracture healing to test quantitative ultrasonometric measurement. Noninvasive, contact testing was performed with the ultrasonic bone tester. Twenty four dry, macerated tibias were osteotomized. Fragments were mounted in contact with themselves on stable bone holder. Bone cement was mixed and in its semiliquid form inserted between the bone fragments. Ultrasonic transducers (100 kHz) were located directly on both fragments and the process of bone cement hardening was assessed to simulate callus mineralization. Transducers were placed on the antero-medial surface of the tibia and fit closely to both sides of the ultrasonographic probe with the use of coupling gel for ultrasonography. Measurement was performed when the fracture gap centered between transducers. At least 145 measurements per case were performed, every 5 seconds. Propagation time across the fracture gap and its amplitude were measured and archived. Achieved data was transmitted into the PC via interface using UMT-LINK software. Further calculation of speed of sound was performed with TMS2ASCI software. Measurement variables were analyzed and bone cement hardening curves were drawn. The ultrasound velocity in osteotomized tibiae was significantly (p < 0,0001) low (1995,61 m s-1, std 525,55), but had significantly (p < 0,0001) increased after bone cement hardening (3086,7 m s-1, std 515,97). The most important condition for proper measurement was transducer location on both sides of fracture gap. Result analysis showed a tendency for better repeatability of measurement with symmetric distance of probes to the fracture gap. In vitro studies under well-defined conditions confirmed the potential of this technique for the non-invasive assessment of bone fracture healing in clinical practice.

P026. APPLICATION OF THE RODIA SYSTEM FOR MONITORING OF QUANTITATIVE FRACTURE HEALING – A METHOD OF X-RAY DENSITOMETRY ENHANCEMENT

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The RODIA System used for quantitative analysis of digitalized radiograms was used to enhance quantitative densitometric examination. Evaluation allows to monitor the progress of fracture healing of long bones employing a comparison of relative values of optical density. The described method gives an opportunity to predict the end of fracture healing. There is a possibility to lead prospective studies, where digital images of patient bones evaluated with densitometry by a fan beam device. Evaluation is performed in two ways. At first the image of the fractured bone is custom analyzed. An evaluation of BMD is performed at a level above, below and within the fracture gap. Next a graphic file attached to bone scan is assessed. The graphic files are saved in the TIFF format and than converted into GIF89 lossy compression file.

Use of the densitometric examination expressed in g/cm^2 allows to standardize the examination and change the relative approach to irrelative. Input data into the RODIA system as an image file was converted into a two-dimensional matrix of coordinates and each pixel represented a value of optical density. Application of RODIA System to TIFF files from densitometry allows to assess quantitatively the course characteristics of fracture healing. Comparing the results of densitometry allows to present quantitatively bone mineral density to enhance bone densitometry.

P027. CONTENT OF TRANSFORMING GROWTH FACTOR ß-1 IN BONE SAMPLES OBTAINED FROM PATIENTS WITH FEMORAL NECK FRACTURES

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The aim of this study is to determine the skeletal content of TGF-ß1 in bone samples of the proximal femur obtained from patients following a femoral neck fracture.

Material consists of 24 samples of cancellous bone from the proximal femur collected during hemiarthroplasty (22 cases) or total hip replacement (2 cases) from 24 patients with femoral neck fracture. 13 samples of cancellous bone from patients with idiopathic osteoarthritis of the hip harvested during total hip replacement serve as a control. All patients gave informed consent to participate in the study, according to the protocol approved by the Human Subjects Review Group of the Medical University of Warsaw. The average age of the patients with fracture was 78,2 years (from 64 to 95). The mean time from the fracture occurrence to the collection of the samples was 7,3 days (range 0 to 28 days). After homogenisation the TGF-ß1 concentration was measured using Quantikine Human TGF-ß1 Immunoassay (R&D Systems, Minneapolis, USA) and total protein content with BCA-Protein Assay Reagent (Pierce, Beijerland, Holland) in both groups simultaneously.

The content of TGF-ß1 in bone samples of patients with femoral neck fractures was higher than in the control group: 2,405 pg/μg protein (from 1,025 to 3,925) versus 1,095 pg/μg protein (from 0,468 to 1,580) respectively. We observed the decrease of TGF-ß1 content with prolonged immobilisation after injury. No significant differences in TGF-ß1 content in relation to age of the patients were observed.

P028. CHANGES IN BONE METABOLISM IN WOMEN AFTER HYSTERECTOMY WITH ADNEXECTOMY

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The paper presents the analysis of changes in bone tissue metabolism in women who underwent hysterectomy with adnexectomy prior to the occurrence of physiological menopause. The authors show that the administration of 50 μg of ethynyloestradiole proves effective for bone tissue protection against an increase in bone resorption which is characteristic in the post-menopausal period. Estrogen deficiency related to the physiological or artificially induced menopause (hysterectomy with adnexectomy) causes a dramatic increase in bone metabolism. The consequence of this rapid rebuilding is the loss of bony substance and increased likelihood of osteoporosis. A rapid increase in bone resorption markers of 102 % (deoxypyridinoline) and 131% (CTX) after 6 months, and of 88 % and 113 % – respectively – after 12 months anticipates the increase in bone formation markers of 25 % (osteocalcin) and 51 % (bone specific alkaline phosphatase) for a few months. During the first year following hysterectomy with adnexectomy the proportion of formation/resorption markers is variable, with bone resorption being predominant.

Bone markers therefore indicate the degree of metabolic dynamics occurring in bone tissue. However, they cannot be indicative of bone substance quality and – consequently – cannot be the sole basis for establishing a firm diagnosis of osteoporo-

sis. BMD values in women on hormone replacement therapy show that hormonal substitution allows to maintain proper bone substance or to significantly inhibit its loss.

Conclusions:

1. Estrogen deficiency related to physiological or induced menopause causes rapid bone rebuilding with a prevalence of bone resorption.

2. Resorption markers rise faster in the first few months and anticipate the rise in formation markers in women undergoing hysterectomy with adnexectomy.

3. Bone markers do not indicate the quality of bone substance.

P029. EVALUATION OF BONY TISSUE MINERAL DENSITY IN WOMEN TREATED WITH GNRH ANALOGUES (GOSERELIN) FOR ENDOMETRIOSIS OF PELVIS MINOR

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The authors present bone mineral density in women with endometriosis within the small pelvis treated with GnRH analogues (Zoladex) in a dose of 3.6 mg in 28-day intervals for 24 weeks. Bone density in the L1–L4 spinal segment was evaluated by the DEXA method. After 24 weeks a fall of 6.8 % in bone mineral density was noted. In the 36th week a rise of 1.8 % was observed – up to the level of 5 %. All the determinations were statistically significantly different. The research allowed the following conclusions:

1. Application of GnRH analogues – Zoladex in the treatment of endometriosis caused a statistically significant loss of bone substance

2. To monitor the decrease in bone density densitometry should be performed both prior to and following treatment.

3. The application of GnRM analogues – Zoladex requires the 'add back' replacement therapy after termination of treatment.

4. Calcium, vitamins D3 and vitamin A+E supplements should be considered as substitution therapy as well as the initiation of treatment with salmon calcitonin or biphosphonates.

P030. ALKALINE PHOSPHATASE – BONE FORMATION AND TYPE I CARBOXYTERMINAL TELOPEPTIDE COLLAGEN LEVELS IN PATIENTS WITH RHEUMATOID ARTHRITIS TREATED WITH GLUCOCORTICOSTERIODES

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The present study has been undertaken in order to evaluate bone turn-over in rheumatoid arthritis patients treated with glucocortycosteriodes (gcs). The bone formation marker – bone-specific alkaline phosphatase (AP-B) and bone resorption marker – carboxyterminal telopeptides of type I collagen (CTx) and two proinflammatory cytokines IL-6 and TNF-α has been determined.

Nineteen patients with established RA have been invited to the study (age 52,5 ± 12,4 years, disease duration: 115 ± 114 months; total dose of gcs, equivalent to prednisone: 1,0 ± 0,9 g). After the first visit they started receiving gcs treatment. The second visit took place after 12 months.

There is evidence to suggest that after initiation of gcs the largest bone loss occurs rapidly within the first months from the beginning of therapy. On the other hand anti-inflammatory effects of gcs may balance their direct effect on bone loss. Our data showed a 50% decrease in IL-6. Biochemical markers of osteoporosis (AP-B, CTx) also decreased within 12 months. It is concluded that short term gcs treatment shows a strong anti-inflammatory effect which may balance the bone loss caused by these drugs.

P031. THE VALUE OF THE LASER-DOPPLER EXAMINATION IN THE DIFFERENT DIAGNOSIS OF THE SUDECK SYNDROME WITH THE LOCAL OSTEOPOROSIS AFTER TIBIA FRACTURE

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After tibial fracture a process of osteoporosis which may last up to 5 months begins. This process is intensified by immobilization and the elimination of weight bearing. In the follow-up X-ray examinations demineralization and local osteoporosis are found, which are intensified particularly in Sudeck's syndrome. Usually, a diagnosis of Sudeck syndrome is made based on radiological examination. This diagnosis is very often not agreeable with the clinical symptoms of this syndrome, where the most character-istic signs are pain and poor blood circulation in the affected limb. The aim of this study was to estimate the sequence of the Sudeck syndrome and posttraumatic local osteoporosis after fracture of the tibia and also an estimation of the value of the microcircula-tion examination using the Laser-Doppler method in the differential diagnosis between the two states.

Fractures of the shaft of the tibia were analyzed in 302 cases. The level of osteoporosis in the radiological examination was assessed in comparison to the healthy limb. Osteoporosis was recorded in 60,6% of cases. The clinical symptoms of the Sudeck syndrome was recorded in 11,25% of cases. The Laser-Doppler examination was carried out in 120 cases. A standard 3 point measurement was employed: the apex of the toe, dorsiflexion of the foot, and the medial aspect at half tibial length. The examination was endertaken comparatively on both limbs. The pressure used for occlusion was 100 mm Hg higher than blood pressure in the brachial artery. A faster and higher amplitude postocclusion circulation reaction in the affected limb, in patients with the early stage of clinically diagnosed Sudeck syndrome had been recorded. The outcome is statistically significant. The Laser-Doppler measurement of the microcirculation is a new method and definite conclusions must be draw with caution. However, these results encourage further research.

P032. OSTEOPOROSIS IN PATIENTS WITH CHRONIC RENAL FAILURE

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The prevalence of osteoporosis (O) in patients with chronic renal failure (chrf) depends on the studied population and as well as the method of BMD measurements. The aim of the study was to evaluate the prevalence of O among dialysed (D) and pre-dialysed patients(pD). A total number of 134 subjects (72M, 62F) were enrolled in the study. 97 subjects (52M, 45F) were in D group whereas 37 subjects (20M, 17F) were in the pD group. Mean age was 55±14. The duration of dialysotherapy varied from 6 to 94 months. 52 patients were treated with hemodialysis (HD) and 45 with continuous ambulatory peritoneal dialysis (CAPD). The BMD was measured by DEXA (Lunar DPX-L) in the following regions: L1-L4, femoral neck and forearm. The results were presented as a

T-score according to WHO criteria. We analysed the influence of the following factors on BMD: gender, ROI, duration and etiology of renal failure and as well as the serum iPTH level.

T-score	L1-L4[NS]	Femur*	Forearm UD*	Forearm 33%*
Dialysed	–1,02±0,96 SD	–1,73±1,12 SD	–2,10±1,46 SD	–1,83±1,19 SD
Predialysed	–0,22±0,78 SD	–0,74±0,88 SD	–0,57±0,73 SD	–0,98±0,81 SD

In females the most sensitive region for detection of O. appeared to be the forearm (30 subjects from 62–48%). In males the most sensitive region appeared to be the femoral neck (19 subjects from 72–26%). In dialysed patients the prevalence of O was higher in comparison with predialysed patients (F 58% vs 23% and M 30% vs 15%). Group D had a significantly longer duration of chrf (8,4 vs 4,1 years) and higher levels of iPTH in comparison with the predialysis patients (358pg vs 193pg). The method of dialysotherapy and etiology of chrf did not correlate with values of BMD.

P033. SKELETAL STATUS IN SUBJECTS WITH END-STAGE RENAL FAILURE TREATED WITH HAEMODIALYSIS OR PERITONEAL DIALYSIS

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The aim of the study was to assess skeletal status in 21 subjects (12 females and 9 males) with end-stage renal failure treated with haemodialysis or peritoneal dialysis. Mean age was 16+/-3.8 years, mean height was 1.46+/-0.18 m, mean weight was 43.8+/-14.9 kg, and mean dialysis duration was 3.1+/-2.8 years. Skeletal status was evaluated by bone mineral density (BMD [g/cm^2]) measurements of the lumbar spine and total body (TB) using the Lunar DPX-L (USA) and by quantitative ultrasound of the phalanges using the DBM Sonic 1200 (Igea, Italy) which measures amplitude-dependent speed of sound (Ad-SoS [m/s]).

Table 1. Mean values of parameters measured.

	Ad-SoS Z-score	Spine BMD Z-score	TB BMD Z-score
Mean ±SD	1937±78 –1.32±2.11	–3.2±4.3 0.940±0.12	0.915±0.25 –1.29±1.31

Table 2. Correlations between parameters studied.

	Spine BMD	TB BMD	age	dialysis duration	height	weight
Ad-SoS	r=0.53 p=0.01	r=0.59 p=0.004	NS	r=–0.58 p=0.006	r=0.57 p=0.006	NS
Spine BMD	–	r=0.83 p<0.001	NS	r=–0.45 p=0.04	r=0.55 p=0.009	r=0.50 p=0.02
TB BMD	r=0.83 >p<0.001	–	NS	r=–0.48 p=0.003	r=0.67 p=0.001	r=0.73 p<0.001

Conclusion: Skeletal status in subjects with end-stage renal failure treated with haemodialysis or peritoneal dialysis is strongly affected by the disease. Ultrasound and densitometric parameters were decreased in comparison to the healthy population, and they did not reveal the normally observed age-dependent accretion.

P034. AN ATTEMPT OF EXPLANATION OF HEPATIC OSTEODYSTROPHY PATHOGENESIS ON THE BASIS OF ASSESSMENT OF SELECTED HORMONAL AND BONE METABOLISM PARAMETERS IN PATIENTS WITH CHRONIC ACTIVE HEPATITIS (CAH)

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Liver diseases can lead, amongst others, to chronic disturbances of calcium-phosphoric homeostasis and following this to hepatic osteodystrophy. The pathogenesis of the bone changes is not completely understood. It is suggested that osteoporosis in patients with CAH can be a result of hypogonadism, disturbances of the somatotrophine axis, and abnormal metabolism of vitamin D3. The aim of the study was an evaluation of daily concentrations of bone metabolism markers [osteocalcin, carboxyterminal telopeptide of type I collagen (ICTP)], growth hormone (GH) – insulin-like growth factor-I (IGF-I) – insulin-like growth factors binding protein-3 (IGFBP-3) axis, parathormon (PTH) and 25(OH)D3 in connection with an estimation of bone mineral density in patients with chronic liver function lesion. Studies were performed in 25 males and 15 females with type B and type C CAH. The control group consisted of 20 males and females. Blood for studies was collected at 8.00 AM, 12.00 AM, 4.00 PM, 8.00 PM, 0.00 AM, 4.00 AM. The studied parameters were assessed with the use of the RIA method. Bone mineral density was estimated with the use of densitometry (DEXA). In patients with CAH a significant increase in daily GH secretion and simultaneous significant decrease of daily IGF-I and IGFBP-3 secretion in comparison to control group were observed. In patients with CAH an essential increase of daily serum ICTP concentration and simultaneous significant increase of daily PTH secretion and significant decrease of osteocalcin and 25(OH)D3 were also noted. In CAH patients bone mineral density in the lumbar region of the vertebral column did not change in comparison to healthy subjects.

P035. BODY COMPOSITION AS A PREDICTOR OF BONE MINERAL STATUS IN YOUNG ADULTS WITH COELIAC DIESASE

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Osteopenia in coeliac disease (CD) is the result of calcium and vit.D malabsorption, moreover CD leads to impairment of nutritional status which in itself may reduce bone mineral density (BMD).

Goal: Assessment of the relationship between anthropometric indices and bone mineral status in young adult coeliacs with silent CD.

Patients and Methods: 50 young adults (30F,20 M), mean age 22 yrs (range 17-31yrs) with diagnosed coeliac disease before the age of 6, were classified into two groups – group A:25 patients on a long term gluten free diet (GFD), group B:25 asymptomatic coeliacs who for various reasons did not follow GFD for more than 12 yrs (minimum last 3 yrs before the study). Total body BMD (BMDT), lumbar spine: L2-L4 BMD (BMDL), total bone mineral content (BMC) and the indices of total body mass (TM), fat mass (FM) and lean body mass (LM) were measured using the Lunar DPX-L with dual energy X-ray absorptiometry. In 12 patients from group A and 12 from group B serum levels of ionized calcium,

phosphate, 25OHD, 1,25(OH)$_2$D, alkaline phosphatase and parathormone were measured between November and April.

Results: In all of the patients the indices of mineral metabolism were within normal limits. 6 patients from group A and 5 patients from B group had BMDT and/or BMDL z-score <-1. There were no significant differences in lumbar spine and total body BMD and BMC between the two analyzed groups. BMC, BMDT and BMDL significantly correlated with LM (r=0,42-0,88 p$<$0,01) but not with FM in the both analyzed groups.

Conclusion: Lean body mass but not fat mass is a good predictor of bone mineral status in young adult coeliacs with silent coeliac disease.

P036. BONE MINERAL DENSITY IN YOUNG ADULT COELIACS – LONG TERM FOLLOW-UP STUDY

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Aim: The assessment of long term effect of gluten ingestion on bone mineral density (BMD) in young adult coeliacs.

Patients and Methods: 26 (15 F,11 M) patients at a mean age of 21 y (17-26y) at the beginning of the study with diagnosed coeliac disease were divided into two groups: 13 patients on a gluten free diet (GFD)-group A, 13 asymptomatic coeliacs not willing to comply GFD-group B. Total body and lumbar (L_2–L_4) spine BMD and anthropometric measurements (total body mass, fat free mass and lean body mass) were measured using the Lunar DPX-L with dual energy X-ray absorptiometry at baseline and at 5 y (range 4,5-5,5 y). Detailed dietary inquiry, IgAEmA and/or duodenal biopsy were carried out every year to evaluate compliance to GFD. BMD measurements were expressed as mean ± SD in g/cm^2.

Results: There were no differences between group A and B regarding total body mass, fat mass and lean body mass at the initial and final examination. BMD results were as follows:

Group	Lumbar spine (g/cm^2)			Total body (g/cm^2)		
	Initial	final	p*	Initial	final	p*
A	1,174±0,13	1,204±0,15	NS	1,139±0,11	1,165±0,11	NS
B	1,196±0,22	1,212±0,24	NS	1,147±0,13	1,163±0,15	NS
p**	NS	NS		NS	NS	

p* – by paired t-test, p** – unpaired t-test

Using the paired t-test we had not observed any significant changes between initial and final BMD in groups A and B as well as for lumbar spine and total body. There was also no difference in lumbar spine and total between the two analyzed groups at the final and follow-up examination.

Conclusion: There are no long term changes of BMD in young adult coeliacs regardless of treatment with a GFD

P037. BONE MINERAL DENSITY AND SPEED OF BONE TURNOVER DEPENDING IN DIABETIC CONTROL

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Introduction: The action of hypoglycemia on bone mineral density and speed of bone turnover is still under research. An explanation of this relationship may prove to be the basis for implementing of preventative measures in cases of poor metabolic control of diabetes.

Aim of the study: To evaluate the influence of diabetic control on bone mineral density and the bone formation and resorption processes.

Material and Methods: A group of 62 patients with type 1 and 2 diabetes mellitus and MODY aged between 17 and 80 were examined. Bone mineral density, bone turnover and diabetic control (based on HbA1c) were evaluated at baseline and then after 3–15 months (av. 6.8). Bone mineral density was measured in the spine, femoral neck and forearm regions by the DEXA method on the Lunar DPX apparatus. Bone structure in the heel was also evaluated using the Lunar Achilles apparatus. Bone formation and resorption processes were evaluated by the levels of bone markers: osteocalcin, bone-specific alkaline phosphatase, deoxypiridinoline and N terminal type 1 collagen peptides (NTX). All subjects were evaluated for late diabetic complications.

Results: In 48 subjects an improvement of diabetic control was observed. At the beginning of the study an average HbA1c was 10.72, in the follow-up – 7.67. 14 subjects did not achieve an improvement of diabetic control and the HbA1c changed from 8.35 to 9.49 in the follow-up. We did not observe a statistically significant change in bone mineral density in either group of patients. A statistically significant change was seen in the level of bone-specific alkaline phosphatase (p=0.0299) and also a marginal significant change in deoxypiridinoline (p=0.0541).

Conclusion: Long term diabetic control improves bone metabolism.

P038. THE DYNAMICS OF BONE CHANGES IN PREGNANT WOMEN WITH TYPE 1 DIABETES MELLITUS

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Pregnancy has a diabetogenic influence, which is characterized by short standing disturbances in carbohydrate metabolism (diabetes in pregnancy, persisting diabetes and exacerbation of existing diabetes). Type 1 diabetes mellitus has a destructive influence on bone structure especially in the first years where an insulin deficit, quite often ketoacidosis and the lack of metabolic control is observed. In Pregnancy induced diabetes hormonal changes occurring in this state influence the state of the bones, but in the future will influence the type of metabolic carbohydrate disturbances. The state of the bone mass in pregnancy is influenced by bone resorptive factors secreted by the placenta, e.g. cortisol, secreted as a response to ACTH produced by the placenta. On the other hand in pregnancy there is an increase in growth hormone and estrogen secretion, extra receptor insulin resistance and hyperinsulinaemia. Because of the lack of research on the influence of diabetes in pregnancy and its influence on the state of the bone mass we have decided to answer the following aims: 1) evaluate the influence of pregnancy induced diabetes on bone mass, 2) establish an optimal model of calcium and vitamin D supplementation.

Materials and Methods: 1) 15 pregnant subjects with a 10 history of type 1 diabetes mellitus were recruited into the study. The control group consisted of 10 subjects. The patients were examined both during pregnancy and then again 3 months after delivery. 2) Bone mineral density was evaluated by the Achilles ultrasound apparatus. 3) The level of diabetic control was evaluated with the aid of the 7-point glycemia profile, HbA1c and fructosamine. 4) In order to see the bone status, bone resorption markers DPX, NTX , bone specific AP and osteocalcin were evaluated. 5) Serum levels of total and ionized calcium and phosphate were evaluated to have an insight into the calcium-phosphorous metabolism. 6) An estimation of chronic diabetic complications was undertaken.

Results: Diabetic control was achieved during pregnancy and 3 months afterwards (av. HbA1c during pregnancy was 6.3%, after pregnancy 6.8%, average daily glycemia was suitably 6.3 and 6.8 mmol/l. The average T-score during pregnancy was 0.66 SD, and

after birth –0.32 SD. The average level of total calcium was 2.30 mmol/l, ionized calcium 1.10mmol/l, phosphorous 1.05 mmol/l. During pregnancy these results were as follows; 2.37 mmol/l, 0.9 mmol/l, 1.13mmol/l. The level of daily diabetic control and HbA1c was analyzed in respect to parameters of bone density SOS (m/s) and BUA (dB/MHz) and bone markers during pregnancy and after birth.

Conclusions: Good diabetic control at the level of normoglycemia contributes to the maintenance of bone status during and after pregnancy.

P039. SOME CIRCULATING CYTOKINES ARE CORRELATED WITH BONE TURNOVER AND BMD CHANGES IN ACROMEGALY

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Acromegaly is associated with changes in BMD and in the activity of bone turnover. Some cytokines are involved in the bone remodeling process, and their circulating levels reflect the activity of bone turnover. We have studied serum IL-1ß, IL-6, TNF- ß and TGF- ß concentrations in 20 patients with active acromegaly in comparison to 20 cured patients and 10 controls. Cytokine levels were related to GH, IGF-1, osteocalcin (OC) and degradation products of C-terminal telopeptides of type 1 collagen – Cross-Laps (CL). Densitometry of the lumbar spine, femoral neck and forearm was carried out using the DEXA method.

Serum IL-6, OC and CL levels were higher ($p < 0.05$) in patients with active disease in comparison to cured patients and controls. There were positive correlations between IL-1 ß and CL (r = 0.34; $p < 0.05$); TNF- ß and OC (r = 0.58; $p < 0.05$) in active acromegaly. IL-6 correlated with GH (r = 0.3; $p < 0.05$), CL with GH (r = 0.3; $p < 0.05$), OC with GH (r = 0.3; $p < 0.05$), OC with IGF-1 (r = 0.34; $p < 0.05$) in the entire group of patients with active and cured acromegaly.

TGF-ß correlated negatively with values of BMD within the femoral neck, Ward's triangle and trochanter ($p < 0.05$) in patients with active acromegaly. IL-6 was positively correlated with BMD of Ward's triangle and trochanter ($p < 0.05$). TNF-ß revealed positive correlations with BMD of the lumbar spine and forearm ($p < 0.05$) in the entire group of patients. Moreover, densitometric values within the femoral neck, Ward's triangle and trochanter were statistically significantly positively correlated with maximal basal GH and IGF-1 concentrations.

TNF-ß and IL-1ß reflect activity of bone turnover in active acromegaly.

TGF-ß. TNF-ß and IL-6 are involved in BMD changes in the disease.

P040. Ca-P-Ma METABOLISM AND BONE MINERAL DENSITY (BMD) IN PATIENTS WITH OESOPHAGITIS TREATED WITH OMEPRAZOLE

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Aim: To assess Ca-P-Mg metabolism and BMD in patients with oesophagitis(OE) treated for 1yr with omeprazole(OM).

Methods: Inclusion criteria: at least erosive OE in endoscopy; age 18-80 yrs for males and 60–80yrs for females; lack of disease and drugs influencing Ca-P-Mg metabolism. OM 20 mg/d, was given for 1 yr, a portion of *H. pylori*(Hp) infected patients underwent eradication at the beginning. Serum Ca, P, Mg, total alkaline phosphatase(AP) and urinary Ca($FU_{Ca/Cr}$) before, after 6 and 12 months of OM; plasma osteocalcin (OC) and urinary deoxypyridinoline (dP) before and after 6 months; BMD(L_{2-4}, Neck and Total) by DEXA before and after 1 yr were determined. Hp infection and eradication were assessed by a urease test. For

data analysis the Student's t-test, Mann-Whitney's and Fisher's tests, ANOVA, multiple regression were applied.

Results: 30 patients (M 20, F 10) aged 58.7±14.0 yr completed the study. After 6 months of OM plasma OC increased in the whole group from 4.62± 3.66 to 8.15±6.20 ng/ml ($p < 0.05$) and after 1 yr serum AP did so in males from 71.9±19.3 to 81.5±22.8 IU/l ($p < 0.05$). Serum Ca, P and Mg, $FU_{Ca/Cr}$ and urinary dP did not change. Total BMD increased after OM in the whole group from 1.106±0.08 to 1.121±0.09 g/cm^2 ($p < 0.05$) and in males from 1.122±0.08 to 1.145±0.08 g/cm^2 ($p < 0.05$). BMD at L_{2-4} and Neck did not change. In Hp eradicated patients serum Ca decreased from 9.68±0.30 to 8.88±0.55 after 6 ($p < 0.01$) and to 9.11±0.45 mg/dl after 12 months of OM ($p < 0.05$), and Total BMD increased from 1.183±0.062 to 1.214±0.069 g/cm^2 ($p < 0.01$).

Conclusions: 1. 1-yr OM therapy does not change serum Ca, P and Mg. 2. OM favorably modifies bone formation and resorption in men, but does not effect bone remodeling in women aged above 60 yrs. 3. Hp eradication may have a favorable effect on mineral metabolism.

P041. THE CONCENTRATION OF GROWTH HORMONE AND SOME GROWTH FACTORS AMONG WOMEN WITH ORAL HORMONE REPLACEMENT THERAPY

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Introduction: The use of complex oral hormone replacement therapy formulations (HRT) should always be critically evaluated with regard to their therapeutic effects. The obtained results allow to evaluate advantages and disadvantages of different types of estrogen-progesterone components composing oral formulations.

The aim of the study is a dynamic assessment of the concentration of growth hormone and some growth factors.

Materials and Methods: A statistical analysis was carried out in a group of 25 women with osteoporosis and osteopenia (mean age 53,3±5,3) divided into two groups depending on hormone replacement therapy: I- women receiving transdermal HRT, II- women receiving oral hormonal therapy. In each of the two groups bone mineral density (BMD) of the lumbar spine was measured by dual-energy X-ray densitometry. Growth hormone (GH), insulin-like growth factor-1 (IGF-1), transforming growth factor (TGF-B), fibroblast growth factor (FGFs) and plate factor (PDGF) were examined four times within a year. A statistical analysis was performed with the use of the T-student and UMann-Whithney tests.

Results: Among women using oral hormonal replacement therapy bone mineral density increased by about 1%, in comparison to women taking transdermal therapy where the increase was between 2,5 % and 3,5%. Biochemical examinations revealed a decrease of GH in group II and a non significant decrease of IGF-1 and PDGF in relation to group I. The FGF concentration did not show any significant differences in both groups.

Conclusions: The type of HRT influences both the concentration of GH and growth factors in women.

P042. ESTIMATION OF TRANSDERMAL HORMONAL REPLACEMENT THERAPY ON HORMONAL PARAMETERS AND BONE MINERAL DENSITY IN HEMODIALYZED WOMEN.

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Patients with end-stage renal disease during hemodialysis frequently have hormonal disturbances to of hypothalamic-

pituitary-ovarian axis. This leads to hyperprolactinemia, hypoestrogenism with menstrual disturbances and a decrease in bone mineral density.

The aim of the study was the estimation of transdermal cyclical-continuous hormone replacement therapy on hormonal profiles and bone density.

Materials and Methods: 10 amenorrheic females aged 22-45 years (mean 39,6 ± 8,29 years) on hemodialysis from a mean 2,98 ± 2,34 years, were treated with transdermal cyclical-continuous regimen of HRT (Estracomb TTS® Novartis) for 12 months. Before treatment and after 12 months serum concentrations of estradiol and prolactin was measured by fluorescence immunoassay (Delfia-LKB). The assessment of bone mineral density of the lumbar region was performed with DEXA-Lunar DPX.

The results are shown below:

parameter	before treatment	after treatment	stat. sign.
BMD g/cm^3	0,896 ± 0,062	0,968 ± 0,05	$p < 0,05$
T-score	−2,54 ± 0,52	−1,93 ± 0,57	$p < 0,05$
estradiol pg/ml	20,57 ± 11,69	50,27 ± 21,15	$p < 0,02$
PRL µIU/ml	1456,79 ± 1845,13	690,8 ± 116,44	$p < 0,05$

Conclusions: Transdermal hormone replacement therapy in amenorrheic, hemodialyzed women results in an increase in bone mineral density. This treatment leads to a significant increase of serum estradiol and a decrease in prolactin levels.

P043. ONE YEAR OF CALCIUM AND VITAMIN D SUPPLEMENTATION IN OSTEOPENIC POSTMENOPAUSAL WOMEN MAINTAINS UNCHANGED BMD AND BONE MARKERS

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Background: Supplementation of calcium and vitamin D in elderly institutionalised women is well documented in regard to increase of bone mass (1,2). However, whether such therapy in postmenopausal women with osteopenia is sufficient for the prevention of bone loss is still a matter of discussion.

Subjects and methods: To observe the effect of 3 years supplementation of calcium and vitamin D on bone density and bone markers. 121 postmenopausal women with WHO criteria of low bone mass, mean age 62 were studied. 108 women completed the first year of the study. Daily calcium intake was calculated from a diary questionnaire. Mean value was 620 mg/d. A supplement of 500 mg of Calcium and 500 I.U of vit.D (Calcium 500D by Polfa Łódź) were added to each individual diet. Blood levels of bone formation markers (serum bone specific alkaline phosphatase) and of resorption (serum CrossLaps) and urinary calcium excretion (Ca/Cr), as well as lumbar and hip bone density at baseline and after 12 months were evaluated.

The *results* are shown in the table below:

	Neck	BMD L1-L4	BMD Total Hip	BAP	Ca/Cr	Serum CrossLaps
Baseline	0.762	0.912	0.911	20,92	0,303	1698,70
12 months	0.763	0.909	0.911	19,052	0,419	1806,43
% Change	+0,23	−0,3	+0,02	−8,0%	+27%	+5,9%
p	$p > 0,05$	$p > 0,05$	$p > 0,05$	$p=0,02$	$p=0,001$	$p=0,4$

Conclusions: Supplementation with calcium and vit. D in postmenopausal osteopenic women maintains bone mass during the first year of treatment.

P044. THE INFLUENCE OF CALCIUM CARBONATE AND ALPHACALCIDOL TREATMENT ON PHALANGEAL QUANTITATIVE ULTRASOUND RESULTS IN CHRONIC RENAL FAILURE

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Quantitative ultrasound (QUS) informs about bone quantity and quality (mineralization and elasticity). Decreased QUS results were found, among others, in patients with end-stage chronic renal failure treated with dialysis. The aim of the study was to evaluate QUS results in early and moderate chronic renal failure (CRF) and the influence of treatment with calcium carbonate and alphacalcidol on QUS results. Fifty-one patients (31 males and 20 females) aged 55.4±10.8 years (29–71) with CRF lasted for 52.7±49.9 months (2–216), with a serum creatinine of 3.1±1.5 mg% (1.5–6.0) were examined. QUS was performed with the use of the DBM Sonic 1200 Igea device (Italy), at the distal metaphysis of the II-V proximal phalanges of the left hand. QUS was 1939±73 m/s (1850-2136) in women and 2010±83 m/s (1819–2171) in men. There were normal results ($\geqslant -1SD$) in 44 patients (28 males and 16 females), -2SD÷-1SD in 4 patients (3 males and 1 female) and below −2SD in 3 patients (3 females). Following this patients were randomly allocated (with respect to gender only) into 2 groups. One group ($CaCO_3$ group) was treated with calcium carbonate in dose of 3 x 1,0 and the second (1α+$CaCO_3$ group) was treated with calcium carbonate in the same dose and alphacalcidol in a dose of 0,25 µg every second day. There was no difference in QUS results between both groups before treatment. A follow up QUS was performed after 1 year in 21 patients in the CaCO3 group and in 23 patients in 1α+$CaCO_3$ group.

	Before treatment	After 1-year treatment	P
$CaCO_3$	2010±84 m/s	2022±94 m/s	NS
1α + $CaCO_3$	1971±87 m/s	1988±82 m/s	NS

Conclusion: Disturbances in bone mineralization and elasticity are rarely found on QUS examination in early and moderate CRF. There is no significant influence of treatment with calcium carbonate and alphacalcidol on the QUS results.

P045. INCREASE IN BONE MASS AFTER ONE YEAR TREATMENT WITH 1.0 µg ALFACALCIDOL IN WOMEN WITH OSTEOPOROSIS

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Introduction: Usefulness of alfacalcidol in the treatment of postmenopausal osteoporosis was well established, but its optimal dose is yet to be determined. The aim of the study was to asses the efficacy of two years treatment of alfacalcidol in a dose of 1µg per day in women with postmenopausal osteoporosis without vertebral fractures. Results after the first year of the treatment are reported.

Materials and Methods: 63 postmenopausal osteoporotic women, without vertebral fractures were included. All the subjects received 1µg of alfacalcidol and 500 mg of calcium per day. Mean dietary calcium intake was 700 mg/d. Bone mineral density (BMD) of the femoral neck and L2-L4 lumbar spine was measured after 6 and 12 months by the DXA method used HOLOGIC QDR4500SL. The marker of bone formation – osteocalcin was evaluated after 3 and 12 months, whereas the

Ca/Cr index every 2 weeks during the first 3 months, and after this ever 3 months.

Results: Mean value of assessed parameters (in table)

Month	Neck BMD	L2-L4 BMD	Osteocalcin	Ca/Cr index
0	0,651	0,768	23,443	0,486
3	NA	NA	27,233	0,701
6	0,663	0,783	NA	0,632
12	0,659	0,778	29,923	0,726

Neck BMD after 6 months increased 1,8% ($p < 0,05$), L2-L4 2% ($p < 0,05$), however after 12 months, 1,2% ($p < 0,05$) and 1,3% ($p < 0,05$) respectively. Osteocalcin levels after 3 months of treatment increased 16% ($p < 0,05$) and after 12 months 28% ($p < 0,05$). Each Ca/Cr index during the first year of the study was higher than at baseline.

Conclusions: 1μg alfacalcidol daily prevents bone loss after one year of treatment and increases level of marker of bone formation. Urine calcium excretion is higher, but still within of normal values.

P046. THE IMPORTANCE OF PAST HISTORY OF CALCIUM SUPPLEMENTATION ON THERAPEUTIC EFFECT OF OSSEIN – HYDROXYAPATITE COMPOUND IN OSTEOPOROTIC FEMALES

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Low bone mass, which is a main cause of health problems of osteoporotic patients, can be prevented or improved with appropriate treatment. Medications containing calcium salts are in general use now, but Osteogenone (OHC) used in this trial contains not only calcium salts, but other minerals, proteins and growth factors. Its effect on bone mass evolution over two years was compared to calcium carbonate (CC). Both treatments were supplemented with vitamin D to facilitate calcium absorption. The two-year studies with a participation of 125 postmenopausal women aged 55–83 years were undertaken. It was found, that both treatments had a beneficial effect on the final BMD values, as compared to the baseline values. It was also found, that the results of treatment were influenced by calcium intake during period of the bone mass increment and consolidation, OHC being more effective than CC in the patients with low calcium intake. Both treatments induced a significant fall in the bone resorption markers NTx and rise of the bone formation marker (osteocalcin).

The mechanism of different action of OHC in relation to CC requires further investigation.

P047. PATIENT ADHERENCE TO BISPHOSPHONATE THERAPY

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To assess adherence with bisphosphonate (B) therapy, either etidronate (E) or alendronate (A), initiated in patients with osteoporosis (OP), we analyzed CANDOO, our prospective observasional database of OP and osteopenia patients seen at our Canadian tertiary care sites. All patients in CANDOO initially seen in Jan/95 or later, who started E or A on or after their initial clinic visit and who were seen at least once in clinic after initiating B were included. There were 1176 patients (1037 women) in the E group and 1003 (855 women) in the A group. At the start of B, patients in the E group were slightly older than those in the A group (65 vs 61, $p < 0.001$) but the 2 groups had a similar prevalence of prior vertebral fracture (23% vs 20%, n.s.), and similar lumbar spine bone mineral density (LS-BMD) t-scores (-2.46 vs -2.48). Using survival curve analysis, at 3, 6, 9 and 12 months after start of B therapy, 97%, 94%, 91% and 88% of patients in the E group and 91, 86%, 83% and 80% of patients in the A group were still continuing therapy. The difference between the survival curves is statistically significant (logrank p=0.036). Compliance diverges within the first 3 months, but the rate of subsequent discontinuation is similar in both groups at 1% of the initial cohort each month. We conclude that an adherence rate of 80–88% after 1 year can be attained with B therapy in a tertiary care setting. The determinants of B adherence need to be established.

P048. INTERMITTENT CYCLIC THERAPY WITH ETIDRONATE PREVENTS CORTICOSTEROID-INDUCED BONE LOSS: THREE YEARS OF FOLLOW-UP

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We determined the effectiveness of 3 years of intermittent cyclic therapy with etidronate (ICT-E) in preventing bone loss in patients receiving corticosteroid (CS) therapy. We analyzed the clinical records of patients seen at our tertiary care Osteoporosis Centre, whose data are routinely collected prospectively into a standardized database.

Patients treated with CS for at least 3 years were selected for the study group if they were concomitantly treated with ICT-E. A comparison (Comp) group was selected of CS-treated patients who were treated with no bone-active therapy other than calcium and vitamin D. Patients were excluded if they had known causes of secondary osteoporosis, were treated with any other bone-active therapy within the preceding 2 years or did not have a bone mineral density (BMD) determination at baseline and after approximately 1, 2 and 3 years of follow-up.

There were 24 and 37 patients in the ICT-E and Comp groups. The groups were comparable in baseline age, 60;16 vs 55;14 yrs (mean;SD), and mean CS dose during the study period (prednisone 13 vs 10 mg/day). The groups differed in prior duration of CS therapy, respectively 11;11 vs 3;4 yrs.

In the ICT-E group, LS-BMD increased significantly relative to baseline at each yearly follow-up time point, by +3.8;5.8%, p=0.006 (1 yr), +5.0;8.0%, p=0.006 (2 yr) and +5.2;9.8%, p=0.01 (3 yr). In the Comp group, LS-BMD changed by -3.6;6.4% (p=0.0005), -3.2;7.8% (p=0.007) and -1.3;9.1% (p=0.3), respectively. The differences in these percent changes between the two groups were significant at each time point, p=0.00003 (1 yr), p=0.0002 (2 yr) and p=0.01 (3 yr).

These data suggest that ICT-E is an effective treatment for CS-induced osteoporosis over a period of 3 years of continuing CS therapy. These findings extend the conclusions of controlled trials conducted over shorter periods of CS therapy.

P049. ESTROGEN RECEPTOR GENE POLYMORPHISM AND BONE MINERAL DENSITY IN MEN – A PRELIMINARY STUDY

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Estrogens are known to be an important factor in maintaining of bone mineral density in women. Estrogen deficiency leads to increased osteoclast activity, which causes a rapid decrease in bone mineral density (BMD). Recent studies in men with aromatase deficiency and resistance to estrogens revealed an increased bone turnover leading to severe osteoporosis. Whether mild mutations within the estrogen receptor (ER) gene can result in decreased BMD is still unclear.

The aim of our study was determination of ER gene polymorphisms and their correlation with BMD in men. 50 men aged 20–78 years participated in our study: 20 with osteoporosis, 15 with osteopenia and 15 healthy subjects. BMD was estimated within the lumbar spine (L1-L4) using LUNAR DPX (DEXA). ER gene polymorphism was investigated using Pvu II and Xba restriction enzymes.

Results (in %) are present in the table below:

Genotype	PP	Pp	pp	XX	Xx	xx
osteoporosis	30	30	40	10	55	35
osteopenia	20	40	40	13.3	46.7	40
controls	40	20	40	40	40	20

There was no statistically significant correlation between Pvu II polymorphism and BMD, but for Xba I we found a borderine significant correlation (p = 0.07). It is necessary to increase the numbers of the investigated groups.

P050. IS HYPERTENSION LINKED TO MALE OSTEOPENIA RESULTING FROM THE NORMAL AGING?

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Disturbances in Ca^{2+} metabolism in men are involved in the pathogenesis of hypertension and are presumed to promote an excessive age-related reduction of bone mineral density. Therefore, hypertensive men are hypothesised to be more prone to the development of age-related osteopenia. The aim of the study was to determine whether men with elevated blood pressure (BP) had an increased relative risk of osteopenia in comparison to normotensives from the local population. Material comprised a sample of 208 healthy men, aged 35–63, inhabitants of Wrocław, Lower Silesia. Trabecular, cortical and total bone mineral content (BMC) at the ultra-distal radius were assessed by pQCT (Stratec 960). BMI was used as a measure of general obesity. BP was measured using an MPC-350 sphygmomanometer, according to WHO instructions. Relationships between BP and BMC were evaluated by a multiple linear regression. The significances of inter-group differences in BMC with regard of age and BP (and BMI as a continuous co variable) were tested by an analysis of covariance ANCOVA. Multiple logistic regression was used to verify whether some select factors (age, BMI, systolic and diastolic BP) predicted male bone status. Systolic BP was not related to bone status at the ultra-distal radius. There were no differences in BMC between systolic hyper- and normotensives. Systolic BP did not affect the relative risk of male osteopenia. In contrast, there were significant negative relationships between diastolic BP, and trab BMC (r=−0,18;p.=0,008) and total BMC (r=−0,15; p.=0,03) (but not cort BMC (r=−0,13; p.=0,06)), when controlled for age and BMI. Diastolic hypertensive men had reduced BMC as compared to normotensives (the ANCOVA results for trabBMC F=8,86; p.=0,003, for cortBMC F=3,81; p.=0,045 and for total BMC F=5,36; p.=0,02). Men of diastolic BP $\geqslant$90 mmHg had an approximately 1,50-fold increased relative risk of being osteopenic within trab BMC as compared to normotensives (OR=1,50; 95% CI=1,01–2,23), when controlled for age, BMI, systolic BP.

P051. THE INFLUENCE OF FLUORIDE ON CORTICAL BONE IN MEN

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Introduction: Fluoride as one of the most active elements in nature and has an influence on organic and inorganic components of bone. This element has a specific affinity to hydroxyapatite in bone tissue $Ca_{10}(PO_4)6(OH)_2$, which is the basic mineral component of bone. It displaces the hydroxyl ions of the hydroxyapatite crystals changing it into fluoroapatite and thus altering its physical and chemical characteristics. Fluoride concentration in human bone increases with age along the whole life-span. The effect of fluoride is dose-dependent; low doses of fluoride (2 mg daily) are used in carries prevention, high doses (40–80 mg daily) are used in osteoporosis treatment, and a dose of 5000 mg is lethal. This study presents the effects of long-lasting influence of low fluoride doses to cortical bone in men.

Material: 1578 men, employees of the the aluminium steelworks in Skawina, mean age 46.5, were included in the study. The mean work period was 17,6 years; during which they were exposed to low doses of fluoride (2–4 mg). The results obtained were compared to the control group which consisted of 57 men, the same age range as the study group, not exposed to fluoride, that died suddenly and unexpectedly.

Method: All patients were subjected to a standard AP in supination radiogram of the right forearm. With aid of the radiogram, morphometric measurements of three segments (distal, medial, proximal) of the radius and the humerus perpendicular to the long axis of the extremity were made. On the appointed line, perpendicular to the long axis of the extremity, bone width and marrow cavity width were measured with a slide calliper (accuracy 0.15mm) and then cortical thickness, cortical index, cortical area and cortical area index were calculated.

Results: Decrease of cortical indices as a result of marrow cavity widening was established in the control group, while in steelworks workers exposed to long-lasting fluoride influence this process was inhibited.

Conclusion: On the basis of morphometric study results the following conclusions could be drawn: 1. Resorption of the radius in men takes place, manifested by widening of the marrow cavity and a decrease in the cortical substance thickness. 2. Effect of fluoride on cortical and cancellous bone is dose-dependent. 3. Exposition to low doses of fluoride leads to inhibition of endosteal resorption of cortical bone and to an increase of trabecular bone mass. 4. Low doses of fluoride can be effective in the prevention of bone loss in men.

P052. JUVENILE IDIOPATHIC OSTEOPOROSIS – DIAGNOSTICS AND REHABILITATION

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Introduction: Juvenile idiopathic osteoporosis is a rare metabolic disease, with a pathomechanism different from involutional

osteoporosis. It was initially described as a specific syndrome by Dent in 1965, although the first description of a case was published in 1938. Its etiology still remains unknown. The onset of the disease is rapid, affecting previously healthy children of both sexes aged 3.5–15 years. A rapid loss of bone mass is especially remarkable.

Early clinical signs of the disease are: pain in the tarsal joints during standing and walking, increasing weakening of the muscles of the lower extremity, especially triceps surae muscle, affected propulsion – walking on the heels, inability to maintain an axial load of the skeleton. Among prevalent late signs are: decrease in height due to compressive fractures of the vertebral shafts, deformations of lower extremity joints, especially the feet, typical walking on the heels with rigid knees. The differential diagnosis apart from endocrine diseases (Cushing's disease, primary or secondary hyperparathyroidism, osteoporosis in the course of thyroid diseases) drug-induced osteoporosis, primary or secondary bone neoplasms, hereditary fragility of bones, aseptic necroses of the bones, local bone mass losses in the course of central- and peripheral nervous system derived palsies should be considered. Disturbances in body static due to the pain impulses derived from decalcified bony tissues of the feet, acting cranially, destabilizes the musculo-ligamentous mechanism of the support system of the lower limbs, especially the knee and hip joints and joints of the vertebral column and the rib cage. This phenomenon leads to motor inactivity of a child, resulting in further bone loss. This occurs because of the fact that movement is a phenotype signal for impulses responsible for bone build-up, and bone turnover – due to a piezoelectric nature of a hydroxyapatite crystal growing – is activated through pressure and muscle contraction.

The aim of the study is to analyze a statokinetic chain in juvenile osteoporosis during axial load of the skeleton and its presentation on the basis of a method of gradual load to the lower limbs and vertebral column during rehabilitation.

Material: In the years 1991–2000 in the Clinic of Rehabilitation 5 children with advanced juvenile osteoporosis, among them 3 boys and 2 girls, were hospitalized. At the onset of hospitalization they were aged 4,1–8 years. The clinical course in all cases was serious and time of rehabilitation onset delayed because of an initial improper clinical diagnosis in regional hospitals, focusing on neoplasmic or inflammatory process of the CNS. Average time of rehabilitation was 3–4 years in 3 children and two still remain under treatment. Apart from these cases 8 another children with a milder form of osteoporosis, aged 6–12 years at onset of rehabilitation, were treated. Their period of treatment was about 2 years.

Method: In the acute stage of disease the rehabilitation should be focused on: pharmacotherapy, elimination of the pain stimuli by the application of physiotherapy and periosteal and segmentary massage, gait exercises in water, respiratory exercises mobilizing the chest and vertebral column, active exercises with fractioned resistance of the limbs and trunk in isolated positions, exercises of muscles of the trunk and lower limbs in an antigravitational position, with increasing axial load, exercises of the feet and gait education on a soft, elastic base, moving track training, interval training on a differentiated base, physiotherapy: calcium iontophoresis, quartz lamp and magnetotherapy. In a subacute stage of osteoporosis rehabilitation should consider: general and respiratory exercises, resistance exercises of the trunk and limbs in a position of axial load of the skeleton, exercises increasing muscular strength of the lower limb in a Hettniger-Muller system, bicycle training, moving track training with gradual increasing of the load, interval training on a differentiated base, physiotherapy: quartz lamp and magnetotherapy.

Conclusions: A full recovery of children depends on the type and stage of osteoporosis and on adequate therapy. Osseo–ligamentous pain declines on average after about 2 years. Full motor aptitude recovers after 3–4 years.

P053. IDIOPATHIC JUVENILE OSTEOPOROSIS OUTCOME BASED ON OVERVIEW OF SYMPTOMS IN 61 PATIENTS

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61 children (27 boys and 34 girls) with idiopathic juvenile osteoporosis were followed up to adulthood starting from the onset of the first symptoms (onset varied from 2.9 to 14 yrs of age). The main symptoms were: difficulty in walking, foot pain, back pain, swelling of the large joints and fractures or distortion of the lower extremities. The group was heterogeneous in respect to their symptoms and outcome. Nevertheless most of the cases manifested acute and chronic stages of the disease, documented by significant decreases in densitometric and bone marker values.

P054. DIFFICULTIES IN DIAGNOSIS OF IDIOPATHIC JUVENILE OSTEOPOROSIS

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Idiopathic juvenile osteoporosis (IJO) is a rare metabolic bone disease in children. Its symptoms are not very characteristic. Among the different diagnostic methods, densitometry seems to be crucial in reaching the diagnosis. Unfortunately, densitometry is rather seldom in use by paediatricians.

We present a case of a 10,5 year old boy, who had been suffering from nagging pains in lower limbs, deficient muscular power and pain in the spine for a period of 10 months.

At the age of 9^8_{12} the diagnosis 'a left ankle sprain' had been formulated, the left limb was placed in a plaster cast and the boy was told to reduce physical activity for 3 weeks. This therapeutic method had not cured the boy and he started complain of pains in both lower limbs and dysbasia. These symptoms were interpreted as a balance disorder. The boy had been diagnosed by some physicians. A suspicion of a collagen disease or borreliosis were diagnosed. Finally he was referred to our department with the diagnosis 'polyneuropathy'.

The medical history of the patient and symptoms of the disease were typical for IJO. All criteria described by Dent (the beginning before the puberty, pains in lower limbs and spine, deficient muscular power, dysbasia and a faulty posture) were presented. Densitometric data were as follows: (DEXA) BMD L_2-L_4: 0.531g/cm^2; (Z –score –polish norm: –3. 2 8SD). Data from the medical history and results of additional investigations were sufficient to exclude the eventuality of secondary osteoporosis.

P055. LEVEL OF INSULIN-LIKE GROWTH FACTOR I (IGF-I) AND THIRD FRACTION OF IGF-I BINDING PROTEIN (IGFBP3) IN SERUM OF CHILDREN WITH IDIOPATHIC OSTEOPOROSIS AND OSTEOPENIA-PRELIMINARY RAPORT

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The aim of the study was to determine whether insulin-like growth factor I (IGF-I) was able to influence the development of idiopathic abnormalities in skeletal mineralization in children and adolescents.

The studied group comprised 45 patients aged 7 to 18 years. There were 12 cases of idiopathic osteoporosis, 20 cases of osteopenia, and 13 controls. Diagnosis of mineralization abnormalities was based on complex clinical, densitometric, and biochemical examinations. Serum level of IGF-I by the radio-immunological method and third fraction of IGF-I binding protein (IGFBP3) by immunoradiometry was determined.

It was found that osteoporotic and osteopenic children have a statistically significantly lower concentration of IGF-I (583 and 686 ng/ml respectively) than the control group (834 ng/ml; $p < 0.05$). Differences did not depend on the biological age of studied children and were present in all stages of adolescence. The level of IGFBP3 did not differ significantly between the examined groups (3593 v. 3957 v. 3993 ng/ml).

The results suggest that IGF-I insufficiency may play an important role in the etiopathogenesis of idiopathic osteoporosis in adolescents. The data presented above requires confirmation in further studies.

P056. LOW-ENERGY FRACTURES THE LEADING SYMPTOM OF OSTEOPENIA OR OSTEOPOROSIS IN 6 CHILDREN

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Osteoporosis and osteopenia in children are underestimated. There are even expressed opinions, that osteoporosis is a disease of postmenopausal people. Childhood is the period of intensive development of osseous tissue. Almost 80% of peak bone mass is cumulated in this period. Every disturbance of bone mineralization occuring in childhood can lead not only to reduced peak bone density in the future, but also to appear as a pathological sign in children.

Among other signs, low-energy fractures are worth notice. The aim of this study was to analyse BMD and selected metabolic and hormonal parameters in young patients with low-energy fractures. The study was carried out in a group consisting of 5 boys and 1 girl aged $6^3/_{12}$–$16^1/_{12}$ years. These boys were admitted to our department because of low-energy fractures (1–5 fractures in the course of 5 years). We diagnosed idiopathic osteoporosis in 3 cases and secondary osteoporosis in 3 cases (2 boys with improper dietary calcium intake, 1 boy with abnormally low 25OHD serum levels). The BMD (DEXA) of the L_2-L_4 spine region was considerably lowered in all these patients (Z score between -1.22 and -6.5; Polish norms published by Lorenc, Lebiedowski, Olszaniecka and the co-authors).

P057. LIMB AND/OR SPINE PAIN –THE LEADING SYMPTOMS OF SECONDARY OSTEOPOROSIS IN CHILDREN

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The problem of osteoporosis in children is underestimated, meanwhile many chronic diseases and many drugs can cause disturbances of bone mineralization and be a cause of secondary osteopenia or osteoporosis even in very young children. Osteoporosis in children can be symptomless, sometimes oligosymptomatic. The children with oligosymptomatic osteoporosis can suffer from bone pains (reported as pain of the limbs or pain of the spine). These symptoms are sometimes called 'growing pains or night pains' and often underestimated.

The aim of this study was to estimate BMD and selected metabolic and hormonal parameters in children with secondary osteoporosis. The bone pains were the dominant symptoms in these patients.

We present cases of 4 patients at the age of $5^3/_{12}$ to $12^{10}/_{12}$. These patients, previously treated in different hospitals and outpatient clinics, had not been properly diagnosed in spite of the presence of risk factors of secondary osteoporosis (prior chronic corticosteroidtherapy or metabolic acidosis).

We noticed that the L_1-L_4 BMD (DEXA) in this patient was considerably lowered (Z score between –2.5 and –3.93). All the patients suffered from bone pains and all were 'diagnosed' by family doctors as children with 'growing pains' or pains caused by a scoliosis or a faulty posture.

P058. ASSESSMENT OF BONE MASS OF THE FOREARM IN THE CHILD AND ADOLESCENT POPULATION FROM THE KUJAWSKO – POMORSKIE PROVINCE BY FOREARM DENSITOMETRY

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Clinicians are able to find abnormalities of bone mineralization in children and adolescents by comparison with normative population values.

The aim of this study was a quantitative assessment of bone mass measurements of bones of the forearm of dominant and non-dominant limbs in children and adolescents from the Kujawsko-pomorskie province by dual energy X-ray absorptiometry.

260 subjects (male and female) aged from 5 to 17 years between 3 and 97 centiles of body height and weight were examined. Bone mineralization was analysed by mean Bone Mineral Density (BMD) and Bone Mineral Content (BMC) in the bones of the forearms by dual energy X-ray absorptiometry (DEXA).

It was found that children aged less than 11 years had a linear sex-independent increase of BMC and BMD before a sharp increase in BMC i BMD in girls from 11 to 14 years and for boys from 13 to 15 years of age. This was followed by a slight linear increase of both parameters but they were significantly higher for boys in comparison with girls. There were no statistically significant differences in BMC or BMD between the dominant and non-dominant arm.

These densitometric values presented could be useful for the assessment of bone mass in children and adolescents and allow to find abnormalities of bone mineralization. Analysis of bone mineralization may become another parameter of somatic development.

P059. RELATIONSHIP BETWEEN ANTHROPOMETRIC VARIABLES, BODY COMPOSITION AND BONE MASS IN ADOLESCENTS – SEX-DEPENDENT DIFFERENCES

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Relationship between anthropometric features, body size and skeletal mass are well known and generally proved in adults. The aim of this study was to establish the most important anthropometric factors influencing total body and lumbar bone density in adolescents.

Materials and Methods: In 164 healthy white subjects (M=93, F=71) aged 14–19 yrs (mean age: 16,6) the densitometric measurements using DEXA (DPX-L, LUNAR) were performed to estimate bone density in the total body (Total BMD) and in the lumbar spine region (AP Spine BMD), moreover, fat mass (FM), lean body mass (LBM) in the whole body were assessed, as well as in the abdominal region (FM-Trunk, LBM-Trunk). At the same time anthropometric examinations was made: body weight, height (BV), body mass index (BMI), waist to hip ratio (WHR), length of upper limb (A-da), length of lower limb (B-sy), length of trunk (B-sst – B-sy = Trunk), chest circumference (Thorax), arm circumference (Arm), thigh circumference (Thigh). Pubertal stage was defined according to Tanner. Statistics: Wilcoxon test, t Student, multiple regression analysis; $p < 0,05$ considered significant.

Results: Mean values of Total BMD were higher in boys than in girls (1,14 vs 1,1 g/cm^2 p=0,001), on the contrary they did not differ in the lumbar spine (1.08 vs 1.13, NS). Both, total BMD and spine BMD showed strong positive correlation with age, Tanner stages and basic anthropometric measurements (weight, BMI, Thorax, Arm, Thigh) in boys as well in girls. A significant positive correlation was found between both BMD and Trunk (r=0,35), WHR (r=0,48), LBM (r=0,74) and LBM-Trunk (r=0,57) in boys. Girls' BMD showed no statistical connection with Trunk, WHR and LBM. In females, the particular association was stated for BMD and B-sy (r=0,34, p=0,003) and FM (r=0,52 p=0,00001). Menarche (mean age: 13,1+/-1,2 y) did not influence bone mass accumulation. A-da correlated positively with BMD better in boys than in girls.

Conclusions: Sexual dimorphism referring to somatic differences and body composition, determine the values of total BMD, to a considerable extent, in the postpubertal period of life. Body weight and BMI are more precise determinants of skeletal mass than height alone. Waist to hip ratio (WHR), length of upper limb and fat free mass (LBM) are specifically associated with higher bone density in boys. In females, the waist/hip ratio (WHR) cannot be used to predict future bone mass. Girls aged 14–19 y demonstrate the particular effect of body components: The lower is the fat mass the shorter are the legs, the greater is the risk of low bone mass in young women.

P060. BIOCHEMICAL MARKERS OF BONE TURNOVER BALP AND NTx IN MONITORING TREATED GIRLS WITH LOW BONE MASS

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We determined serum concentrations of bone specific alkaline phosphatase (BALP) and urinary concentrations of $\alpha2(1)$ N-telopeptides of collagen type I (NTx) during estrogen therapy in girls with secondary amenorrhoea and bone demineralisation.

Materials and Methods: 90 girls aged 17–19 years and more than 4 years after menarche were examined. 55 subjects (group A) had more than 3 months of secondary amenorrhoea or oligomenorrhoea since menarche, the last 35 healthy subjects (group B) constituted the control group. We determined body mass index (BMI), serum concentrations of gonadotropins, estradiol (E2), testosterone (T) and prolactin (PRL) using RIA [Orion Diagnostica] and BALP using EIA [Metra Biosystems]. We determined urine concentrations of NTx using EIA [Ortho-Clinical Diagnostica]; the values were presented in relation to urine creatinine in nM BCE (Bone Collagen Equivalents)/mM Cre(Creatinine). Bone mineral density (BMD) was measured at L1 lumbar spine by DEXA. BALP and NTx measurements were repeated after 3-6 months of estrogen-progestin (EP) sequential therapy.

Results: Before EP treatment in group A the results were: BMI 18.1+/-2.38kg/m^2 BMD 0.857+/-0.08g/cm^2, E2 43.8+/-21.78pg/ml and the values were significantly lower than in B group (p < 0.001); in both groups serum concentrations of FSH, LH, PRL and T were in the normal range. In group A before and after EP treatment the mean BALP concentrations were respectively 79.9U/l (26.7÷463.6) and 40.9U/l (13.4÷334.0) and NTx respectively 399.7nM/mM Cre (27.4÷999.8) and 160.7nM BCE/mM Cre (2.8÷636.7).In control group B the values were: BALP 41.1U/l (24.1÷88.3), NTx 46.9nM BCE/mM Cre (9.5÷105.3). We found a 47.3% (18.5÷88.4) decrease in BALP concentration and a 57.4% (12.6÷95.6) decrease in NTx concentration after EP therapy in the group with low bone mass (group A).

Conclusions: The biochemical markers of bone turnover BALP and NTx may be a sensitive indicator of the antiresorptive estrogen effect on bone in girls with low bone mass.

P061. VDR, ER AND COLIA1 GENE POLYMORPHISM AND BONE MINERALIZATION IN GIRLS WITH TURNERS SYNDROME

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We examined the incidence of vitamin D receptor (VDR), estrogen receptor (ER) and collagen type I $\alpha1$ chain (COLIA1) genes polymorphism and evaluated their importance to bone mineral density.

Materials and Methods: 65 girls and women aged 16-34 years, including 29 subjects (group A) with Turner syndrome (kariotype 45,X) and 36 (group B) healthy subjects (control group), were examined. The patients with Turners syndrome were not treated with growth hormone. We determined polymorphisms: BsmI of VDR gene [Morrison], XbaI and PvuII of ER gene [Carling] and COLIA1 gene [Grant]; DNA amplification in PCR was conducted with primers for the polymorphic regions and the amplification products were incubated with the analogous restriction enzymes [MBI Fermentas]. The genotypes we found were: VDR [BB, bb, Bb], ER [XX, xx, Xx and PP, pp, Pp], COLIA1 [SS, ss, Ss]. Bone mineral density (BMD) at the L1 lumbar spine was measured by dual photon absorptiometry (DEXA). BMI and levels of gonadotropins, estradiol (E2), testosteron (T) and prolactin (PRL) were determined.

Results: In group A the results were: BMI 22.5+/-4.1kg/m^2, FSH 81.6+/-37.09mIU/ml, LH 42.3+/-21.1mIU/ml, E2 11.8+/-8.4pg/ml, T 0.86+/-0.65ng/ml, PRL 11.6+/-4.03pg/ml, L1 BMD 0.795g/cm^2 (min 0.447, max 1.012), which is 70.2% of the peak (min. 40.00, max. 89.00) and 75.71% of the age-matched (min. 43, max. 93) bone mass. In comparison to group A, in group B the results of the hormonal tests and the densitometric measurements were in the normal range (p < 0.001). The gene polymorphisms found in group A were: VDR [BB 3.4%,Bb 34.5%, bb 62.1%], ER [XX 20.7%, Xx 27.6%, xx 51.7% and PP 34.5%, Pp 37.9%, pp 26.6%], COLIA1 [SS 89.7%, Ss 10.3%, ss 0.00%], and in group B: VDR [BB 11.1%, Bb 47.2%,bb 41.7%], ER [XX 11.1%, Xx 44.4%, xx 44.45% and PP 27.7%, Pp 50.0%, pp 22.3%], COLIA1 [SS 65.7%, Ss 31.4%, ss 2.8%]. The relationship between BMD and ER genotype pp→Pp→PP in group A was the only significant one (p < 0.008, t=–2.91).

Conclusions: The ER gene polymorphism (PvuII) may intensify bone demineralisation in Turner syndrome so it may constitute a genetic marker used to verify the time of beginning and dose of estrogen therapy. The incidence of unfavourable alleles in the control group was significant and because it may be a risk factor of osteoporosis the patients require long-term observation.

P062. BONE METABOLISM MARKERS IN CHILDREN WITH OSTEOPOROSIS AND OSTEOPENIA IN THE COURSE OF NEPHROTIC SYNDROME

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The aim of the study was to determine abnormalities in calcium and phosphorus metabolism and biochemical markers of bone metabolism in children with nephrotic syndrome (NS) and decreased mineralization of the skeleton.

The examined group comprised 32 children (23 boys and 9 girls) aged 6 to 19 years. NS patients have been treated with corticosteroids (CS) for 6 months to 15 years. The total dose of the drug ranged from 1.07 to 39.3 g. The following examinations, i.e.: bone densitometry (DEXA, total body and spine), serum

calcium, phosphorus, and magnesium concentrations, level of: PTH, 25-OHD, calcitonin, osteocalcin and activity of bone alkaline phosphatase (AP) in all children were performed. Diurnal urine collection was used to determine elimination of calcium ions and concentration of piridinoline, deoxypiridinoline and collagen type I crosslinked C-telopeptide.

Our study revealed a significant decrease in bone mineralization in 13 of the total of 32 children. In 4 cases-osteoporosis, and in 9-osteopenia were recognized. The most frequent estimated abnormalities were: elevated activity of bone alkaline phosphatase, increased elimination of bone resorption markers, and hypomagnesaemia. A direct correlation between the duration of corticosteroid therapy, total dosage of CS and a decrease in bone mineralization was not observed.

P063. SHORT STATURE AND LOWERED BONE MINERALIZATION – THE LEADING SYMPTOM OF LATELY DIAGNOSED DISTAL RENAL TUBULAR ACIDOSIS IN A 5 YEARS OLD BOY

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Renal tubular acidosis (RTA) is a rare clinical syndrome. The syndrome can include many clinical conditions. In some cases RTA can be almost symptomless. This kind of RTA is diagnosed accidentally or not before late complications (such as haematuria and pains caused by urolithiasis) present.

Distal RTA is caused by an abnormal renal acidification process and is characterized by an inability to decrease urine pH (below 5.5) in spite of the presence of a metabolic acidosis. Metabolic acidosis, hyperchloraemia, excessive renal loss of Na, K, Ca and HCO_3^- are typical of distal RTA. The compensatory mechanisms result in improper bone mineralization and growth retardation.

We present a case of a 5 year old boy who had been diagnosed because of improper bone mineralization and growth retardation for 2 years. At the age of 5 years, his body height achieved 95 cm, body weight – 12 kg (these parameters being typical for a 3 year old boy). At this time – the skeletal age was estimated at 3 years.

The analysis of metabolic parameters of this boy made it possible to diagnose distal RTA. The correction of metabolic disturbances gave a very good clinical effect – an increase of body height (1 cm/2 months) and the acceleration of bone tissue mineralization.

P064. BONE MINERAL STATUS IN PATIENTS WITH CELIAC DISEASE: INFLUENCE OF GLUTEN FREE DIET

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Aim: The aim of the study was the assessment of bone mineral density (BMD) in patients with celiac disease depending on gluten free diet compliance.

Materials & Methods: 59 patients (40 girls, 19 boys) aged 10-20 years with celiac disease, diagnosed according to the ESPGAN criteria. Patients were divided into 3 groups: 1- strict gluten free diet, 2-not entirely compliant i.e. faults in gluten free diet 1-2 times per week 3- gluten free diet not followed. Daily calcium (Ca) intake and physical activity was assessed. BMD of the lumbar spine L2-L4 was measured by dual-energy-X-ray absorptiometry with the LUNAR DPX-IQ. Physical development was assessed by anthropometric measurements: growth and weight.

Results: Gluten free diet was strictly followed by 16 (27%) patients (group 1), group 2 consisted of 23 (39%) patients. Diet was not followed by 20 (34%) patients. 35 (59%) patients had a low Ca intake and in every group they made up the majority of

patients. High physical activity was declared by 35 (59%) patents. No statistically significant differences in BMD were found between group 1 and 2 (mean Z-score in group 1 = –0.18, group 2 = –0.14). BMD was lower in group 3 (Z-score = –1.57) in comparison with group 1 (p = 0,01) and group 2 (p = 0,003). BMD was higher in patients with a high Ca intake (p = 0,002). Physical activity had no significant influence on BMD. There was no statistically significant difference in physical development between the groups.

Conclusions: BMD was lower in patients who were not compliant to the gluten free diet, occasional faults in the diet had no influence on the BMD. Only few patients with celiac disease strictly followed the gluten free diet.

P065. BONE MASS, BONE TURNOVER MARKERS, CALCIUM, PHOSPHORUS AND MAGNESIUM METABOLISM IN CHILDREN TREATED FOR ACUTE LYMPHOBLASTIC LEUKEMIA

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The putative cause of osteoporosis and osteopenia in children with acute lymphoblastic leukemia (ALL) before and after intensive chemotherapy has led us to assess mineral status.

In a cohort of 27 children treated for ALL: Bone Mineral Content (BMC) and Bone Mineral Density (BMD) of the upper extremity were measured by dual energy X-ray absorptiometry before and after the completion of intensive therapy. Blood and urine samples for calcium, phosphorus and magnesium concentration and blood samples for alkaline phosphatase bone-isoenzyme activity (ALP-b) and serum levels of type I carboxy-terminal collagen telopeptides (CTX) were collected.

At the time of diagnosis 51.9% of children showed a reduction in BMD and a 44.4% reduction in BMC. Before therapy hypocalcemia (9/27), hypomagnesemia (10/27) hypophosphatemia (7/27) and CTX content below age-matched ranges were observed. After intensive therapy the number of patients with abnormal BMD and BMC values rose significantly. Additionally plasma ALP-b activity rose compared with initial values. Urinary excretion of calcium, phosphorus within the upper population ranges and plasma electrolytes within the lower population ranges were evaluated. Reduced postchemotherapy CTX content correlated significantly with bone mass loss detected by densitometry. Almost 50% of children who participated in the study displayed bone mineral mass deficiency when first examined. This study indicates that the above alterations could originate from slower bone formation and faster bone resorption. These complex mechanisms at present, remain unclear but appear to be multifactorial and therefore, further examinations are required.

P066. CALCIUM-PHOSPHORUS METABOLISM AND BONE MINERAL DENSITY DISTURBANCES IN CHILDREN ON ANTIEPILEPTIC THERAPY

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Aim: To evaluate the long term effect of commonly used antiepileptic therapy on the selected parameters of calcium-phosphorus metabolism, 25-OHD metabolism and BMD in children and young adults with epilepsy. Furthermore, to estimate the correlation between generally measured parameters and ones reached only in scientific laboratories.

Patients and Methods: The study group comprised 50 patients – 26 male and 24 female, at a mean age of 14 y. (8–23 y), treated with antiepileptic drugs in the out-patient clinic. The group was divided in three subgroups: Group I: 17 subjects treated only with valproate (VPA), group II, 20 subjects treated only with carbamazepine (CBZ), group III, treated with more than one antiepileptic drug, including VPA and/or CBZ. In all patients serum levels of ionized calcium, total calcium, phosphorous, alkaline phosphatase, 25OHD and parathormone were measured. Additionally, total body and lumbar (L2-L4) spine BMD were measured. All results obtained were compared to laboratory norms.

Results: We observed a significant decrease in ionized calcium, alkaline phosphatase, 25OHD and parathormone level in each of the analyzed subgroups. Moreover we have found a significantly reduced lumbar spine BMD (L2-L4) and decreased level of alkaline phosphatase in the third analyzed subgroup. There was a significant correlation between ionized calcium and the 25 OHD level.

P067. DOES LEVOTHYROXINE (L-TX) TREATMENT REDUCE BONE MINERAL DENSITY (BMD) IN ADOLESCENT GIRLS WITH EUTHYROID GOITER?

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Bone and mineral metabolism is influenced by thyroid hormones. It has been suggested that long term L-TX treatment may reduce BMD and increased bone turnover. The purpose of this study was to assess the influence of L-TX treatment on bone mineralization and metabolism in adolescent girls. The effect of one year of L-TX treatment was studied in a group of 21 adolescent girls (SG) with euthyroid goiter (e.g.) at a mean age of 14,2 ± 1,8 years. Lumbar and whole body BMD (Lunar DEXA), Serum PTH, osteocalcin (OC), hydroxyproline (HP), bone alkaline phosphatase (bAPh), vitamin D3, Ca and P and urinary excretion of Ca and P were measured before and after one year of combined L-TX and iodine (100 mg/d) treatment. The initial L-TX dose (100 μg/d) was adjusted to keep TSH in normal-low and FT4 in the normal-high level. Results were compared to a control group (CG) of 22 girls matched for age, BMI and maturation status, treated with iodine only, in whom TSH and FT4 levels were normal during the whole study. Lumbar BMD increased significantly ($p < 0,001$) in SG (1,01 ± 0,2 g/cm^2 to 1,06 ± 0,16 g/cm^2) and in CG ($p < 0,01$) (1,05 ± 0,15 g/cm^2 to 1,1 ± 0,13 g/cm^2). Total BMC decreased significantly ($p < 0,001$) in the SG and CG (from 2296 ± 506 g to 2161 ± 403 g and from 2335 ± 427 g to 2177 ± 340 g respectively). Markers of bone turnover changed in a similar manner in both groups. In all girls there was a significant increase in PTH and significant decrease in OC, Vitamin D3 and P and no change in HP, Ca, bAPh serum levels as well as Ca and P urinary excretion. There was no significant difference between the SG and CG in respect to all the measured parameters. Conclusion: One year L-TX treatment of adolescent girls with no-toxic goiter does not have a negative impact on their bone mineralization and metabolism and their bone turnover is similar to girls treated with iodine only.

P068. THE ASSESSMENT OF THE AGE-RELATED CHANGES OF THE TRABECULAR BONE

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In this study different parameters currently applied to the description of trabecular bone architecture are compared. Histological sections collected from ten young (mean age 28.1 years, range 25 ÷ 33 years) and ten older (mean age 73.4 years, range 70 ÷ 77 years) individuals. The following methods of the descriptions of trabecular bone architecture were considered: histomorphometric analysis (BV/TV, asymmetry, mean trabeculae length), Euler characteristics, star volume of the marrow cavity, the mean distance between two points of the trabecular network and the probability of disconnection (is directly connected to the number of separated parts of the network). Highly significant correlations were demonstrated between bone density (BMD, BV/TV) and trabecular architecture (SV/GV, probability of disconnection). To quantify the sensitivity of the aforementioned parameters to the age-related changes the stochastic algorithm of trabecular bone remodelling was constructed. It was shown that for the young bone the density reacts most sensitively to the trabecular bone changes. For elder individuals (typically the 55–60 year old patient) the mean ratio of the star volume of marrow cavity to the geometrical volume of marrow cavity becomes the most sensitive parameter. For the oldest bone (patients older than 65 years) the disconnection probability reacts most sensitively to the age related changes.

P069. INFLUENCE OF SEXUAL AND PHYSICAL DEVELOPMENT ON STRUCTURAL-FUNCTIONAL STATE OF BONE TISSUE IN PRE- AND PUBERTAL GIRLS

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To study influence of sexual and physical development on structural-functional state of bone tissue (BT) we have examined 97 girls aged 10–16 years old (mean age −13,2±0,18 years; height −1,54±0,01 m; weight −45,6±1,3 kg). Quantitative evaluation of sexual development parameters was carried out using Tumilovych's method. The following anthropometric parameters were determined: chest volume (CV, sm), pelvic size (DSp – distance between anterior iliac spines, DCr – distance between sacral crests, DTr – distance between trochanters, sm). To evaluate structural-functional state of bone tissue (BT) the Achilles+ ultrasound bone densitometer was used (Lunar Corp., Madison, WI). Speed of sound spreading (SOS, m/sec), broadband ultrasound attenuation (BUA, dB/MHz) and Stiffness Index (%) were determined. Patients were divided into three groups: I gr. −39 girls of prepubertal age (mean age −11,7±0,22 years; height −1,46±0,02 m; weight −35,6±1,4 kg); II gr. – 33 girls of prepubertal age with disorders of menstrual cycle (mean age −14,0±0,2 years); III gr. – 25 girls with an established menstrual cycle (mean age −14,4±0,2 years). Appearance of menarche led to a considerable increase in physical development parameters: (height: I gr. −1,46±0,02 m; II gr. −1,59±0,01 m ; III gr. −1,59±0,01 m; weight: I gr. −35,6±1,4 kg; II gr. −51,4±1,8 kg; III gr. −53,6±1,7 kg; CV: I gr. −69,7±1,1 cm; II gr. −81,2±1,2 cm; III gr. −80,5±0,9 cm; DSp: 19,8±0,3 cm; II gr. −23,3±0,3 cm ; III gr. −24,2±0,3 cm; DCr: 22,4±0,3 cm; II gr. −25,6±0,2 cm; III gr. −26,3±0,3 cm; DTr: 25,1±0,4 cm; II gr. −29,0±0,3 cm; III gr. −30,1±0,4 cm), general number of permanent teeth (I gr. −23,6±0,7; II gr. −27,5±0,2; III gr. −27,1±0,3) and ultrasound characteristics of structural-functional BT state (SOS: I gr. −1570±3 m/sec; II gr. −1580±4 m/sec; III gr. −1587±5 m/sec; BUA: I gr. −98,2±1,3 dB/MHz; II gr. −107,0±1,8 dB/MHz; III gr. −112,1±2,5 dB/MHz; IS: I gr. −85,3±1,1%; II gr. −93,8±1,8%; III gr. −99,0±2,5%). Unlike parameters of physical development, SI of girls belonging to III gr. has a shown varitable increase compared to II gr. ($p < 0,05$). Girls having pathological establishment of menstrual function and late menarche make up a risk group for osteoporosis. They need constant densitometric control (once or twice a year) and respective treatment and prophylaxis (Calcium, Vitamin D metabolites, exercise therapy etc.).

P070. IMPACT OF INCREASEDFLUORIDE CONCENTRATIONS IN WATER ON BONE TISSUE FUNCTIONAL STATE, TEETH, ANTHROPOMETRIC PARAMETERS AND PHYSICAL DEVELOPMENT OF TEENAGERS

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The aim of this research is to study structural-functional state of bone mass, teeth, state of factual feeding, anthropometric parameters and physical development of children and teenagers residing in regions with high Fluoride content in water. 103 children, aged 10–15 years (48 boys and 55 girls) from the residential areas A, B and C where Fluoride content in environment was increased were inspected during the study. It was discovered that the Fluoride level in the water of towns B and C was 2–5 times higher than normative, and in local wells the level differed within bounds of residential area. Lower level of calorie content, insufficient protein consumption and low level of microelements, unbalanced consumption of carbohydrates and fats characterize a daily ration of teenagers from all towns. The excessive F concentration in water (max – up to 3,51 ml/l in town C) leads to development of dental fluorosis, frequency and degree of which depends on Fluoride level in drinking-water, on the background of normal indexes of structural-functional state of bone tissue. For children residing in region with increased Fluoride content in drinking-water delay of physical development of boys and disharmonious physical development of girls are rather typical. The anthropometric examination of children revealed particular somatotypes of children from different towns, but to study them would be the task of further investigations. The increased Fluoride content in water negatively influences peak bone mass formation and physical development as well as dental state and calls for arrangements of primary and secondary prophylaxis of ?steoporosis and fluorosis.

P071. EXAMINATION OF INTER DEPENDENCE BETWEEN TYPES OF BONE BODY STRUCTURE AND THE CHOSEN ANTROPOMETRIC INDICATORS OF NUTRITIONAL STATE ASSESSMENT

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Purpose: to estimate the influence of the body bone frame on the value of chosen anthropometric indicators, which enables a more detailed assessment of obesity in the context of the threat of osteoporosis.

Subjects: Participants included: males (n = 1441) and females (n = 1406), 19–28 years of age.

Methods: anthropometric measurements carried out defined body weight, height, wrist width, sum of skin folds, according to which fat content in body was described according to Durnina & Wormsley and indicated BMI. The base of body build diversity was a wrist width diameter. Three categories of bone body frame size were created (small, medium, large) to which a correlation to BMI values and chosen anthropometric parameters was examined.

Results: statistic analysis carried out has shown a significant diversity in basic values of basic anthropometric parameters and BMI among people of varied body frame categories. After the three categories of body build were devised the elevation of correlation index between BMI and body consistence estimation parameters was noticed.

Conclusions: the conducted examination has shown the influence of body bone frame on the value of the chosen anthropometric indicators, which enables a more detailed assessment of obesity in the context of the threat of osteoporosis.

P072. THE USE OF A DIAGNOSTIC QUESTIONNAIRE IN ASSESSMENT OF CALCIUM INTAKE

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The inadequate consumption of calcium in childhood and the adolescent period deems it difficult to attain peak bone mass and is one of the factors favouring the development of osteoporosis. Accessible, precise methods of estimation of consumption of nutrients, including calcium, are usually labour-consuming and expensive.

Therefore, the aim of this study was to find an easy, inexpensive and satisfactorily precise diagnostic test as a tool to quantitatively estimate the consumption of calcium, intended to be use in epidemiological research. In our research there was agreement in the estimation of consumption of calcium obtained by means of our diagnostic test compared with the 24-h recall method, repeated in 7 successive days.

The study was carried out among 21 subjects, university students in Olsztyn, aged 21–22 years. Data obtained from diagnostic test, relating to quantity and weekly frequency of consumption of 11 milk products, and accepted indices of consumption frequency, led to the assessment of average consumption of calcium/person/day. In comparison the average consumption of calcium from milk products, obtained by the 24-h recall method was used. The T test and coefficient of linear correlation (r) at p ⩽ 0.05 in statistical analysis was used.

There were no differences in consumption of calcium between the data from the diagnostic test and the 24-h recall method (women p=0.156; men p=0.684). Average consumption of calcium in the diagnostic test in comparison to that of 24-h recall method was higher in males by about 4% (1023±255.4mg vs. 982±310.4mg; r=0.74), and in females about 23% (664±322.6mg vs. 538±226.8mg; r=0.28).

The results show the satisfactory use of the diagnostic test as a straight tool to quantitatively estimate calcium consumption and encourage further investigation in this area.

P073. ASSESSMENT OF RELATIONSHIP BETWEEN MELATONIN SECRETION AND BONE TISSUE METABOLISM IN OBESE PRE AND POST MENOPAUSAL WOMEN

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It has been recently suggested that changes in secretion of melatonin (Mel) seen in obese women may be of importance in regulating bone mass loss following menopause. The purpose of the undertaken study was to investigate whether, and to what degree, changes in nocturnal levels of Mel in obese women of pre- and postmenopausal age influence bone tissue metabolism as assessed by serum/plasma level of recognized markers of bone turnover (ALP, BGP, PICP and ICTP). The study comprised 29 women of childbearing age, including 16 obese (BMI 42 ± 6.12 kg/m^2; WHR 0.88 ± 0.05) and 13 with normal body mass, and 30 post menopausal women, among them 18 were obese (BMI 45 ± 7.03 kg/m^2; WHR 0.86 ± 0.06) and 12 with normal body mass. A significant lowering of the nocturnal level of Mel was demonstrated for all obese women, as compared to appropriate controls. This change was accompanied by a considerable increase in the level of the investigated markers of bone metabolism. The increase was more pronounced in the case of resorption markers. A statistically significant, inversely proportional relationship was found between nocturnal levels of Mel and those of investigated markers. Changes in the nocturnal levels of Mel were less pronounced in obese women post menopause than in obese women of childbearing age; the changes were accompanied by less abnormalities in the level of investigated

markers of bone turnover, especially those of bone resorption. A stronger correlation of changes in nocturnal levels of Mel and values of ALP, BGP, PICP and ICTP demonstrated for postmenopausal obese women, as compared to obese women of childbearing age, suggests that changes in the Mel level may have a protective effect against bone mass loss following menopause.

P074. BODY MASS INDEX, CONCENTRATION OF INSULIN LIKE GROWTH FACTOR –1 AND BONE MINERAL DENSITY IN WOMEN IN THE POSTMENOPAUSAL PERIOD

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Insulin like growth factor –1 (IGF –1) possess a direct influence on the bone remodelling unit, therefore it takes part in the regulation of bone metabolism. A higher body mass index (BMI) is considered a bone protective factor. The aim of the study was to evaluate the correlation between bone mineral density (BMD), serum IGF 1 level and BMI in postmenopausal women.

38 women were admitted to the study. The concentration of serum IGF 1 was evaluated. BMD was evaluated by the DEXA method in the lumbar spine. We assessed the correlation between BMD, concentration of IGF 1 and time after menopause.

There was a positive correlation between time after menopause and bone mineral density ($p. < 0,05$) and a positive correlation between the serum IGF 1 level and BMD ($p < 0,05$). There was no correlation between BMD and BMI (p=0,053).

Conclusions: After menopause BMD decreases, lowered level of IGF 1 is correlated with lower BMD and poses a more prognostic value in predicting lower bone mineral density.

P075. CHANGES IN HORMONAL PROFILES AND BONE MASS DENSITY IN WOMEN WITH UTERINE FIBROIDS TREATED WITH TRIOPTORELIN

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The GnRH-analogues induce hypogonadism through pituitary desensitization, down regulation of gonadotropin receptors and decrease in gonadotropin blood level, suppression of ovarian steroid secretion leading to amenorrhea. These drugs are used in treatment of uterine fibroids.

The purpose of the study was to determine the hormonal profile and bone density in women with uterine fibroids during 12 months treatment with trioptorelin (Decapeptyl depot®-Ferring).

Materials and Methods: 14 women of premenopausal age (34-47 years, mean 42,67 ± 7,51 years) with ultrasonographically proven uterine fibroids. All patients received intramuscular injections of 3,57 μg trioptorelin every 4 weeks for 12 months. Before and after treatment hormonal profiles (FSH, LH, estradiol E_2 and prolactin PRL) were determined by Delfia-LKB kits and lumbar densitometry (Lunar DPX) was performed.

The results are shown in the table:

Parameter	Before treatment	After treatment	Statistically significant
BMD g/cm^3	1,056 ± 0,069	0,984 ± 0,046	$p < 0,05$
T-score	−1,034 ± 0,577	−1,622 ± 0,037	$p < 0,05$
Z-score	−0,792 ± 0,576	−1,308 ± 0,289	$p < 0,05$
FSH mIU/ml	8,22 ± 9,45	4,94 ± 2,81	ns
LH mIU/ml	8,45 ± 8,85	0,71 ± 1,27	$p < 0,05$
E$_2$ pg/ml	155,12 ± 154,82	26,96 ± 27,63	$p < 0,05$
PRL μIU/ml	169,51 ± 107,37	136,79 ± 94,17	ns

ns – not statistically significant

Bone density decreased after 12 months of treatment with trioptorelin by 6,0 ± 4,47%.

Conclusions: 1. Lutropine (LH) and estradiol (E_2) plasma concentration decreased significantly after the treatment with trioptorelin (GnRH analogues) 2. Twelve months treatment with trioptorelin leads to a statistically significant decrease in bone mineral density in the lumbar region.

P076. EVALUATION OF BONE MINARAL DENSITY AND NEOPLASM PROGRESSION AND IN PATIENTS WITH ADVANCED PROSTATIC CARCINOMA TREATED WITH 1-α VITAMIN D$_3$ AND CLODRONATE

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A complete androgenic blockade used in the treatment of advanced prostate carcinoma may result in bone mass loss and an increased number of bone fractures. Active metabolites of vitamin D inhibit the proliferation of neoplastic cells and restrain angiogenesis. Bisphosphonates, inhibiting bone resorption and reducing the release of growth factors from bone tissue, can retard the development of bone metastases.

The purpose of the study was to assess whether 1α-OH vitamin D$_3$ and clodronate are able to retard the progression of prostate carcinoma and bone changes induced by androgenic blockade.

73 patients with advanced prostate carcinoma, with skeletal metastases, treated with orchidectomy and flutamide were examined for at least 12 months. 26 of the patients were additionally given 1α-OHD$_3$ in a dose of 0,5 μg/d and CaCO$_3$ in a dose of 1g daily, while 22 patients were treated with the same drugs and clodronate in a dose of 1600 mg daily. Carcinoma extent was determined with USG, biochemical analyses (PSA, acid phosphatase, PAP) and with skeletal scintigraphy. BMD was measured by means of DXA and bone turnover with biochemical markers of bone resorption and formation processes.

It was found that treatment with 1α-OHD$_3$ and CaCO$_3$ decreased the loss of bone mass in the lumbar spine and proximal femur, while therapy with clodronate resulted in an increase in BMD in the evaluated regions of the skeleton. Starting from the 6th month of therapy serum Ca and P concentrations were higher in patients treated with 1α-OHD$_3$ and CaCO$_3$ compared to other groups of patients. Serum alkaline phosphatase activity decreased in all groups of patients, while urine calcium that increased in patients with a complete androgenic blockade was reduced by clodronate therapy. Serum acid phosphatase, PAP and PSA decreased promptly in all groups of patients indicating inhibition of neoplasm progression with the treatment used.

P077. EFFECT OF BONE MINERAL DENSITY AND MICROSTRUCTURE OF LUMBAL VERTEBRAL BODIES ON THEIR COMPRESSIVE STRENGTH

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Prediction of vertebral body compressive strength is very important for determination of fracture risk in the spine. Bone mineral density is widely used as an indirect method for estimation of this parameter.

However, some clinical observations indicate a rather poor relation between BMD and occurrence of compression vertebral fractures. Similarly, bone micro-structure, especially its trabecular configuration, is postulated to be one of the decisive

factors for determining its mechanical properties. The main goal of this study has been the comparison of compression strength estimated using both methods described above with the apparent compression strength determined on cadaveric vertebral bodies. An especially high correlation with bone compressive strength was for length of branches and trabecular bone volume (R=0,90). This correlation for BMD was indeed lower (R=0,48).

P078. THE EFFECT OF PROLONGED BISPHOSPHONATE TREATMENT ON BONE ESTIMATED BY SCINTIGRAPHY AND RADIOGRAPHY

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Bisphosphonates as potent inhibitors of bone resorption are widely used to prevent bone loss associated with various bone diseases. The aims of our study were to determine: 1) the retention of ^{99m}Tc-MDP in dogs treated with different bisphosphonates, 2) the frequency of spontaneous fractures in these dogs shown by bone scans and radiography. Mature female beagles (n=38) were assigned into 5 groups receiving: 1) Etidronate (EHDP) 0.5mg/kg/day s.c., 2) EHDP 5.0mg/kg/day s.c., 3) Risedronate 0.5mg/kg/day p.o., 4) Alendronate 1.0mg/kg/day p.o., 5) Control – saline s.c. for 12 months. Skeletal radiographs of the lumbar spine, pelvis, ribs in ventro-dorsal and lateral views were obtained at baseline and after 7 and 12 months of treatment. Bone scans with semiquantitative body retention studies were performed after 7 and 12 months of treatment. The scans were obtained 5 minutes, 3h and 24h after i.v. injection of 8-10mCi of ^{99m}Tc-MDP. Regions of interest (ROI) were placed over the T_1–T_4 vertebrae in the posterior projection. Retention of the tracer was calculated at 3h and 24h, and expressed as a percentage of activity found at 5 minutes after injection. Counts were corrected for radionuclide decay. Lateral images of the thorax and posterior images of the pelvis were obtained 3 hours after injection. Focal areas of increased uptake in bones were considered to be fractures. Bone scan results were compared with radiographs.

Semiquantitative study revealed decreased retention of ^{99m}Tc-MDP in two groups of dogs treated with EHDP after 7 months of treatment. Retention of radionuclide tracer after 12 months of treatment was decreased in all dogs receiving bisphosphonates in comparison to the control group. Bone fractures were found only in the group of dogs treated with the higher dose EHDP. During the 7th month of treatment bone scans revealed 22 rib fractures in all of these dogs. Radiographs revealed 13 (59%) of the 22 fractures. During the 12th month of treatment bone scans revealed 48 rib fractures only in dogs receiving the higher dose EHDP. At that time radiographs revealed 43 (89%) of the 48 fractures.

In conclusion: dogs treated with bisphosphonates showed decreased retention of tracer indicating a significant influence of bisphosphonates on bone turnover and mineralization. Multiple rib fractures were found only in the group treated with the higher dose of EHDP. Bone scintigraphy in dogs undergoing prolonged treatment with bisphosphonates was far more sensitive than radiographs in detecting fractures.

P079. EVALUATION OF BONE MINERAL DENSITY AROUND PROSTHESIS ELEMENTS AFTER TOTAL HIP ARTHROPLASTY

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Total hip arthroplasty is the most frequently used operative procedure for coxarthrosis and femoral neck fracture treatment.

The fundamental problems are planning of the operative procedure, prognosis of outcome (result prognostication) and early detection of complications. The densitometric examination around a steam and a cup of the prostheses is a modern method which allows precise analysis of bone mineral density (BMD) marked in numerical values (g/cm^2). Bone mineral density was measured in 33 patients, of these 24 patients had primary cemented total hip arthroplasty and 9 patients had revision hip arthroplasty. In the studied group there were 27 females and 6 males, aged 45–84 years. BMD was evaluated using the DPX-IQ densitometer with 'Orthopedic hip' software. In all patients BMD was estimated around the steam of prostheses in Gruen's zones, but in 3 cases in the so-called broadened Gruen's zones. In 9 cases with the application of the Manual option, bone mineral content was determined in Charlney-Lee zones in the acatabulum (cup). The densitometric examinations were performed before hip arthroplasty, and 6 weeks, 3 months, 6 months and a year after arthroplasty. The observation period was from 9 months to 3,5 years (av. 21,5 months). We found an initial decrease of about 13-25% in density in all Gruen's zones, mainly in first and seventh zones, especially between 3–6 months, but in the following controls we observed a normalisation of BMD. In the remaining zones of the steam and cup there were no important changes of BMD. During preoperative examinations in cases of revision hip arthroplasty we observed statistically significant differences in BMD in the loose zones compared to zones without osteolysis.

In spite of a short period of observation, the results of our study show the usefulness of bone densitometry in both preoperative planning and outcome prognosis of hip arthroplasty.

P080. EVALUATION OF BONE MINERAL DENSITY AROUND CEMENTLESS HIP PROSTHESIS WITH PROXIMAL HYDROXYAPATITE COATING

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Within 7–10 years following surgery of the stems of hip prostheses fixed with cement become loose in 20% of patients. The purpose of the study was to determine, by means of dual energy X-ray absorptiometry, whether the application of cementless, hydroxyapatite coated ABG prostheses prevents bone mass loss next to their stems.

110 patients (67 women, 43 men) aged 21-69 years, were examined prospectively for at least 12 months. 89 patients completed 2-years, and 56 a 3-year observation period. DXA scans were performed within 3 weeks after surgery and then after 3, 6, 12, 24, 36 months following the procedure. BMD was determined in both standard and Gruen zones. BMD of the lumbar spine and of the opposite proximal femur were measured every year and biochemical markers of bone turnover every 6 months.

It was found that within the first 3 months following surgery BMD around the stems of the ABG prostheses decreased by 2-9%. During the next months BMD had risen gradually and after 1-2 years approached the baseline values, except for the upper medial aspect of the femur where a progressive reduction in BMD was observed.

It was found, that a decrease in BMD was significantly more pronounced in patients with higher bone turnover. An increase in BMD observed in the subsequent period was greater in men than in women as well as in patients with lower initial BMD values around the prostheses. Changes in BMD around the prostheses positively correlated with patients' weight and height while they were independent of the changes in BMD in other parts of the skeleton.

P081. MODELLING OF BIOLOGICAL ACTIVITY OF TNFα AND ITS SOLUBLE RECEPTORS IN RHEUMATOID ARTHRITIS

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The presented study proposed the application of non-linear dynamics and computer simulation to modify an approach of the biological role of TNFα; and its soluble receptors. The aims of the study were as follows: 1/ to assess the dynamics of time dependent variations of TNFα and its soluble receptor concentration in plasma in rheumatoid arthritis (III[0]), 2/ to search for rules regulating the fluctuation (usually non-linear and dynamic) of these parameters, 3/ to determine the velocity of these processes applying characteristic coefficients defining time-dependent changes of the TNF system, 4/ to describe the correlation between TNFα and sTNF-Rs concentration using non-linear differential equation, 5/ to devise a mathematical model of fluctuation in time of the cytokine and soluble receptors in analysed diseases. Mathematical modelling was based on clinical measurements of the concentration of both TNF and soluble receptors in 45 patients with rheumatoid arthritis (III0).

Dynamic mathematical models were presented in the order of three non- linear differential equations, which regards rapid time-dependent changes in the number of TNF secreting cells, serum levels of TNF and sTNF-Rs fluctuations. The obtained data led to the following conclusions: 1/ Elevated values of serum TNF concentration of its soluble receptors in rheumatoid diseases, 2/ Application of the order of three differential equations in order to perform prognostic analysis of variations of cytokine serum concentration and its soluble receptors in the course of rheumatoid arthritis lead to the creation of a mathematical model which illustrates dynamic and non-linear fluctuation in time base, 3/ The analysis of obtained solutions makes it possible to conduct a theoretical and clinical verification of this data, and moreover can be a vital factor in medical prognosis of survival time.

P082. CORRELATION BETWEEN CLINICAL, RADIOLOGICAL AND ULTRASONOGRAPHICAL IMAGE OF KNEE JOINTS IN CHILDREN WITH HAEMOPHILIA

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The aims of the study were to evaluate the clinical, radiological and ultrasonographical images of knee joints in children with severe haemophilia and von Willebrand's disease, to determine the correlation between these images and to assess the usefulness of ultrasonography (USG) in evaluating the intensity of haemophilic arthropathy. Thirty-nine boys were included in the study, all had a past history of knee bleeding. The average age of the children was 10,02±3,01 years. In patients with slight radiological changes in bones of the knee joint (1–3 points) and moderate changes (4–7 points), an increase in synovial fluid, considerable hypertrophy and inflammation of the synovium were observed on USG. In haemophilic patients with severe bone changes (8 - 13 points) fluid amount was usually normal and there was slight inflammation but considerable hypertrophy of the synovium. Radiological evaluation of haemophilic arthropathy was made according to the Pettersson et al. classification. A positive correlation between the degree of cartilage damage on USG and the progression of bone changes in radiographs was found. Cartilage and bone damage progressed with the increase in number of intraarticular haemorrhages into the knee joint . In our opinion USG is useful in evaluating fluid, synovium and cartilage of joints in haemophiliacs.

P083. DENTAL STATE IS NOT RELATED TO LOW BONE MASS IN ADOLESCENTS

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Teeth are the most mineralised tissue in human body. There is no published data about the connection between state of dentition and bone density in adults and adolescents. The aim of the study was to estimate the state of dentition in relation to bone mineral status in adolescents.

Materials and Methods: 123 healthy subjects (80M, 43F) aged 14–19 y (mean age: 16,4 y), ranged between 3rd and 97th percentile for body weight and height underwent a clinical examination by a dentist. Dental status was assessed using DMF (decayed + missed + filled) for each person, as well as the presence of malocclusion. Dental hygiene based on a 3-stage score and consumption of sweets/candies were also investigated. In all subjects, anthropometric measurements (height, weight, Body Mass Index) and assessment of pubertal stage according to Tanner were performed. Densitometric evaluation was carried out by means of dual-energy X-ray absorptiometry (DEXA) with the DPX-L densitometer (LUNAR) in the total body and lumbar spine (AP L2-L4) for quantitative assessment of bone mineral density (BMD). Statistical analysis based on the Wilcoxon and U Mann Whitney test.

Results: A positive correlation was found for DMF and chronological age (r=0,2 p=0,03) and Tanner stages in boys (r=0,26 p=0,03) but not in girls. There was no statistical association between DMF and BMD. Appearance of malocclusion was associated with a lower total BMD in the studied group (r = −0,24 p=0,008). Frequent and excessive consumption of sweets showed a substantially significant connection with higher body weight and, especially, higher value of BMI (r=0,29 p=0,001) but it correlated negatively with Total BMD (r=–0,21 p=0,03) and Spine BMD (r=–0,26 p=0,004).

Conclusions: State of dentition based on DMF calculation does not show significant association with total bone mass and lumbar spine density in the postpubertal group. Adolescents with malocclusion should be qualified to the risk group of lower skeletal mass. Excessive consumption of sweets among adolescents seems to be one of numerous factors threatening osteopenia.

P084. PANORAMIC-BASED MANDIBULAR INDICES IN RELATION TO MANDIBULAR BONE MINERAL DENSITY (BMD) AND SKELETAL OSTEOPENIA ASSESSED BY DUAL-ENERGY X-RAY ABSORPTIOMETRY (DXA) AND QUANTITATIVE ULTRASOUND (QUS)

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The panoramic-based indices (Mandibular Cortical Index-MCI, Panoramic Mandibular Index-PMI, Mandibular Ratio-MR) were used in a group of 36 healthy, postmenopausal, edentulous women (mean age 60.4 +/- 6.9 y.) to determine whether they correlate with BMD [g/cm^2] of the mandible and hip, and with ultrasound parameters of the calcaneus and phalanges. Basing on MCI women were divided into 3 subgroups (C1,C2,C3). BMD of the hip (neck-BMD, Wards-BMD, troch-BMD; CV% = 2.5%) and mandible (m.-BMD; CV% = 2.06%) were measured by DXA. QUS of the calcaneus using Achilles (Speed of Sound-SOS[m/s]CV% = 0.22%; Broadband Ultrasound Attenuation-BUA [dB/MHz] CV%=1.8%; Stiffness Index-SI [%]) and the phalanges (amplitude dependent speed of sound-Ad-SoS [m/s]; CV% = 0.64%) using the DBM Sonic 1200 were measured. All parameters decreased in

subgroups from C1 to C3 with the most significant or borderline significant differences between the C1 and C3 subgroups. MCI correlated positively with age and negatively with PMI, m.-BMD, Wards-BMD and Ad-SoS, while PMI and MR did not correlate with any skeletal parameter except for a correlation of PMI with m.-BMD.

In conclusion: MCI is able to distinquish normal and osteopenic postmenopausal edentulous women. It correlates significantly with DXA and QUS measurements of mostly cortical bones. Subjects classified into cortex group C3 have a higher tendency to be osteoporotic than subjects classified into cortex groups C1 or C2. Positive agreement between two observers confirms the diagnostic efficacy of MCI in clinical practice. PMI and MR should not be used as indicators of skeletal status in a population of postmenopausal edentulous women. They do not correlate significantly with skeletal osteopenia, although they reveal a tendency to decrease in subgroups C1–C3 of the mandibular cortex, just as skeletal parameters measured by DXA and QUS.

P085. DIGITAL ASSESSMENT OF TRABECULAR STRUCTURE OF THE MAXILLARY BONES AFTER APPLICATION OF CHOSEN BIOMATERIALS IN PATIENTS WITH PERIODONTAL DISEASES

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Periodontal diseases quite often lead to bony defects. Radiological assessment of defect healing after filling with biomaterials is difficult. In this paper the possibility of using a digitalized reading of the trabecuar structure is introduced. In 20 patients aged 32–55 years in whom vertical defects were evident as a result of periodontal disease were treated surgically. Selected biomaterials were inserted into the bone defects. The reason for surgical treatment was to improve the quality and reconstruct the bone structure damaged by the inflammatory process.

The following graft materials were used: – a mixture of β-TCP (Tricalcium phosphate) with HA-p (hydroxyapatite) – bioglass.

An intraoral radiological examination using the Cieszyński isometric method was carried out before grafting and again after 12 months. The radiograph images were digitalized, saved as bitmaps in a 256 gray scale, after which they were subjected to the 'Trabecula' program algorithm at pre-selected parameters. In order to establish a qualitative assessment of the regenerated bone structure, the radiological trabecular definition according to Czerwiński was used.

The obtained qualitative and quantitative results proved the usefulness of undertaken surgery and also that the feasibility of the outlined diagnostic method which allows for an objective assessment of efficacy of treatment.

P086. EVALUATION OF SELECTED PARAMETERS MEASURED ON THE PANORAMIC RADIOGRAPHS AT POSTMENOPAUSAL WOMEN

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Osteoporosis and as a consequence pathological bone fractures are a serious health problem of the today's world. The aim of this study was to evaluate if the image of the mandible obtained by panoramic radiographs may contribute to early determination of the risk of this disease. The examination was carried out in 55 women aged 51–69 years. The group consisted of female patients, in whom due to the long lasting process of osteoporosis, had a pathologic fracture of the distal radius. The control group consisted of women who were volunteers and agreed to be examined. Density of bone tissue within the calcaneal bones (ultrasonic technique). In these female patients panoramic radiographs were taken. The compacted substance of the base of the mandible was bilaterally radiologically assessed distally from the mental foramen. Depending on the morphology of the compacted substance the values of the MIC index was determined. The value of the PIM index was calculated. The results of the study were statistically analyzed. Significant differences were indicated in the parameters which are derivatives of bone density and also statistically significant differences in the value of the MIC (grade) index in both groups Conclusions: The studies proved this useful application of the quantitative ultrasonographic method in women in the postmenopausal period to evaluate bone density. Very thorough analysis of the panoramic radiographs, although it is not an infallible method, may prove an important, auxiliary tool to determine the risk of osteoporosis. The studies confirmed the necessity of close co-operation between the dentist and other physicians. The dentist, who often fulfils the role of the 'first contact physician' must demonstrate an interdisciplinary knowledge, also in respect to the problems connected with general osteoporosis.

P087. NEW APPROACHES TO THE PATHOMECHANISM OF COMMON JOINT DISEASES. DIRECT IN VIVO OBSERVATION OF SYNOVIAL MICROCIRCULATION IN THE KNEE JOINT ALLOWING FOR VALIDATION OF PHARMACOLOGICAL THERAPY

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Microvascular disturbances play a significant role in the pathophysiology of various diseases affecting joints. An increased network of synovial capillaries with its congestion, and increased water and macromolecule extravasation could be observed, reflecting the severity of pathological process proceeding in the affected joint. An animal model for the investigation of the microcirculation in synovial tissue is presented.

Materials and Methods: The mouse knee was immobilized in the special observation chamber in slight flexion, and Hoffa's fatty body was exposed by circular skin excision with release of patellar tendon. Using an intravital microscopy technique, blood capillaries as well as leukocyte attachment to the postcapillary venule endothelial cells were observed after intravenous injection of FITC-dextran (150kD) and rhodamine – 6G. Observations visualized a dense, honey-like network of blood capillaries, containing some postcapillary venules and a few arterioles. Using a computer-assisted analysis system the numerical parameters of micorcirculation like functional capillary density, vessel diameters, the velocity of blood flow, extravasation index, and number of slowly rolling as well as sticking leukocytes were observed.

Results: The presented model allowed observation of changes in synovial circulation giving a result in numerical data of its parameters representing blood perfusion, the net volume of blood flow, and macomolecular extravasation.

Conclusions: The evaluated model allowed for the quantitative observation of microvascular parameters in the synovial tissue

under laboratory conditions. The presented model could be used for investigation of changes in the microcirculation in acute or chronic joint inflammations. It could also be used in validation of various treatment modalities in inflammatory articular diseases.

P088. EVALUATION OF THE KNEE JOINT WIDTH ON THE BASIS OF COMPUTER AIDED IMAGE ANALYSIS OF RADIOGRAMS

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The aim of the study was the evaluation of an objective and automatic method of evaluation of the knee joint which could be applied in clinical practice.

As material for the experiment radiograms of knee joint taken in the standing position were taken. The radiograms were digitized at a resolution of 254 dpi using the HP ScanJet 6100C scanner equipped with an adapter for scanning transparent materials. Next, the obtained files were analyzed using the special Aphelion v. 3.0. software for image analysis.

The core of experimental work was the introduction of a new method of analysis, eliminating the drawback of the previously demonstrated one. The algorithm currently used is significantly less sensitive to the local non-homogeneity of the radiogram and, consequently, the results obtained can be used in clinical practice.

The preliminary analysis of the results obtained and their comparison with the results of manual measurements confirm the correctness of the method proposed.

P089. CLINICAL EFFICACY AND TOLERABILITY OF GLUCOSIMINE SULFATE (ARTHRYL) IN TREATMENT OF GONARTHROSIS

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Anabolic and anti-catabolic characteristics of the glucosamine sulphate (GS) shown in phase I and II experimental studies have led to the commencement of several clinical trials aimed at treatment of osteoarthrosis. The aim of this paper was to gather own experience and assessment of tolerability and clinical efficacy of SG. The study covered 35 female patients with mild and moderate gonarthrosis, their mean age was 58,5 years with pain symptoms on average of 7,6 years duration.

Patients received 1 sachet containing 1500mg of SG for 6 weeks. At the beginning of the trial, after 6 weeks and after 3 months following treatment termination tolerability and efficacy was assessed. In spontaneous pain intensity, palpable pain and pain during movement were assessed using Likert's and VAS scales. There was a significant reduction in symptoms observed at the end of treatment, in comparison to the beginning of the study and this effect was sustained at 3 months following termination of treatment. A statistically significant improvement was also observed in quality of life measured using Lesquesne's pain-performance test both at 6 weeks and 2–3 months after termination of the treatment. The mean time for 25 m walk on a flat surface was reduced during the same period in the majority of patients. The subjective assessment of treatment efficacy showed improvement in 32 patients and according to the attending physician in 34 patients. The number of paracetamol tablets used during SG treatment was also significantly lower. The observed tolerability of the formulation was also good.

P090. BILATERAL OSTEOCHONDRITIS DISSECANS OF THE KNEE FROM THE DEPARTMENT OF ORTHOPEDICS AND TRAUMATOLOGY, MILITARY HOSPITAL WROCLAW, POLAND

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In our department, 24 patients (4 women and 20 men) AT A mean age of 22,5 (16–36) years, were diagnosed and treated with osteochondritis dissecans of the knee between 1996 to 2000. A bilateral lesion was found in 6 patients (6 men) at a mean age of 18,5 (16–24) years. All patients were diagnosed by arthroscopy and treated by chondroplasty. Osteochondritis dissecans in 5 patients was located in the medial femoral condyle, and in 1 patient in the lateral femoral condyle. Radiological examination of the contralateral knee in these patients, showed osteochondritis dissecans in the same condyles.

In a follow-up of 2months to 4 years (average 1,5 years), 2 patients had recurrent exudates, limited range of motion, occasional pain of the knee. Operative methods and follow-up were presented.

P091. THE POSSIBLE FAULTS IN MICROSCOPIC EXAMINATION OF CRYSTALS IN SYNOVIAL FLUID SEDIMENTS

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The examination of synovial fluid (SF) under compensated polarised light is of great value in identification of crystals and diagnosis of crystal induced diseases. Unfortunately some other particles may incidentally contaminate SFs during aspiration and examination . These artefacts can mimic the crystals and become the reason of misdiagnosis.

The aim of our study was to document the similarities between crystals and some other particles.

We have observed a similarity between:

MSU crystals and	– Cotton, cellulose fibres
	– Cover slips fragments
	– Large lipid crystals
CPPD crystals and	– Corticosteroids
	– Talc particles
	– Small lipid crystals
	– EDTA

Hydroxyapatite crystals and – cellulose and cotton fibres.

All the results will be presented as photographs. We conclude that the identification of crystals in wet specimens of SF demands careful differentiation with other particles.

P092. POLYMORPHISM OF CHOLESTEROL CRYSTALS IN SYNOVIAL FLUID

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The aim of the study was to evaluate the frequency of cholesterol crystal occurrence in synovial fluid (SF) in rheumatic diseases as well as characteristics of crystals.

We studied 1000 synovial fluid samples from 854 patients. The most numerous was the group of rheumatoid arthritis (RA) (573 cases) and osteoarthritis (OA) patients (281). Synovial fluids were taken on heparin as an anticoagulant. SF sediments were examined under polarized microscopy.

Cholesterol crystals were demonstrated in 16 samples taken from 7 patients with RA only. Most of the crystals occurred as typical large flat rectangular or rhomboid plates. They ranged in

size from 8 to 100 um and they showed strong birefringence with negative or positive elongation. Less frequently, they appeared as long rods or curved needle-shaped crystals.

The results showed a rare occurrence of cholesterol crystals in synovial fluid samples. Polymorphism of cholesterol crystals under polarised microscopy may be a cause of difficulty in synovial crystal differentiation.

P093. THE RESULTS OF SYNOVIAL FLUID ANALYSIS AFTER CHEMICAL SYNOVECTOMY

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The chemical synovectomy-intraarticular injection of obliterating substances is an effective alternative to operative synovectomy. One of the agents used for chemical synovectomy is Varicocid. The aim of our studies was to evaluate synovial fluid (SF) constituents after application of Varicocid.

Synovial fluids were obtained from 47 rheumatoid arthritis patients with recurrent effusions in knee joints before and after chemical synovectomy. The SF physicochemical characteristics, cell count and cell identification as well as serological studies were performed. Moreover, microscopic examination of paraffin-embedded specimens taken from the pellets of SF, stained with haematoxylin and eosin was performed.

The studies yielded an increased protein level as well as cell count and PMN percentage in SF after synovectomy in comparison to with the first examination. Abundant masses of destroyed synovium and cartilage fragments appeared in sediments.

Our results confirm that administration of Varicocid has caused a 'true' synovectomy. It remains unclear if multiple cartilage fragments in SF were released from the inflamed synovium or if they appeared as a result of a direct lesion of cartilage by the therapeutic agent.

P094. ACTIVITY OF N-ACETYL-β-HEXOSAMINIDASE AND ITS ISOENZYMES IN RHEUMATOID AND OSTEOARTHRITIC FLUIDS

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N-acetyl-β-hexosaminidase (HEX) releases N-acetylhexosamines from the non reducing end of glycoproteins, glycolipids and proteoglycans. N-acetylhexosamines are constituents of proteoglycans and glycoproteins of human joint cartilage. Data regarding hexosaminidase activity in arthritis are limited to a few publications.

The aim of our study was to determine the activity of HEX and its isoenzymes in the serum and synovial fluid of patients with rheumatoid arthritis (RA), osteoarthritis (OA) and knee injury (patients with trauma and tear of the anterior cruciate ligament-ACL alone or in combination with meniscus-ACL/MEN). In these patients X-rays were taken of all joints which had clinical symptoms of joint injury. The radiographs were evaluated by the Larsen method. Patients with RA had a Larson score $> III^0$, patients with OA had a Larson score $< III^0$ and changes in one or two knees and patients with injured ligaments and menisci of the knee had normal results on radiography.

The serum and the knee synovial fluid were obtained from: 15 active RA patients (age 22–76), 17 patients with primary OA (age 41–75) and 36 patients with torn ACL/MEN (age 16–42). The

activity of HEX and its isoenzymes was determined by measuring liberation of p-nitrophenol from p-nitrophenyl N-acetylglucosaminide. In all investigated groups, specific activity of HEX and its isoenzymes in synovial fluid was 2–3 times higher than in the serum. We found the highest specific activity of HEX in synovial fluid and serum of RA patients, medium values of patients with arthrosis, and lowest of patients with knee injury.

Our data suggest that N-acetyl-β-hexosaminidase is involved in degradation of the knee joint extracellular matrix and can be good indicator of the degree of that degradation.

P095. GLYCOSAMINOGLYCANS AND AMINOHEXOSES IN SYNOVIAL FLUID OF INJURED KNEE JOINTS

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Injuries to the ligaments and meniscus of the knee are associated with an increased risk for developing post-traumatic osteoarthritis associated with an increased release of proteoglycans and glycosaminoglycans from the cartilage. There is little information about the proteoglycans and glycosaminoglycans in the synovial fluid of an injured knee joint.

The aim of our investigation was to evaluate the levels of glycosaminoglycans and aminohexoses in knee joint fluids in relation to the time which has passed since injury. Samples of knee joint fluid were collected during routine diagnostic arthroscopy, 3 weeks to 27 months after injury, from 18 patients (13 men and 5 women) aged 17–38 (mean 24.9 years). In this fluid we determined: proteins, uronic acids and hexosamines. Glycosaminoglycans were released from proteoglycans by papain digestion, and separated in microcolumns with CF-11 into: hyaluronic acid, heparan sulphate, chondroitin sulphate –4 and –6, and keratan sulphate.

In the synovial fluid from the knee joint we found the highest levels of hexosamines and glycosaminoglycans occuring at 1 month after trauma, and diminishing after this period.

P096. CHANGES OF BONE MINERAL DENSITY OF THE PROXIMAL TIBIA IN GONARTHRITIS WITH VARUS AXIS DEVIATION OF LOWER EXTREMITY

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Lower extremity axis deviation is observed very often in patients with gonarthritis. Structure of subchondral bone of the knee in these patients was previously examined by X-ray. Densitometry gives us a new method of estimating structure of bone in the interesting regions of the skeleton. We used this method to estimate changes of bone mineral density in the assessment of varus axis deviation of the lower extremity in patients with gonarthritis. Bone mineral densities (BMD) were estimated in 45 patients at a mean age of 62 years (15 to 78) who were operated on in Department of Orthopaedics due to osteoarthritis of the knee with varus deviation. BMD of the proximal tibia was evaluated on the Lunar DPX-IQ densitometer and analyzed in three regions of interest: medial, lateral and central. Lower extremity axis deviation was evaluated using the Metrecom devise (Faro). Results were compared to a control group of 20 patients without osteoarthritis of the knee and without deviation of lower extremity axis. Increased BMD was found on the overweighed compartment of the knee in comparison to the underweight one. These differences were not observed in the control group. We developed a coefficient, which is the ratio of BMD in the overweighed compartment compared to BMD in

underweight one. In our patients the mean value of this coefficient was 3.3, and it ranged from 1,2 to 24,5 (SD 5,7). We also found a strong correlation between the increased BMD coefficient and varus axis deviation of the lower extremity.

P097. NONSELECTIVE NSAIDS INHIBITS BONE RESORPTION IN VITRO

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Background: Prostaglandins (PGs) are powerful mediators of bone remodelling. At low concentrations their character is stimulating, but at high - inhibiting osteoblast (OB) activity. Directly and transiently inhibited, but indirectly and persistently stimulated osteoclastic (OC) bone resorption (BR). NSAIDs are the most commonly used drugs in articular diseases, and act mainly through the inhibition of PGs synthesis in synovium, cartilage, but also in bone.

Materials and the Methods: We have examined the effects of naproxen sodium (NS), piroxicam (P), diclophenac (D) and indomethacin (IN) on the 'proton pomp' and on resorptive activity of rat OC cultivated on bone slides in DMEM+10% FCS expressed as a 'resorption index' (nr of OC: nr of resorptive pits), and in the case of NS also by computer analysis of the resorption lacunae fields. In the case of P, we have also evaluated the effect of PGE-2 on this process.

Results: All NSAIDS studied have significantly inhibited BR at the concentrations below their therapeutic serum levels, and in the case of P and in the presence of PGE-2, it happened at the concentration 500 x lower. None had inhibited the proton pomp, except for IN , but at 10 times higher conc.

Conclusions: NS, P, D and IN strongly inhibited BR in vitro. Because there are some links between the inhibition of BR and antyarthritic and antyinflammatory effect, these results show an underestimated feature of some NSAIDs in regard to their inhibitory influence on BR and healing of OA.

P098. TISSUE ENGINEERING FOR ARTICULAR CARTILAGE REGENERATION

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Joint cartilage does not regenerate in the human body. That is why any damage due to injury or illness tends to become more severe over time and is a very serious clinical problem. The most innovative methods of articular cartilage defect treatment involve cellular engineering. Cellular engineering is an aspect of cellular biology that has developed over past 30 years and applies engineering principles to the chemical composition of cells. Attempts to engineer structural tissue such cartilage have scored the greatest successes (R. Service, Science, 1995). Repair of cartilage defects with autologous chondrocytes requires multiplication of chondrocytes. The use of cultured chondrocytes to repair articular cartilage defects has been considered successful (M. Brittberg et al., NEJM, 1994; T. Noguchi et al., Clin Orthop, 1994). Autologous chondrocyte transplantation was performed for the first time in 1987 and is today an established treatment of cartilage defects in the knee joint. The number of chondrocytes that can be harvested from a patient is limited. Therefore the cells need to be multiplied in vitro. Special instruments are used to obtain cartilage samples from the upper part of the medial femoral condyle. Repair of full-thickness articular cartilage defects with autologous material has the best chance for success if the defect is isolated. The new cartilage cells display the consistency of healthy cartilage. The technique of isolation and culturing of human chondrocytes is somewhat time-consuming.

However, some biotech tissue repair companies (eg. Genzyme) developed engineered tissue techniques that allow for more rapid result.

P099. DIETARY PROTEIN INTAKE AND TRABECULAR BONE VOLUME IN FEMALE RAT TIBIA

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The aim of the study was the assessment of the effect of protein amount in diet on trabecular bone volume in the proximal epiphysis of the female rat tibia.

The study was carried out on 54 female Wistar Outbred rats aged 75–80 days. The animals were divided into groups depending on the content of calcium, phosphorus and protein in an experimental diet. After 6 months of study 24-hour urine collection was performed, the rats were decapitated and blood and tibial bone were taken. The levels of calcium, phosphorus and alkaline phosphatase were assayed in serum, and 24-hour excretion of calcium was determined in urine. A 15 mm portion of the proximal epiphysis of the tibia (without decalcification) was fixed, dehydrated and embedded in methyl metacrylate. The embedded bone was cut in a sagittal plane into 5 μm slides and stained by the Goldner method. Histomorphometric assessment of trabecular bone volume (BV/TV) was carried out in the area from 0.5 to 2.5 mm from growth cartilage plate towards the bone shaft using a microscope with Zeiss 1 ocular integrator.

	NBNCa	NBUCa	WBNCa	WBUCa	UBNCa	UBUCa
%Ca food	0,75	0,25	0,75	0,25	0,75	0,25
%P food	0,7	0,7	0,7	0,7	0,7	0,7
% protein	15	15	30	30	7,5	7,5
S Ca	2,70	3,20	2,26	2,63	2,22	2,42
(mmol/l)	±0,08	±0,33	±0,10	±0,12	±0,13	±0,10
U Ca	0,22	0,23	0,31	0,29	0,22	0,24
(mmol/d)	±0,05	±0,03	±0,3*	±0,05*	±0,04	±0,02
BV/TV %	23,1±3,2	24,8±3,3	18,9±1,6*	16,9±1,6*	18,8±3,1*	18,3±2,5*

X ± SD, Mann-Whitney U test: * p<0,05 vs NBNCa

Both increase and decrease of protein content in the diet led to a significant reduction in trabecular bone volume in female rats.

P100. INFLUENCE OF PINEAL GLAND REMOVAL AND MELATONIN ADMINISTRATION ON THE PROCESS OF POSTMENOPAUSAL OSTEOPOROSIS IN FEMALE RATS FOLLOWING OVARIECTOMY

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The purpose of this study was to demonstrate whether pinealectomy (Px) and melatonin (Mel) administration can affect postmenopausal osteoporosis processes induced in female rats by way of ovariectomy (Ovx). The study included 150 animals; 6 remained unaffected (C), 72 were ovariectomized and the remaining underwent a sham operation. Following surgery, rats were divided into 6 groups: 1 - Ovx, 2 - Ovx+Px, 3 - Ovx+Px+Mel, 4 - C, 5 - C+Px, 6 - C+Px+Mel. Animals from the 2nd, 3rd, 5th and the 6th group were pinealectomized while the remainder underwent a sham operation. After 2 weeks following surgery animals in

the 3rd and 5th group were administered Mel (50μg/100g of b.w.) for 4 weeks while the remaining animals were administered solvent only. At the appropriate time, i.e. prior to surgery and after 6, 12, 18 and 24 weeks from operation the animals were placed in metabolic cages (from 06:30 until 09:30) in order to collect urine samples for HYP and Ca level determination. Within the next 24 hours the rats were decapitated (at 08:00) and their blood was collected and centrifuged. Mel and remaining markers of bone turnover (ALP, PICP, ICTP) were then determined in serum. The study has shown that Px had an inducing, while exogenous Mel a suppressing effect upon the level of investigated markers. Administration of Mel only partially levelled changes of bone metabolism caused by Ovx. This points also to participation of factors other than Mel in such processes. In rats with a preserved pineal gland the effect of Mel upon bone metabolism was more pronounced which suggests that the pineal gland itself may modify effects on its own action, most probably via receptors specific for this hormone.

P101. CHANGES OF BONE DIVERSION PARAMETERS IN BLOOD SERUM OF RAT FEMALES AFTER EXPERIMENTAL OVARIECTOMY AND LONG TERM EXPOSITION ON ELF MF

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Introduction: Loss of estrogens after physiological ovary dysfunction or surgical ovariectomy creates an opportunity for osteoporosis development. The purpose of this project is to investigate the influence of long term ELF MF exposition on bone remodeling through measurement of osteoclastic and osteogenic parameters in the serum of animal models of experimentally ovariectomized female rats.

Materials and Methods: We investigated 35 female Wistar rats. The source of ELF was the Ambit 2000 (Poland) device. Exposition was provided 1 hour daily during 100 days. All animals were divided into 4 groups:

Groups of rats	Number of rats	Ether nercosis	Owariectomy	EMF exposure
	8	yes	no	None
0	8	yes	yes	None
5	10	yes	yes	10mT, f=5Hz, rectangle
40	9	tak	tak	10mT; f=40Hz, sinusoid

Activity of aspartate aminotransferase (AsPAT) as an osteogenic enzyme and the level of calcium (total and ionized) and phosphorus were determined in serum after exposition.

Results: Serum aspartate aminotransferase activity was statistically significant in various groups (p=0,0102). The levels in group '5' were significantly lower in the '0' and 'K' groups (p=0,0164 and p=0,0029, respectively). In the tested serum we did not find any statistically significant changes in total calcium level of each group of animals (p=0,0682). Ionized calcium levels in each rat group were statistically significant (p=0,0081). Significantly lower in '5' and '40' group in addition to the 'K' group (p=0,0077 and p=0,0033, respectively). According to this dependence the highest level of ionized calcium was observed in the 'K' group followed by '40'. Serum phosphorus in tested groups '0', '40' and 'K' were significantly lower than in group '5' (p=0,0004, p=0,0025, 0=0,0014, respectively). The highest level of phosphorus was observed in group '5'.

Conclusions: Long term exposition to ELF significantly influences biochemical changes in tested serum parameters in female rats after experimental ovariectomy.

P102. EVALUATION OF CHANGES IN BONE MASS DENSITY (BMD) OF FEMALE RATS AFTER EXPERIMENTAL OVARIECTOMY EXPOSED ON ELF MAGNETIC FIELD

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Introduction: Estrogen deficiency after physiological loss of ovarian function or after surgical ovariectomy creates a possibility for the development of osteoporosis. The purpose of this project is to assess ELF magnetic field on bone tissue mineralization tested by radiological measurement of BMD on animal models of female experimentally ovariectomized rats.

Materials and Methods: We investigated 35 female Wistar rats. The source of ELF was the Ambit 2000 (Poland) device. Exposition was provided 1 hour daily during 100 days. All animals were divided into 4 groups:

Groups of rats	Number of rats	Ether nercosis	Owariectomy	EMF exposure
	8	yes	no	None
0	8	yes	yes	None
5	10	yes	yes	10mT, f=5Hz, rectangle
40	9	tak	tak	10mT; f=40Hz, sinusoid

BMD was established by densitometry using the DEXA method. Measurements were provided in the lumbar spine and left femur.

Results: 1: BMD levels in the lumbar spine were statistically significant in each animal group (p=0,0061). The lowest significant BMD were observed in groups 'O' and '5' in comparison to group 'K' (p=0,0357 and p=0,0019 respectively) and significant low BMD in group '5' in comparison to group '40' (p=0,0179). Statistically significant changes were not observed between groups '40' and 'K'. A statistically insignificant increase in BMD in group '40' compared to group '5' and 'O'. A greater BMD is noted in the control group followed by the group exposed to sinusoidal 40Hz.

2: BMD levels in left femur in each group of animals were also significantly different (p=0,0031). BMD levels in groups '40', '5' and 'O' were significantly lower compared to group 'K' (p=0,0024, p=0,0025 and p=0,0039). A non-statistically significant increase in BMD was observed in group '40' compared to group 'O'. The highest level of BMD existed in the control group followed by the group exposed to sinusoidal 40Hz frequency ELF.

Conclusions: 1: Long term exposition to an ELF magnetic field increases BMD in ovariectomized female Wistar rats, especially those exposed to sinusoidal 40Hz.

2: Our results show a possible way of utilizing ELF MF in osteoporosis therapy after further more specific investigations which include selection of therapeutic parameters of ELF MF.

P103. EFFECTS OF LENTARON ON THE SKELETAL SYSTEM IN OVARIECTOMIZED AND NON-OVARIECTOMIZED RATS

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Lentaron is an aromatase enzyme inhibitor which is uniquely responsible for the generation of estrone and estradiol from androgenic precursors. Lentaron is used in the treatment of breast cancer in postmenopausal women. Lentaron causes a reduction of estrogen biosynthesis in all tissues where it occurs. Deficiency of estrogens disturb remodeling of bone tissue. The effect of Lentaron on bones in not known.

The aim of the present study was to investigate the effects of Lentaron (20 mg/kg s.c. once a week) administered for 4 weeks on the skeletal system in bilaterally ovariectomized and non-

ovariectomized rats. The experiments were carried out on 4 groups of 3-month-old female Wistar rats: I – Control (nonovariectomized rats), II – Ovariectomized rats, III – Nonovariectomized rats + Lentaron, IV – Ovariectomized rats + Lentaron. In all the groups body weight gain, bone mass, length and diameter, mineral and calcium content in the tibia and femur, endosteal and periosteal transverse growth, endosteal and periosteal osteoid width, transverse cross-section area of the cortical diaphysis and that of the marrow cavity in the tibia, epiphyseal cartilage width, trabeculae width in the epiphysis and metaphysis of the femur were examined. Mechanical properties of the femur were also studied.

Bilateral ovariectomy induced osteopenic skeletal changes in female rats. Lentaron did not significantly change bone remodeling in nonovariectomized rats (group III). Lentaron administered to the bilaterally ovariectomized rats (group IV) slightly reduced the changes caused by ovariectomy in the skeletal system.

P104. EFFECT OF ASEPTIC INFLAMMATION OF THE MARROW CAVITY ON LONG BONES IN THE RAT

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The aim of the present study was to investigate the effect of the aseptic inflammation of the marrow cavity of the femur on the morphometry of the femur and tibia in rats.

The experiment was carried out on male SPD rats (233–250 g) divided into 2 groups in which aseptic inflammation of the marrow cavity was induced (3 or 6 weeks) and 2 respective control groups.

The aseptic inflammation of the marrow cavity was induced using the method of Meier et al. in our modification. The implant of an aseptic cotton pellet was inserted into the marrow cavity of the femur of rats under methohexytal anaesthesia. After 3 or 6 weeks of the experiment, the animals were killed. The macrometric parameters (mass, length, diameter of the diaphysis and epiphysis) and histomorphometric parameters of the femur (transverse cross-section area of the diaphysis and of the marrow cavity, transverse growth, width of the osteoid, width of the trabeculae in the epiphysis, width of the epiphyseal cartilage) were studied. Hematological investigation of the blood and marrow were also carried out.

Results: The applied experimental model may be used to induce aseptic inflammation of the femoral marrow cavity. A decrease in the number of the erythroblastic system cells and increases in the number of the myeloblastic and limphoblastic system cells in of the bone marrow of the bone containing the implant were observed. Moreover, an increase in the transverse cross-sectional area of the diaphysis and a decrease in the transverse cross-section area of the marrow cavity, increases in the endosteal and periosteal transverse growth, a decrease in the width of the epiphyseal cartilage, an increase in bone mass and a deformation of the bone containing the implant were observed.

P105. EFFECT OF CYCLOPHOSPHAMIDE ON REMODELING OF LONG BONES IN THE RAT

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Neoplasms, with or without metastases to bones, can induce pathological bone remodeling, leading to systemic bone resorption and hypercalcemia or osteomalacia and normocalcemia.

The aim of the present study was to investigate the effect of a cytostatic – cyclophosphamide on the skeletal system in rats.

The experiments were carried out in male Wistar rats with initial body weight of 212–229 g, divided into 3 groups (n = 6): I – Control, II – Cyclophosphamide (10 mg/kg im daily for 14 days, and, after a 7-day break, for 7 days), III – Cyclophosphamide (20 mg/kg po daily for the initial 14 days). After 28 days of the experiment, the animals were killed and bone mass, length, diameter, mineral content in the femur and tibia, transverse cross-section surfaces of the cortical diaphysis and of the marrow cavity, transverse growth, endosteal and periosteal osteoid width in the tibia, trabeculae width, epiphyseal cartilage width and mechanical features of the femur were examined.

Cyclophosphamide caused disorders of bone tissue remodeling. Decreases in bone mass, length, diameter, mineral content in long bones, trabeculae width in the femur, transverse growth, width of osteoid, transverse cross-section surface of the cortical diaphysis, an increase in the transverse cross-section of the marrow cavity in the tibia, and a deterioration of mechanical properties of the femur were observed.

P106. UPTAKE OF STRONTIUM BY BONE AND BY JOINT CARTILAGE OF RATS AFTER ORAL ADMINISTRATION IS COMPARABLE

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Introduction: Strontium salts stimulate osteoblasts and chondrocytes but inhibit osteoclasts. Because the distribution of strontium after oral administration in trabecular and cortical bone as well as in joint cartilage is unknown, we have tested it in rats.

Materials and Methods: Four groups of male rats six weeks of age received 0.001% (1.75 uM/day), 0.05% (87.5 uM/day) and 0.1% (175 uM/Day) water solutions of strontium chloride vs. water as a control for six months. Cartilages of knee and hip joints as well as cortical and trabecular tissue of the femur were prepared than dried and strontium concentrations were measured by the AAS-ETA method by the Perkin-Elmer 4100ZL machine with a THGA graphite cuvete.

Results: Concentrations of strontium expressed in mg per kg of dry tissue are listed in table:

	Controls	0,001%	0,05%	0,1%
Knee cartilage	85	1917	3681	4800
Hip cartilage	83	2011	4604	5719
Cortical bone	151	2316	3962	5681
Trabecular bone	131	1947	3561	4826

Conclusion: In three examined solutions strontium concentrations in bone and cartilage are comparable, larger in the hip than in the knee cartilage, higher in cortical than in trabecular bone.

P107. EFFECT OF STRONTIUM CHLORIDE ON DEVELOPMENT OF PREDNISOLONE INDUCED CHANGES IN THE RAT SKELETAL SYSTEM

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Methods used in the treatment of osteoporosis induced by glucocorticosteroids are not effective enough. There is a need for new drugs which could be useful in counteracting the effects of glucocorticosteroids on bone tissue.

The aim of the present study was to investigate the effects of strontium chloride on the development of osteopenia induced by prednisolone (5 mg/kg im daily) in male SPD rats. Strontium chloride was administered in a dose of 300 mg/kg po daily for 4 or 8 weeks.

The macrometric parameters (length and diameter of the bone), bone mass and mineral and calcium content in the tibia and femur were studied. The transverse cross-sectional area of the diaphysis and the marrow cavity in the tibia, endosteal and periosteal osteoid width, endosteal and periosteal transverse growth in the tibia, epiphyseal cartilage width, width of trabeculae in the epiphysis and metaphysis of the femur were also examined. Mechanical properties of the femur were determined by the measurement of force necessary to cause a fracture and maximal deformation.

Strontium chloride administered for 4 or 8 weeks did not significantly affect the length and diameter, mass and mineral content in the tibia and femur of healthy rats. The histomorphometric studies demonstrated that strontium chloride caused some changes indicating the inhibition of bone resorption without a significant effect on bone formation. Administration of strontium chloride together with prednisolone slightly attenuated the unfavorable effect of prednisolone on bones.

P108. JOINT CARTILAGE IN OVARIECTOMIZED RATS – DOES IT MIMICRIES POSTMENOPAUSAL ARTHROPATHY IN WOMEN?

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Background: Physical strain stimulates chondrogenesis and osteogenesis, but the influence of female sex hormones upon the articular cartilage is less known. In youth oestradiol exhibits an anabolic influence, but after menopause its role is difficult to interpret. Experimental ovariectomy (OVR) mimics such a pathomechanism. Because the impact of OVR on structures of load bearing joints is unclear, we have devised an experiment on female rats subjected to intensive but not exhausting running with and without OVR.

Materials and the Methods: The research was carried out on 60, 6-month-old female rats, divided into four groups: 'C'- no OVR controls, 'rC'- no OVR running, 'O'- OVR not running, and 'rO' - OVR with running on a tread-mill set at the frequency of rotation of 1200 m/hr, at an angle of elevation of 10 degrees, for 6 days a week, 2 hr/day, for 6 weeks. Structures of the knee joint (Cartilage, meniscus, ligaments, and synovial membrane) were evaluated by histomorphologic and morphometric studies, including the polarized light, as well as cartilage GAGs content.

Results: 1. Female rats with retained gonads subjected to intensive but not exhausting running did not exhibit microscopic nor macroscopic changes in the structures of the knee joint. 2. The OVR has substantially enforced the mineralization of the articular cartilage as well as ossification of the meniscus. 3. The rats subjected to OVR and running had established all features of degeneration: damage and thinning of the articular cartilage and the reduction of GAGs content, the decrease in the number of chondrocytes, the ossification of the meniscus, and dysphaemia in the course of collagen fibers in the cartilage.

Conclusion: OVX rats may serve as experimental model of postmenopausal arthropathy.