CHEMICAL COMPOSITION OF BONE REGENERATE UNDER INFLUENCE OF “OSTEIN”

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CHEMICAL COMPOSITION OF BONE REGENERATE UNDER INFLUENCE OF “OSTEIN”

Luzin V. I., Ivchenko V. K., Ivchenko D. V., Skorobogatov A. N., Andrieieva O. V.

Lugansk State Medical University. Lugansk, Ukraine

Key words: rats, bone defects, bone regeneration, biological hydroxyapatite, “Ostein”

Introduction, aim of the study
The biogenic material “Ceramic hydroxyapatite” (OC) is widely used for replacement of the removed pathological formations, but still the exact data of it’s influence on bone formation and it’s interaction with new-forming bone tissue has not been presented. Our study therefore is aimed at investigation of chemical composition of bone regenerate under influence of “Ostein” after experimental operations for plastics of bone defects with ceramic hydroxyapatite (OC015).
Materials, methods
For the purposes of the study we selected 126 non-linear rats with the initial mass of 130-150 grams and separated them into three groups. First group comprised intact animals, another

groups were operated on for through perforation of both tibiae thus modeling a routine bone tissue removal. In the third group we administered intragastric (via catheter) “Ostein”, a new calcium drug. Upon expiration of each observation term (7, 15, 30, 60, 90 and 180 days) the bones were excised for further analysis.

Results, conclusions

During observation the intact animals exhibited decrease of water percentage from 31.69±0.69% to 26.25±0.81%, organic substances also decreased from 27.09±0.31% to 24.08±0.55% and mineral share on the contrary increased 41.22±0.72% to 49.68±0.55% which is fully compliant with previously described age dynamics in bone contents. In the second group regenerate changed similar to the first group: water amount exceeded the same value of the control group and percentage decreased gradually from 41.78±0.43% to 31.80±0.44%, minerals amount was higher than control group values and percentage increased from 33.02±0.39 to 40.20±0.44%. Alongside with this by the 7th day organic substances amount was lower than in control group by 7.01% and by the 15th and the 30th days exceeded control values by 6.70% and 9.82% respectively. In later terms no significant deviations from control values were observed. In the third group dynamic changes were generally the same as in the second yet deviations were expressed in another way. Water amount exceeded the values of the first group only by the 7th and 15th days – by 27.21% and 9.56% respectively that is lower than second group values. Minerals amount was lower than in the control group in the period from the 7th to the 30th day of observation by 11.25%, 15.19% and 11.38% and organic substances amount exceeded the control values in the period from the 15th to the 60th days – by 13.23%, 17.82% and 5.16% respectively which is much higher. Like in the previous group no significant differences from the control group were found in later terms.

The data show that calcium drug “Ostein” used for treatment of bone defects has a positive effect on chemical content of bone regenerate and optimizes regeneration processes though the

data require verification using histological and X-ray scattering methods.

FEATURES OF BONE MINERALIZATION AFTER PLASTICS OF METADIAPHYSEAL DEFECTS WITH CERAMIC OSTEOAPATITE

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FEATURES OF BONE MINERALIZATION AFTER PLASTICS OF METADIAPHYSEAL DEFECTS WITH CERAMIC OSTEOAPATITE

Luzin V. I., Ivchenko V. K., Lubenets A. A., Skorobogatov A. N., Astrakhantsev D. A.

Lugansk State Medical University. Lugansk, Ukraine

Key words: rats, bone defects, bone mineralization, biological hydroxyapatite

Introduction, aim of the study
The data on actual mineral and organic contents in the bones other than injured are practically unavailable in the modern sources. Our study therefore is aimed at investigation of bone minerals in hipbone and parietal bone after experimental

operations for plastics of bone defects with ceramic hydroxyapatite (OC015).

Materials, methods

126 non-linear rats with the initial mass of 135-145 grams were operated on for through perforation of both tibiae thus modeling a routine bone tissue removal. The 2.2-mm. defects in half of the total number of the animals were filled with osteoapatite granules of the respective diameter while in the rest the defects remained unfilled. The observation terms were 7, 15, 30, 60, 90 and 180 days. Upon expiration of each term the required bones were excised for further analysis.

Results and discussion

The first group showed increase of water contents in the hipbone beginning from the 7th day of observation; the values exceeded those of controls by 5.75%, 7.59%, 9.76%, 12.12%, 20.14% and 7,07% ($p<0,05$) respective to observation terms. The minerals were on the contrary lower than in control group in the period from the 7th to the 90th day and organic substances decreased only by the 90th day – by 12.55%. Parietal bone featured the same changes yet beginning from the 15th day of observation.

The second group exhibited actually the similar dynamics as the first group yet in the period from the 7th to the 90th days deviations amplitude was somewhat higher. In the period from the 60th to the 90th day deviations amplitude smoothed and finally by the 180th day no significant differences between two groups were observed.

Conclusions

Regeneration processes in tibiae lead to minerals and organic substances loss vs. water share increase in hipbone and parietal bone. Promoted regeneration still features similar changes yet more expressed in early terms but finally leveling to baseline in later terms.

USAGE PROSPECTS OF BIOLOGICAL HYDROXYAPATITE CERAMICS, SATURATED WITH MICROELEMENTS, […]

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USAGE PROSPECTS OF BIOLOGICAL HYDROXYAPATITE CERAMICS, SATURATED WITH MICROELEMENTS, FOR EXTREMITY BONE DEFECTS PLASTICS UNDER CONDITIONS OF REPEATED OSTEOPOROSIS

Ivchenko V. K., Ivchenko D. V., Skorobogatov A. N., Ivchenko A. V., Pankratiev A. A.

Lugansk State Medical University. Lugansk, Ukraine

Key words: benign tumours, tumour-like diseases, bone defects, biological hydroxyapatite

Introduction, aim of the research
The problem of choosing the material for bone defects substitution remains relevant under conditions of repeated osteoporosis, which arises after surgical ablation of benign tumours, tumor-like and dysplastic diseases. The usage of synthetic hydroxyapatite ceramics with this aim attracts special interest today.

We have analyzed the results of clinical usage of compositional material of biological origin on basis of hydroxyapatite, which was made in Ukraine and was called “ceramic osteoapatite”- CO.

Material, methods

In experiments on rats and in clinic the peculiarities of rebuilding CO-100 in the form of powder, particle size 100 mkm, pore-granular CO-015-5000 with particle size 1000-5000 mkm, pore size 90-600 mkm and OC-1, 5 in the form of blocks, saturated with microelements Cu, Zn, Se, have been studied. When using CO, saturated with Cu, Zn, the conditions for improving the repair regeneration in the place of ceramoplastics are made. Selenium combinations have an important anticarcinogenic influence on the neoplasm development, due to its antioxidant and immune response modulating characteristics. When filling in the defects of CO bone, saturated with selenium, some conditions of anticarcinogenic effect, from the side of implant, are made, thus, the probability of illness relapse is reduced and that is especially relevant in treating giant cell tumour.

The clinical part of the work includes the observations among 86 patients, in which defects plastics was performed with one of CO types, saturated with microelements, after surgery of benign tumours, tumour-like and dysplastic ailments of extremity bones.

The patients were from 7 till 52 years of age. Children aged until 15 years old were 25,6%. The majority were men (69-80,2%). Solitary bone cyst was observed in 17, aneurismal – in 4, fibrous dysplasia – in 16, enchondrome – in 19, orteochondrome – in 11, osteoma – in 4, and giant cell tumour in 15 cases.

Depending on the data, parietal and intracavitary resection was applied. In one case segmental resection was carried out at the lesion of distal radius part. The defect was removed with pore – granular CO-015, which at hardening was adapted to the form of the defect. If bone stability suffered insignificantly firm low porous block of CO-1, 5, which was

placed along load axis, was applied and the rest of the cavity around the block was filled with pore granular CO-015.

Results, conclusions

Remote results were traced in 90,7% of patients. There were no signs of inflammation and implant rejection. Only one patient with giant cell tumour developed disease recurrence, which required repeated surgery. Biodegradation assessment of CO implants was conducted according to 4-points scale.

The application of different forms of CO, saturated with microelements, enables to obtain good results of treatment in the majority of patients. And namely with the study of these types of implants we connect perspectives of reconstructive orthopaedy of bone defects after operative treatment of benign tumours, tumour like and dysplastic ailments of extremities bone.