CHEMICAL COMPOSITION OF BONE REGENERATE UNDER INFLUENCE OF “OSTEIN”

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CHEMICAL COMPOSITION OF BONE REGENERATE UNDER INFLUENCE OF “OSTEIN”

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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

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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.

P69 MORPHOGENESIS OF THE SKELETAL BONES AFTER IMPLANTATION OF HYDROXYAPATITE INTO THE TIBIA

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P69
MORPHOGENESIS OF THE SKELETAL BONES AFTER IMPLANTATION OF HYDROXYAPATITE INTO THE TIBIA

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Key words: *rats, bone defect, hydroxyapatite, regeneration*

Introduction. In the study, we attempted to assess features of bone growth after implantation of hydroxyapatite material OK-015 into the tibia.

Materials and methods. 126 rats with initial mass of 130-135 grams were divided into 3 groups: 1st group – intact animals, 2nd group – rats with 2.2 mm defect formed on the border between proximal metaphysis and diaphysis of the tibia. In the 3rd group, the bone defect was filled with 2.2 mm hydroxyapatite implants that contained vitreous phase up to

6,6%.
The observations terms were 7, 15, 30, 60, 90 and 180 days. The humeri, hipbones and the 3rd lumbar vertebrae were excised for osteometry, and Simon index calculation.

Results and discussion. The intact animals exhibited intensive longitudinal and appositional bone growth. The 2nd group exhibited retarded bone growth evident in decrease of humerus length by 2.44%-5.43% in the period from the 30th till the 90th days compared to the controls. Length of the vertebral body by the 30th day of observation was less than that of the controls by 3.05%. Here we may assume that the experimental conditions influenced primarily epiphyseal cartilages because only the humerus features two epiphyseal cartilages unlike the rest of the studied bones. In the period from the 7th day to the 90th day antero-posterior diameter of the humerus was less than in the control group by 5.42%-8.83%. Vertebral body width in the same period decreased by 2.76%-5.49% and transverse diameter of the diaphysis of humerus decreased by 4.11%-7.10%. By the 180th day of observation, all values returned to baseline. Bone loss was confirmed by dynamics changes of obturator foramen size: its longitudinal size increased by 2.03%-5.61% compared to the controls. In the 3rd group growth rate also decreased yet to smaller extent than in the 2nd group and was observed mostly in humerus. The length of the humerus was less than in 1st group, by the 7, 30, 60 and 90 days by 2.69%-4.20%. Hipbone length and vertebral body length were not different to those of controls. Antero-posterior diameter of the humerus, was less than in group 1st on the 3,31%-7,22% respectively, in time from 15 day to 60 days. The transverse size of the vertebral body was not different to that of the control group. Simon index under such conditions increased similarly to the 2nd group.

Conclusions. The defect in tibia results in decrease of bone growth rate. Bone growth rate depended on regeneration activity degree in bone defect zone. Implantation of hydroxyapatite also resulted in retarded bones growth though less expressed than in the 2nd group. Probably, we can influence regeneration processes in the defect zone by implanting hydroxyapatite and systemic skeletal reactions by changing composition of implants.