

From Local to General Reactogenicity of Biphasic Calcium Phosphate (BCP) Bioceramics after Implantation in Osteoporotic Bone

*Aleksandrs Grišuļonoks, Ilze Šalma, Leonard Muller,
Andrejs Skagērs*

Rīga Stradiņš University, Department of Oral and Maxillofacial Surgery, Latvia

Introduction. Osteoporosis is a chronic, metabolic and systemic skeletal disease characterised by low bone mineral density (BMD) and micro-architectural deterioration, resulting in increased bone fragility and fracture risk. Changes in mineral structure occur due to aging or because of progressive pathologic processes such as osteoporosis, as well as in both aging and effects of bone diseases. Biphasic calcium phosphate bioceramics do have a radiographically determinable impact on the density of different structures of the mandible, if implanted in the hip bone.

Aim, Materials and Methods. The aim of the study is to determine the effects of two different modifications of biphasic calcium phosphate bioceramics implanted into the hip bone of specimen with experimental osteoporosis on the example of bone density measured in the mandible of these specimen.

Experimental osteoporosis was induced on 20 eight-months-old female rabbits by ovariectomy and methylprednisolone course i/m six weeks 1 mg/kg. Bone defect was made in *trochanter major* region and filled with biphasic calcium phosphate (BCP, Ca/P 30/70) granules saturated with Stroncium 5% (Sr). In control group, there were six rabbits. After 12 weeks animals were euthanased and samples from different bone parts were taken. BMD was measured using HU statistics programme in 3DCT iCAT unit in different parts of lower jaw.

Another aim of this study was to measure bone mineral density (BMD) in lower jaw, far away from bioceramic's implantation site on rabbits with experimental osteoporosis. For statistical analysis the programme SPSS 7.5 was used. The samples were provided by Rudolfs Cimdinis Biomaterial Innovations and Development Centre, Riga Technical University.

Results. Average HU value of rabbits jaw premolar region in control group - 712,66, statistically significant in comparison with biphasic calcium phosphate group - 0.008 ($p < 0.05$) and statistically significant in comparison with Stroncium group - 0.001 ($p < 0.05$), average HU value in group only of biphasic calcium phosphate granules - 437,14, but average HU value in group, were granules were saturated with Stroncium - 446,14. Difference between them was not statistically significant - 0.920 ($p > 0.05$). Statistical assessment of radiographical specimen revealed the following results in concerns of: frequency and percentage of Specimen in relation to SOM. For SOM 1 the test group with implanted HAp/TCP showed the best results with an increase of bone density by 32.25% in comparison with the osteoporotic test group. Group HAp/TCP + Sr had an increased bone density by 25.50%. The group without experimental osteoporosis had a 12.01% higher bone density in *proc. Condylaris* mandibulae cancellous bone.

Conclusions. Bone mineral density (BMD) in rabbits lower jaw premolar region, far away from bioceramic's implantation site on rabbits with experimental osteoporosis in comparison with implantation of biphasic calcium phosphate and granules with Stroncium are statistically without significant difference. The test groups radiodensitometric analysis displays an advantage of the reviewed biomaterials (HAp/TCP (90 : 10) and HAp/TCP (90 : 10) + 5% Sr) and their implantation in osteoporosis compromised bone. These results confirm the initial assumption of a radiological determinable systemic effect of calcium phosphate biomaterials on bone quality of the mandible.