

Abstract:

Introduction: A lack of bone mass poses limits on treatment in maxillofacial surgery, orthopaedics and traumatology. This post-graduate research aimed to confirm the hypothesis that inorganic or organic non-cellular bone matrix could act as a carrier for autologous stem cells able to differentiate into osteoblasts as well as to verify whether we could accelerate regeneration of the augmentation and the healing process, resulting in improving the bone quality.

Materials and methods: Regenerative properties of the bone were explored using bone marrow stem cells with hydroxyapatite and tricalcium phosphate in a rat bone defect and spinal fusion model. A simple spinal fusion model was induced in a rat capable of easy reproduction, with the least possible mortality and morbidity. After the 8-week experiment, the rodents were euthanized. All samples were analyzed using micro-CT and histomorphometry.

Results: The research on a rat bone defect showed that stem cells with hydroxyapatite and tricalcium phosphate led to a significantly higher bone regeneration. It was proved that a higher concentration of stem cells caused a bigger body mass increase. The research on a spinal fusion model demonstrated that stem cells reduced inflammation and improved bone quality but did not significantly accelerate bone regeneration.

Conclusion: The experiment proved that stem cells have osteogenic potential, improve osteogenesis depending on their density, and may have anti-inflammatory qualities.