BONE MECHANICAL PROPERTIES WITH CHITOSAN–HYDROXYAPATITE COMPOSITE IMPLANTS: A RAT MODEL

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Mechanical properties of bone are basic parameters which reect the structure and function of bone.Bone has adaptive mechanisms which give the tissue the ability to repair itself, altering its mechanicalproperties and morphology in response to increased or decreased function. Bone fracture leads remodeling ofwhole bone tissue not only the fracture area. Several studies show that bone implants change mechanicalproperties of whole bone and bone-implant interface. But we can't found results about the bone hardness onimplantation of the chitosan–hydroxyapatite composite biomaterials to the bone defect.

In this study a series of biocompatible chitosan/hydroxyapatite (ChAp) composites has been synthesized in anaqueous medium from chitosan solution and soluble precursor salts by a one-step coprecipitation method. Forthe in vivo tests, 48 laboratory rats 4 months old were used. Perforated defects, diameter 2 mm were made ina sterile operating room with a stomatological borer in the middle third of the right tibia of the animals. The50/50 ChAp scaffolds were chosen for in vivo evaluation. In the experimental group of animals the cylindricalChAp rods were implanted into the traumata; the diameter of the rods being equal to the width of the woundchannel. The control group consisted of rats with analogous tibial defects not filled with the investigatedmaterial. The animals were taken out of the experiment 24 days after implantation. We evaluated bonemicrohardness (the tissue level), compressive and tensile strength of whole bone.

Our results suggested that bone tissue close to the defect has less microhardness in control group that showstimulating effect of the ChAp to the bone remodeling on bone-implant interface. Far from the defect our datesalso show positive effect on microhardness of bone tissue. Compressive and tensile strength significantlydecrease on control group that show change of whole bone remodeling during the fracture healing. In theexperimental group compressive and tensile strength significantly increase mechanical properties incomparison of control group. The present results support previous histologic findings that ChAp increase thebone healing rate and improves bone maturation and remodeling.