

Molecular Events around Biomaterials under the Influence of Mesenchymal Stem Cells and Plasma Components

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Introduction. Biocompatibility and osteoinduction depend very much on the local tissue reaction like inflammation, apoptosis, regeneration and degeneration factors. Mesenchymal stem cells (MSC) and blood factors (fibrin) are supposed to give positive biostimulation. However, very little is known about the tissue effects in long-term under the combined influence of the above mentioned factors. Thus, the aim of work was to detect apoptosis, local immune response, typical and atypical reactions of soft tissue after different factors and hydroxyapatite/tricalciumphosphate (Hap/TCP) implantation.

Materials and methods. Tissues were obtained from 5 rabbit spine *subcutis* 5 months after Hap/TCP implants. The experimental side enrolled by MSC covered biomaterial and Hap/TCP with fibrin emulsion implanted near the biomaterial in 3.5 months. Control consisted of the same rabbit other body side where only biomaterial was implanted. Routine staining, TUNEL method and immunohistochemistry for IL10, collagen I and defensin 2 were used.

Results. The obtained results of the study demonstrated inflammation, connective tissue capsule, neoangiogenesis in fibrin and Hap/TCP side. Also prominent phagocytosis of granuli and especially fibrin deposits was realised by numerous osteoclasts/epitheloid cells. Defensin-containing cells were detected in various numbers of control side and Hap/TCP covered by MSC side while after biomaterial and fibrin few to moderate number of cells showed defensin. IL10 positive structures showed similar numbers in all tested tissue. Apoptosis affected control tissue with following decrease in biomaterial and fibrin side and notable decrease in Hap/TCP covered by MSC side. Interestingly, also some atypical soft tissue reactions took place mainly near the blood vessels, when intensively stained collagen I deposition was observed. Also numerous macrophages showed collagen I immunoreactivity in the inflamed tissue regions.

Conclusions. From routine tissue reactions inflammation and probably new bone formation are characteristic near the fibrin implants. MSC covered biomaterial decreases apoptosis still 5 months after implantation while fibrin emulsion shows similar not so distinct effect. Fibrin emulsion near biomaterial raises massive inflammation in tissue. However, similar IL10 expression after different factors and biomaterial combinations suggests about equal anti-inflammatory response of tissue. The variations in defensin 2 expressions prove probably the individual tissue response.