

Segmental bone repair by tissue-engineered periosteal cell transplants with bioresorbable fleece and fibrin scaffolds in rabbits.

Authors: Perka C., Schultz O., Spitzer R.-S., Lindenhayn K., Burmester G.-R., Sittinger M.

Publication Date: 2000

Abstract:

The biological bone healing depends on the presence of osteochondral progenitors and their ability for proliferation. Isolated periosteal cells were seeded into biodegradable PGLA polymer fleece or fibrin beads and cultivated for 14 days after prior monolayer culture. On 12 New Zealand white rabbits 8mm metadiaphyseal ulna defects were created bilaterally and subsequently filled with cell-fibrin beads, with polymers seeded with cells compared to controls with fibrin beads and polymers alone and untreated defects. A semiquantitative grading score was applied for histomorphological and radiological analysis after 28 days. Histologically intense bone formation was observed in both experimental groups with cell transplants only. The histological and radiological scoring was superior for both experimental groups. Control groups revealed only poor healing indices and untreated defects did not heal. The highest histological score was noted in the group with polymer fleeces containing periosteal cells. Applying the radiographic score system we determined a significant difference between experimental groups and controls without cells. The radiographic and histological scores for both experimental groups containing periosteal cells differed not significantly. The results strongly encourage the approach of the transplantation of pluripotent mesenchymal cells within a suitable carrier structure for the reconstruction of critical size bone defects. Copyright (C) 2000 Elsevier Science B.V.