

Tricalcium phosphate/hydroxyapatite (TCP-HA) bone scaffold as potential candidate for the formation of tissue engineered bone

Abstract

Background & objectives: Various materials have been used as scaffolds to suit different demands in tissue engineering. One of the most important criteria is that the scaffold must be biocompatible. This study was carried out to investigate the potential of HA or TCP/HA scaffold seeded with osteogenic induced sheep marrow cells (SMCs) for bone tissue engineering. **Methods:** HA-SMC and TCP/HA-SMC constructs were induced in the osteogenic medium for three weeks prior to implantation in nude mice. The HA-SMC and TCP/HA-SMC constructs were implanted subcutaneously on the dorsum of nude mice on each side of the midline. These constructs were harvested after 8 wk of implantation. Constructs before and after implantation were analyzed through histological staining, scanning electron microscope (SEM) and gene expression analysis. **Results:** The HA-SMC constructs demonstrated minimal bone formation. TCP/HA-SMC construct showed bone formation eight weeks after implantation. The bone formation started on the surface of the ceramic and proceeded to the centre of the pores. H&E and Alizarin Red staining demonstrated new bone tissue. Gene expression of collagen type 1 increased significantly for both constructs, but more superior for TCP/HA-SMC. SEM results showed the formation of thick collagen fibers encapsulating TCP/HA-SMC more than HA-SMC. Cells attached to both constructs surface proliferated and secreted collagen fibers. **Interpretation & conclusions:** The findings suggest that TCP/HA-SMC constructs with better osteogenic potential compared to HA-SMC constructs can be a potential candidate for the formation of tissue engineered bone.

Keyword: Bone; Ceramics phosphate; Fibrin; Scaffold; Tissue engineering