

Ultrastructural analysis of implant-soft tissue interface on a three dimensional tissue-engineered oral mucosal model

Type: Journal Article

Abstract:

A three dimensional tissue-engineered human oral mucosal model (3D OMM) used in the investigation of implant-soft tissue interface was recently reported. The aim of this study was to examine the ultrastructural features of soft tissue attachment to various titanium (Ti) implant surfaces based on the 3D OMM. Two techniques, that is, focus ion beam (FIB) and electropolishing techniques were used to prepare specimens for transmission electron microscopic (TEM) analysis of the interface. The 3D OMM consisting of both epithelial and connective tissue layers was constructed by co-culturing human oral keratinocytes and fibroblasts onto an acellular dermis scaffold. Four types of Ti surface topographies were tested: polished, machined (turned), sandblasted, and TiUnite. The specimens were then processed for TEM examination using FIB (Ti remained) and electropolishing (Ti removed) techniques. The FIB sections showed some artifact and lack of details of ultrastructural features. In contrast, the ultrathin sections prepared from the electropolishing technique showed a residual Ti oxide layer, which preserved the details for intact ultrastructural interface analysis. There was evidence of hemidesmosome-like structures at the interface on the four types of Ti surfaces, which suggests that the tissue-engineered oral mucosa formed epithelial attachments on the Ti surfaces.

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