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Oral surgery biomaterials: analyses of Al2O3-treated titanium surfaces tested with fibroblast and osteocyte cell lines

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Two different cell lines - MLO-Y4 (murine osteocytes) and 293 (human fibroblasts) - cultured for 48 hours in standard media were used to analyse engineered biomaterials (i.e. Al_2O_3 shot-peened titanium surfaces). Distribution, density and expression of adhesion molecules (fibronectin and vitronectin) were evaluated under scanning electron microscope (SEM) and confocal microscope (CM) as previously described [1]. The engineered biomaterial surfaces showed under SEM irregular morphology displaying variously-shaped spicules, obtained by shooting different-in-size particles of Al_2O_3 against the scaffolds of biomaterial. DAPI and fluorochrome-conjugated antibodies were used to highlight nuclei, fibronectin and vitronectin, under CM; cell distribution was analysed after Gold-Palladium sputtering of samples by SEM. Both SEM and CM observations showed better outcome in terms of cell adhesion and distribution in treated titanium surfaces with respect to the untreated ones. The results obtained clearly showed that this kind of surface-treated titanium, used to manufacture devices for dental implantology: *i)* is very suitable for cell colonization, essential prerequisite for the best osseointegration, and *ii)* represents an excellent solution for the development of further engineered implants with the target to obtain recovery of dental function stable over time.

Further studies on these Al_2O_3 shot-peened-titanium surfaces, both *in vitro* and *in vivo*, will be needed to obtain accurate definition of better biomaterial outcome, also after additional treatments.

References

[1] Palumbo et al. (2013) Immunocytochemical and structural comparative study of committed *versus* multipotent stem cells cultured with different biomaterials. Micron 47: 1–9.

Keywords

Titanium scaffold, MLO-Y4 and 293 cultures, immunofluorescence, confocal microscopy, scanning electron microscopy.