Early Osseointegration Adjacent to Various Implant Surfaces in Humans

N.P. LANG, D.D. BOSSHARDT, G.E. SALVI, G. HUYNH-BA, S. IVANOVSKI, and N. DONOS, 1The University of Hong Kong, Hong Kong, Hong Kong, 2University of Bern, Bern, Switzerland, 3Griffith University, Gold Coast, Queensland, Australia, Gold Coast, Australia, 4Eastman Dental Institute for Oral Health Care Sciences, London, United Kingdom

Objective: To evaluate the rate and degree of osseointegration at chemically modified moderately rough (SLActive) and moderately rough (SLA) implant surfaces during early phases of healing in a human model. Material and methods: The devices used for this study of early healing were 4 mm long and 2.8 mm in diameter and had either an SLActive chemically modified or a moderately rough SLA surface configuration. 49 devices were surgically installed into the retromolar area of 28 human volunteers and retrieved after 7, 14, 28 and 42 days of submerged healing. A 5.2 mm long specially designed trephine with a 4.9 mm inside diameter, allowing the circumferential sampling of 1.0 mm tissue together with the device was applied. Histologic ground sections were prepared and histomorphometric analyses of the tissue components (i.e., old bone, new bone, bone debris, soft tissue) in contact with the device surfaces were performed. Results: All device sites healed uneventfully. All device surfaces were partially coated with bone debris. A significant fraction of this bone matrix coating became increasingly covered with newly formed bone. The process of new bone formation started already during the first week in the trabecular regions and increased gradually up to 42 days. The percentage of direct contact between newly formed bone and the device (BIC) after 2 and 4 weeks was more pronounced adjacent to the SLActive than to the SLA surface (14.8% vs. 12.2% and 48.3% vs. 32.4%, respectively), but after 42 days, these differences were no more evident (61.6% vs. 61.5%). Conclusion: While healing showed similar characteristics with bone resorptive and appositional events for both SLActive and SLA surfaces between 7 and 42 days, the degree of osseointegration after 2 and 4 weeks was superior for the SLActive compared to the SLA surface. Supported by a grant (371/04) from the ITI Foundation.