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Basic research methods and current trends of dental implant surfaces.

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Abstract

Among dental implant design alterations, surface modifications have been by far the most investigated topic. Regarding implant surface research, the lack of hierarchical approaches relating in vitro, in vivo, clinical trials, and ex vivo analyses has hindered biomaterials scientists with clear informed rationale guidelines for implant surface design. This manuscript provides a critical hierarchical overview of the in vitro, laboratory in vivo, clinical, and ex vivo methodologies used to investigate the performance of novel biomaterials aiming to allow dental professionals to better evaluate the past, present, and future dental implant surface research. This manuscript also contains an overview of the commercially available surface texture and chemistry modifications including novel nanotechnology-based fabrication processes. Over the last decade, surface texturing has been the most utilized parameter for increasing the host-to-implant response. Recently, dental implant surfaces utilizing reduced length scale physico/chemical features (atomic and nanometric) have shown the potential to synergistically use both texture and the inclusion of bioactive ceramic components on the surface. Although surface modifications have been shown to enhance osseointegration at early implantation times, information concerning its long-term benefit to peri-implant tissues is lacking due to the reduced number of controlled clinical trials. Given the various implants/surfaces under study, the clinician should ask, founded on the basic hierarchical approach described for the in vitro, laboratory in vivo data, as well as the results of clinical studies to effectiveness before use of any dental implant.

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