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LETTER TO THE EDITOR

Nanotechnology in dental implants of medically compromised patients: is this the right way forward?

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Nanotechnology has achieved wide attention in scientific media and can be defined as science engaged in design, synthesis, characterization and application of materials and devices whose smallest functional organization at the nanometer scale (Siegel & Fougere 1995). Innovative findings on nanoroughness are valuable in the fields of dental implantology, maxillofacial or orthopedic implant surfaces and on cardiovascular implants.

Some advantages of nanoroughness on titanium dental implants include increasing of surface area, improvement of cell attachment and biomechanical interaction of implant with bone (Pachauri et al. 2014). Nanoparticles used in the coating of dental implants present osteointegrative (Al_2O_3, hydroxyapatite, calcium phosphate), antimicrobial (silver, zinc, cooper, quercitrin, chlorhexidine), and osteointegrative and antimicrobial (TiO_2, nano-crystalline diamond) activities (Parnia et al. 2017). Nanohydroxyapatites have nanostructured surface with higher surface area and higher reactivity, letting them to bind to bone creating a biomimetic coating on implants (Yazdani et al. 2018). However, more investigations are needed to develop an effective implant due to the interaction of cells and biomaterial surface after implantation. Despite these advances, the clinical relevance of surface nanoroughness of dental implant in clinically healthy patients is poorly known (Matos 2021, Zhang et al. 2021).

On the other hand, in medically compromised patients with advanced age, diabetes mellitus, smokers, using bisphosphonates due to osteoporosis or in head and neck radiotherapy, the osseointegration is still a challenge for dental implant therapy (Gómez-de Diego et al. 2014, Turri et al. 2016, Zhang et al. 2021). In these cases, the clinical and radiographic follow up must emphasize criteria such as pain, mobility, bone crest loss, probing depth, and peri-implantitis. Genetic factors, such as polymorphisms in interleukin 1 (IL-1) genes, can be utilized to reduce the chances of failure (Dirschnabel et al. 2011). It is also worth mentioning that the incorporation of nanoparticles in implant coatings must be properly fixated to the surface due to the cytotoxicity and potential hazard (Mao et al. 2018), specially in compromised patients.

Therefore, nanotechnologies in the dental implant surface should be developed aiming to improve the prognosis the medically compromised patients based on the specific features of diseases or clinical conditions (e.g. diabetes mellitus), forming a barrier to the ingress of oral pathogens. In this context, would be this the right way forward?

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