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# BIOINSPIRED DENTAL IMPLANT CONCEPT, A FINITE ELEMENT STUDY

**Cátia Gomes[1], Michel Mesnard[2], António Ramos[1]**
[1]TEMA; Department of Mechanical Engineering, University of Aveiro
[2]Dép. Sciences de l'Ingénierie et du Numérique, CNRS UMR 5295, Université de Bordeaux
*catia.fgomes98@ua.pt, michel.mesnard@u-bordeaux.fr, a.ramos@ua.pt*

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**Summary:** Dental implants have emerged in society as a highly successful solution replacing missing teeth, although there are still reports of failure (Moraschini, et al. 2015). Thus, a bioinspired dental implant (BDI) has been developed and studied to reduce the rigidity of conventional dental implants and to promote a load transfer equivalent to that of a tooth. This study tried to evaluate the new dental implant concept behavior in comparison with the tooth. A tooth model in the mandible was developed. The periodontal ligament was considered to be a positive copy of the tooth root with a thickness of 0.2 mm (Tsouknidas, et al. 2016). The implant was inserted in the same position of the mandible, and a total osseointegration situation has been simulated. A convergence study has evaluated the mesh quality. Bidimensional and tridimensional simulations were performed. Compression tests to simulate the bite force were executed with a 100 N load and 30 degrees of inclination (Robinson, et al. 2019). Analyzing the results, BDI generated higher stresses in the facial side of the bone. This occurrence was not observed in the tooth model, which exhibited similar stresses in the facial and lingual sides. The BDI presented the capacity to reduce the strain and the stress in the proximal zone of the trabecular bone, exhibiting the higher values approximately at the middle of the implant length. Regarding the von Mises stresses registered in the cortical bone for the BDI, they were higher than the ones registered in the tooth model, although it will be interesting to compare the results in cortical bone with other commercially available dental implants. The bone quality also affects the stresses in the bone. For the trabecular bone, the stresses decreased with the decrease of the bone density, but the opposite occurred in the cortical bone. the bone growth inside the slits of the BDI, which is expected over time, has also been simulated. It was possible to observe that the model's displacement decreased with the increase of bone ingrowth, increasing the stability of the implant. Within the limitations of the simulations performed, since isotropic, homogeneous, and linear materials were considered, it was possible to observe the behavior of the BDI is similar to the tooth and can be an interesting solution with bone integration. In the future step, the model will be improved to consider the bone compression during implantation.