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Section Applied Dentistry and Oral Sciences

A vertical strip on the left side of the page shows a microscopic image of biological tissue, likely dental or oral, stained in shades of blue and purple. The tissue shows various cellular structures and textures.

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Section Information

The Applied Dentistry and Oral Sciences Section aims to disseminate the most impactful and innovative knowledge on all the applied sciences relevant to dentistry and oral biology.

This section will consider multidisciplinary research that combines medicine, tissue engineering, stem cell biology, and material sciences, towards the development of novel and promising therapeutic strategies and devices for dentistry and oral medicine applications.

This section will welcome original articles well designed and robustly carried out, and systematic reviews aimed at providing strong and reliable clarifications to clinical and preclinical issues. Moreover, well-conducted reviews and preliminary results of outstanding interest will be occasionally considered by the editorial team.

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Selected Papers



Synthesis and Characterization of Cerium Oxide Nanoparticles: Effect of Cerium Precursor to Gelatin Ratio

Authors: Maria Eleni Ioannou, Georgia K. Pouroutzidou, Iason Chatzimentor, Ioannis Tsamesidis, Nikoleta Florini, Ioannis Tsiaoussis, Evgenia Lympiraki, Philomela Komninou and Eleana Kontonasaki

Abstract: Hemocompatible nanoparticles with reactive oxygen species (ROS) scavenging properties for titanium implant surface coatings may eliminate implant failure related to inflammation and bacterial invasion. Cerium (Ce) is a rare earth element, that belongs to the lanthanide group. It exists in two oxidation states, Ce^{+3} and Ce^{+4} , which contribute to antioxidant, catalytic, antibacterial, and ROS-scavenging properties. The purpose of the present study was to synthesize ceria nanoparticles and to evaluate their hemocompatibility and ROS scavenging properties. The synthesis of Ce-NPs was performed via the sol-gel method, and five different ratios of cerium precursors to gelatin were evaluated. Their characterization was achieved through FTIR, XRD, SEM, and TEM. Hemocompatibility and ROS analysis were evaluated at different concentrations with human erythrocytes. The morphology and size distribution were certified by TEM and the cubic CeO_2 fluorite structure was identified by selected area electron diffraction and high-resolution TEM.

<https://doi.org/10.3390/app13042676>



Primary Stability Assessment of Conical Implants in Under-Prepared Sites: An In Vitro Study in Low-Density Polyurethane Foams

Authors: Luca Comuzzi, Margherita Tumedei, Ugo Covani, Tea Romasco, Morena Petrini, Lorenzo Montesani, Adriano Piattelli and Natalia Di Pietro

Abstract: Bone characteristics, the implant macrogeometry, and the drilling technique are considered the main important factors to obtain a good implant primary stability (PS). Indeed, although it is known that implant placement in poor bone sites increases the possibility of implant failure, several surgical procedures have been proposed to improve PS, such as site under-preparation. Hence, this in vitro study aimed to evaluate the insertion torque (IT), removal torque (RT), and resonance frequency analysis (RFA) of conical implants (3.3 and 4 × 13 mm) placed in under-prepared sites on 10 and 20 pounds per cubic foot (PCF) density polyurethane sheets (simulating a D3 and D2 bone, respectively) with and without a cortical sheet of 30 PCF in density (corresponding to a D1 bone). After using ANOVA or Kolmogorov–Smirnov test to elaborate data, the resulting IT and RT values were directly proportional to the polyurethane block densities and increased with the increasing amount of site under-preparation. In conclusion, in this in vitro study using low-density polyurethane blocks, the under-preparation of the implant insertion sites was shown to be effective in increasing implants' PS.

<https://doi.org/10.3390/app13106041>



A Digital 3D Retrospective Study Evaluating the Efficacy of Root Control during Orthodontic Treatment with Clear Aligners

Authors: Monica Macri ,Silvia Medori,Giuseppe Varvara and Felice Festa

Abstract: This study aimed to investigate the efficacy of torque movement and the incidence of root resorption in the maxillary and mandibular teeth with clear aligner therapy using cone-beam computed tomography. The sagittal root positions, the faciolingual inclinations, and the root lengths of 672 teeth, from central incisors to first molars for each arch, were measured and compared on virtual cross sections from pre-treatment and post-treatment cone-beam computed tomography of 28 patients who received comprehensive orthodontic treatment with clear aligners. An improvement of root position was found in incisors, canines, and premolars of the upper and lower arches. There was a statistically significant torque increase for incisors, canines, and first premolars at the end of therapy. Comprehensive treatment with clear aligners improved sagittal root position and increased torque, especially in the anterior teeth. Most teeth showed mild resorption after clear aligner therapy, and only two showed moderate resorption.

<https://doi.org/10.3390/app13031540>



Automated Detection of Periodontal Bone Loss Using Deep Learning and Panoramic Radiographs: A Convolutional Neural Network Approach

Authors: Jihye Ryu, Dong-Min Lee, Yun-Hoa Jung, Oh Jin Kwon, Sun Young Park, Jae Joon Hwang and Jae-Yeol Lee

Abstract: (1) Background: The accurate diagnosis of periodontal disease typically involves complex clinical and radiologic examination. This study focuses on the use of panoramic radiographs. The objective is to evaluate whether panoramic radiographs are a reliable source for the detection of periodontal bone loss using deep learning, and to assess its potential for practical use on a large dataset. (2) Methods: A total of 4083 anonymized digital panoramic radiographs were collected using a Proline XC machine (Planmeca Co., Helsinki, Finland) in accordance with the research ethics protocol. These images were used to train the Faster R-CNN object detection method for detecting periodontally compromised teeth on panoramic radiographs. (3) Results: This study demonstrated a high level of consistency and reproducibility among examiners. (4) Conclusions: The regional grouping of teeth exhibited reliable detection performance for periodontal bone loss using a large dataset, indicating the possibility of automating the diagnosis of periodontitis using panoramic radiographs.

<https://doi.org/10.3390/app13095261>

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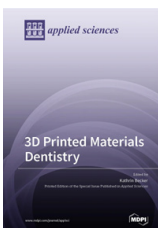
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