Cycle 38th

Student: Cianconi Giovanni
Thesis Tentative Title: Removal of Accumulated Hard Tissue Debris (AHTD) from Root Canals with an Electric Current Device: A MicroCT Preliminary Report

Abstract

In modern endodontics, removal of accumulated hard tissue debris (AHTD) from root canals is requested. In the last decade, different irrigating solutions and activation methods have been successfully tested. Sonic activation has been shown to be effective in the removal of AHTD. Electric current has been tested before in restorative dentistry, but not in endodontics. An experimental electric current delivering device was compared in the removal of AHTD, using microCT analyses. Fifteen single-rooted teeth were shaped with TruNatomy system endodontic files and divided into three groups: negative control group: specimens underwent no activation; EA group: specimens were activated with EndoActivator (EA); EB group: specimens were activated with ElectroBond (EB). The 2D images, 3D images and morphometric analysis from the microCT showed a statistically significant increased AHTD removal when EB was used. Results of the present preliminary study showed that the irrigant activation with ElectroBond is encouraging when compared to EndoActivator along the entire root canal system. The AHTD was significantly statistically reduced, validating the clinical use of electric fields in endodontics.

Student: De Angelis Riccardo
Thesis Tentative Title: Narrow Implants and Overdentures in the Total Rehabilitation of Atrophic Edentulous Jaws: Review of Clinical Aspects with Meta-Analysis

Abstract

The present study analyzes the clinical aspects of the use of small-diameter implants for the fixation of total overdenture-type prostheses on both totally edentulous dental arches.
Most databases were analyzed, and clinical studies involving the insertion of at least two narrow implants were analyzed. Studies showed that the survival rate of narrow implants varied from 78% to 100%. The results indicated that narrow-type implants have satisfactory and predictable clinical performance for the long-term stability of overdenture-type prostheses.

Student: Gentile Davide
Thesis Tentative Title: Effects Of Intraoral Aging On Surface Roughness Of Removable Orthodontic Retainers: A Prospective In Vivo Study

Abstract

Removable retainers (RR) are devices aimed to minimize the risk of relapse and maintain the achieved dental occlusion. Their effectiveness is closely linked to the properties of the materials used to make them. Primarily, the increase in surface roughness provokes plaque accumulation, worsening its fit. This study compares the changes of RR surface roughness after intraoral usage at different time intervals: before the use, after three months and after six months of use.

Student: Grattagliano Asia
Thesis Tentative Title: Synthesis of New water-soluble electroactive species for sustainable Redox Flow Batteries (RFB)

Abstract

In this study, we synthesized and characterized nickel tetra-(4-sulfonatophenyl) porphyrin (NiTPPS) for Aqueous Organic Redox Flow Batteries (AORFBs). We used 1-butylpyridinium tetrafluoroborate (BupyBF4) as a supporting electrolyte to reduce porphyrin aggregation and expand water potential stability. DFT calculations and UV-Visible absorption studies showed that adding the metal atom enhances the porphyrin's

chemical and electrochemical stability. BupyBF4 also improved redox process resolution, addressing water electrolysis issues.

Student: Kerpi Bora
Thesis Tentative Title: Effects of administration of endocrine disruptors in drinking water in male mice transgenic for the neu oncogene which spontaneously develop salivary gland adenocarcinoma.

Abstract

Endocrine disruptors (Eds) are chemicals with the ability to alter the normal balance of hormones with adverse effects on the body. Male BALB-*neu* T mice is a suitable animal model to study salivary gland tumor progression during Eds administration.
Preliminary observations indicated that, in comparison to control, BPA ingestion did not alter the body mass growth. However, in BPA-treated mica as compared to control we found an earlier onset of tumors, an increased tumor growth, a reduction of the tumor-free survival and of the overall survival.

Student: Leggeri Andrea
Thesis Tentative Title: Hyaluronic acid as a new adjuvant material in bone regeneration

Abstract

The primary outcome was to assess possible histomorphometric differences in new bone formation and in remaining graft particles when HA was added in bone regeneration. Meta-analyses were performed using the fixed and random-effect model to significative changes in new bone formation and in remaining graft particles. After screening procedures, only three randomized controlled trials fulfilled the inclusion criteria and were selected for qualitative and quantitative analysis. The effect size of HA in new bone formation was not statistically significant at 95% CI (Z=1.734, p-value=0.083, CI -,399; 6,516).

Student: Montalto Manuela
Thesis Tentative Title: Development of Platinum group metal free electrocatalysts for polymer electrolyte water electrolyzers

Abstract

This work investigates high entropy oxides (HEOs) as catalysts for the oxygen evolution reaction (OER) in anion exchange membrane water electrolyzers. A series of HEOs, optimized in terms of synthesis method and stoichiometry of the metals, was characterized regarding of OER activity (RDE experiments), structure (Rietveld refinement), composition (ICP-OES), and chemical surface analysis (XPS). The optimized synthesis and the tailored composition of the HEOs were effective in promoting the formation of a single-phase spinel oxides, with a homogeneous distribution of the metals. Furthermore, the best-performing catalyst was tested at the anode side of an AEMWE single-cell, showing high OER activity, (J=1.8 Acm^{-2} at 2.2 V) and good durability (>50h).

Student: Vesna Osmanagiq
Thesis Tentative Title: Skeletal and dentoalveolar changes by Rapid Expansion and Lip Bumper Therapy in Pre-Puberal phase vs Twin Block therapy in pre-puberal in Class II malocclusion with mandibular retrusion.

Abstract

The aim of our therapy in treated patients is to reduce the interposition of the lip and correct the Class II transverse problem caused by mandibular retrusion. The action on the transversal plane leads to an improvement in the interarch relationships, in order to be able to deal with the second phase of therapy at peak growth in a better way, reduce the incidence of incisal trauma and keep the patient under medical supervision.
The improvement in the Co-Gn value, i.e. the total mandibular length, is an indication of how early therapy can influence mandibular growth. However, in our opinion, this value should be evaluated for a longer time interval in order to verify the extent of growth in phases closer to the growth peak.

The reduction of the ANB angle in our group indicates that the therapy undertaken helps patients to improve their skeletal relationship, bringing us closer to the ideal Class I relationship.
The analyzed divergence values, SN^GoGn and ArGoMe, appear to have decreased. This data suggests that the therapy used may be useful in controlling divergence.
The overjet parameter remained unchanged post therapy, a justifiable result considering that some of the patients had a combined therapy with retroincisive springs or positioning of 4 brackets on the upper arch, positioned in order to improve the inclination of the upper incisor, with the objective of promoting anterior sliding of the mandible. Therefore the increase in overjet in some patients, which therefore led to the unchanged average result, was mainly caused by the alteration of the U1-PF inclination. However, it must be considered that an excessive decrease in the overjet in this phase would compromise the possibility of progressing to the next phase of therapy with functional equipment.
In conclusion, the results we obtained lead us to think that the analysis should be conducted for a more prolonged period of time, with a larger sample and possibly making a comparison with an untreated control group that is homogeneous.

Student: Pietrafesa Davide
Thesis Tentative Title: Computational design of RNA aptamers targeting the HuR protein as apromising therapeutic strategy for cancer

Abstract

Human Antigen R (HuR) stabilizes mRNAs, and its dysregulation contributes to cancer. Given HuR's role in promoting inflammation, it is a potential therapeutic target. RNA aptamers have emerged as selective inhibitors. Although HuR's full structure is unresolved, RosettaFoldNA was used to model HuR-RNA interactions, while AlphaFold3 to model HuR-aptamer complexes. These models underwent classical molecular dynamics (MD) simulations and Gaussian-accelerated MD simulations, respectively, showing the stability of the HuR-RNA model and the promising inhibitorypotential of aptamers against HuR.

Student: Pietrosanti Virginia
Thesis Tentative Title: Study and characterization of radiation effects on electronic components for avionic and space environment with neutron and optical probes

Abstract

During the second year of my Industrial PhD I mainly worked on the data analysis of two experiments performed at the ISIS Neutron and Muon Source (UK) during my first year and I collaborated with Thales Alenia Space Italia, the PhD co-financing industry. I spent a period abroad at ISIS@UK to perform experiments and data analyses with ChipIr beamline team. I started writing papers for both experiments performed, and the data analysis results are given below together with a list of the PhD formation activities.

Student: Scalzini Lorenzo
Thesis Tentative Title: High-throughput molecular analysis of gene expression to evaluate the role of nanoceria as anticancer and anti-inflammatory agents

Abstract

The project involves conducting high-throughput molecular and bioinformatic analyses with the aim of studying the role of nanoceria in the context of anti-cancer and anti-inflammatory therapies. In particular, we want to assess the role of cerium oxide nanoparticles as a potential co-treatment due to their strong anti-inflammatory and anti-tumour activities by studying gene expression in a prostate cancer model simulating treatment with chemotherapeutic or hormonal therapies. In this 2nd year, I performed RNA-seq and pathway enrichment analyses, showing how nanoceria modulates inflammation and differentiation and confirming that ADT affects DNA repair, EMT and NED.

Student: Urbani Marta
Thesis Tentative Title: Anti-inflammatory activity of cerium oxide nanoparticles

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Ph. D Program in Materials for Sustainable Development
(Former denomination Materials for Health, Environment and Energy)

Abstract

Prostaglandin E2 (PGE-2) is a lipid mediator responsible for the activation of inflammation and immune response. During the first year, I observed that cerium oxide nanoparticle (nanoceria), specifically decrease PGE-2, converting it into its anti-inflammatory counterpart, PGA-2. In this second year, I tested how such activity impacts on two ex-vivo models of immune response, showing that nanoceria, by reducing PGE-2 levels, boost T lymphocytes activation and signalling. Moreover, in an in vitro prostate cancer model, I showed that nanoceria, with the same mechanism, prevent therapy-induced tumor progression.

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