# Scientific Letters

VOLUME 1 SUPPLEMENT 2 (2023) ISSN 2795-5117


## BOOK OF ABSTRACTS

IUCS-CESPU Publishing

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**https://doi.org/10.48797/sl.2023.112**

For citation purposes, cite each abstract independently as indicated on the abstract page at https://publicacoes.cespu.pt/index.php/sl/issue/view/112.

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UNIPRO
ral Pathology
and Rehabilitation Research Unit

# II INTERNATIONAL CONGRESS OF UNIPRO RESEARCH UNIT (IUCS–CESPU)

## 1ST – 2ND OF JUNE 2023
## MUSEU DE PENAFIEL / PORTUGAL

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INCLUDING

## II CONFERENCE ON ADVANCES IN RESEARCH ON ORAL CANCER

CONVENED BY
**UNIPRO** (IUCS-CESPU) &
**THE WHO COLLABORATING CENTRE ON ORAL CANCER** (LONDON, UK)

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**ISSN** 2795-5117 (online)

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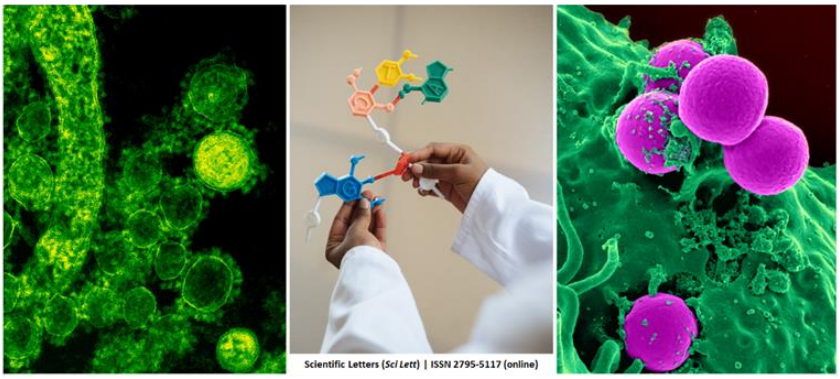


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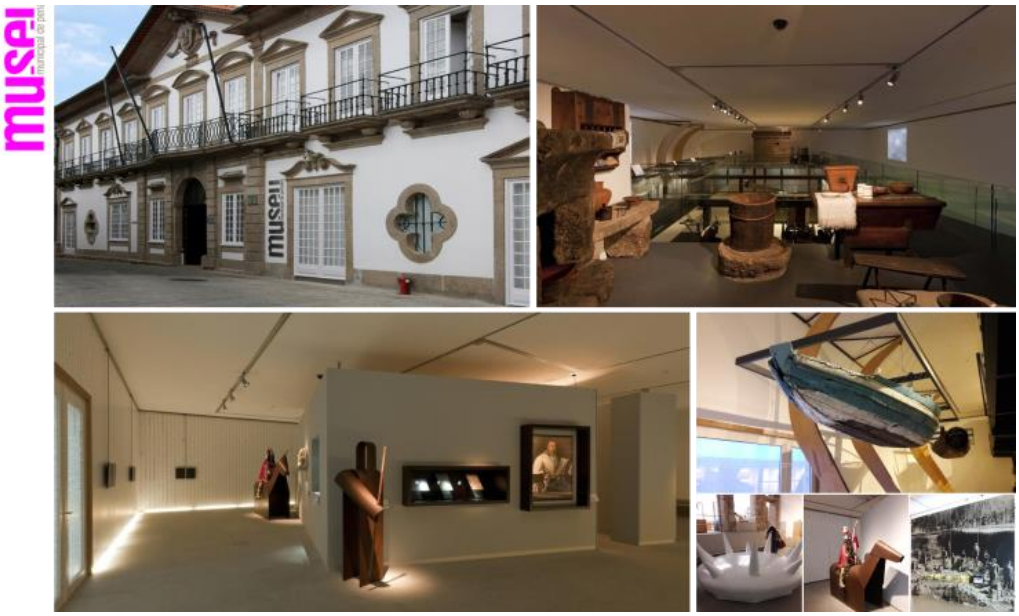
*II International Congress of UNIPRO Research Unit 2023*

*Including*

*II Conference on Advances in Research on Oral Cancer*

Museu de Penafiel, 1st and 2nd June 2023

**Museu de Penafiel**




## Organizing Entities

- UNIPRO - Oral Pathology and Rehabilitation Research Unit
- IUCS – Instituto Universitário de Ciências da Saúde, CESPU

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## WELCOME MESSAGE

Dear collegues,

It is with a great honour that we promote the II INTERNATIONAL CONGRESS OF UNIPRO RESEARCH UNIT from Instituto Universitário de Ciências da Saúde (IUCS) held in Museu de Penafiel in 1st and 2nd of June 2023.

We have included a wide and comprehensive group of lectures with speakers from worldwide research units that will give an outstanding contribution in the knowledge of the field of oral disease and their treatment advances. We promote also the presentation of the research works in oral communication or poster format regarding many of the research lines related with Oral Pathology and Rehabilitation.

We will have the "II Conference on Advances in Research on Oral Cancer" convened by UNIPRO and the WHO Collaborating Centre on Oral Cancer (London, UK) coordinated by Professor Saman Warnakulasuriya, with many actual issues on research in oral cancer field.

Many of the included topics are the translation of the research performed in the inside of the Clinical and Labs Unit´s walls to the improve Oral health in Society such as orthodontics & orofacial disorders including masticatory function and temporomandibular disorders; biomechanics of dental implants; importance of dentistry in aerospace research; cytology applied to diagnosis; the use of artificial intelligence in the diagnosis of oral cancer; delays in diagnosing oral cancer; etiologic and risk factors including smoking in oral potentially malignant disorders; circulating tumor cells: periodontal disease etiopathogenesis and its relation with systemic diseases; and 3D print tissue technologies.

This congress is based and the reflection of the mission of UNIPRO, that aims to establish bridges of connection with the scientific, academic and society in general, where the acquisition, transfer of scientific knowledge and translational applicability are the manifestation of UNIPRO's major objectives.

We look forward to sharing our exciting and engaging programme with you.

Welcome to UNIPRO!

*Luís Monteiro*

# SCIENTIFIC PROGRAMME

## 1st JUNE, 2023

### ORTHODONTICS & OROFACIAL DISORDERS

*Session manager:* **Teresa Pinho** *(UNIPRO-IUCS)*

**08h00** ***Conference Registration***

**08h50** ***Opening of the Congress***

**09h00** CAD-CAM ceramic blocks in adhesive rehabilitation of Maxillary Lateral Incisor Agenesis. | Maria João Calheiros-Lobo, Ricardo Carbas, Lucas F.M. Da Silva, Teresa Pinho (UNIPRO-IUCS |IBMC-i3s |FEUP | INEGI, Portugal)

**09h30** Clear aligners: is there an Impact in occlusion, masticatory Function and TMDs? | Vanessa Marcelino, Maria Paço; Maria dos Prazeres Gonçalves, Teresa Pinho (UNIPRO-IUCS | TOXRUN-IUCS | UnIGENe, IBMC, Portugal)

**10h00** Disc displacement treatment: a clinical study. | Júlio Fonseca (Sociedade Portuguesa de Disfunção Têmporo-Mandibular, Dor Orofacial e Sono, Portugal)

**11h00** ***Coffee break & Poster viewing***

**11h30** Myofascial orofacial pain and pain referral. | Fernando Exposto (Section for Orofacial Pain and Jaw Function, Department of Dentistry and Oral Health, Aarhus University, Denmark)

**12h30** ***Congress Opening Session***

**13h00** ***Lunch***

### ORAL REHABILITATION

*Session manager:* **José Manuel Mendes & António Sérgio** *(UNIPRO-IUCS)*

**14h00** Aerospace Dentistry: Finding the way to the stars we improve problems on Earth. | Victor LLoro (Space Generation Advisory Council: Viena, AT)

**15h00** Studies on biomechanics of dental implants – from conceptualization to practice. | Ana Lúcia Messias (Faculty of Medicine, University of Coimbra, Portugal)

**16h00** ***Coffee break & Poster viewing***

### COMMUNICATE RESEARCH IN ORAL PATHOLOGY & ORAL REHABILITATION

*Session manager:* **Hassan Bousbaa, José Barbas do Amaral & Paulo Miller** *(UNIPRO-IUCS)*

**16h30** Cytology applied to diagnosis. | Fernando Ferreira (UNIPRO-IUCS, Portugal).

**17h20** Presentation of selected Oral Communications.

**OC 01 -** In vitro evaluation of the effects of double insertion into bone on the surface of titanium alloy mini-implants. | Ana Beatriz Gomes Miranda

**OC 02 -** Coronal repercussions of the maxillary central incisor torque in the first set of aligners. | Ana Catarina Azeredo de Oliveira

**OC 03 -** Analysis of the impact of prison conditions on the oral and nutritional health of inmates in a prison in northern Portugal-Preliminary results. | Mariana Dias

**OC 04 -** Efficiency and predictability of arch expansion with Invisalign® system: Clinical study compared to integrative systematic review. | Ana Sofia Barbosa e Rocha

**OC 05 -** Retention Capacity of Original Denture Adhesives and White Brands for Conventional Complete Dentures. | Joana Cláudia Morais da Silva Mendes

**18h05** ***Closing of the Congress Works.***

## 2nd JUNE, 2023

### II CONFERENCE ON ADVANCES IN RESEARCH ON ORAL CANCER

convened by **UNIPRO** and the **WHO** Collaborating Centre on Oral Cancer

*Session manager:* **Luís Monteiro** *(UNIPRO-IUCS)* **& Saman Warnakulasuriya** *(King's College London)*

**09h00** Oral Potentially Malignant Disorders – Challenges in Diagnosis & Management. | Saman Warnakulasuriya (King's College London, United Kingdom)

**09h40** Artificial intelligence in the diagnosis of oral cancer/OPMDs. | Alexander Ross Kerr (New York University, USA)

**10h20** Delays in Diagnosis of Oral Cancer; How to minimize delays. | Juan Seoane (University Santiago de Compostela, Spain)

**11h00** ***Coffee break & Poster viewing***

**11h30** Oral Cancer in Latin America. | Alan Roger Santos-Silva (Piracicaba Dental School, State University of Campinas (UNICAMP), Brasil)

**12h10** Exploring Circulating Tumor Cells: Advancements in Identification and their Implications for Oral Cancer. | Luís Lima & Lucio Lara Santos (Portuguese Oncology Institute of Porto, Portugal)

**13h00** ***Lunch***

### ADVANCES IN RESEARCH IN ORAL PATHOLOGY & REHABILITATION

*Session manager:* **Cristina Cabral, Filomena Salazar, Odília Queirós & Paulo Rompante** *(UNIPRO-IUCS)*

**14h00** Clinical research in dentistry for the 21st century. Problems and solutions. | António Mata (SED)

**14h45** Periodontal disease etiopathogenesis and its relation with systemic diseases, with a focus on diabetes mellitus. | Marta Relvas (UNIPRO-IUCS, Portugal)

**15h25** In vitro study on the behavior of different implant-abutment connections, in Klockner dental implants, in the absence of load and after load application-SEM and Micro-CT analysis. | Ana Sofia Vinhas (UNIPRO-IUCS, Portugal)

**16h00** ***Coffee break & Poster viewing***

**16h30** Teaching a robot to 3D print tissue | Introduction to Advanced Solutions Life Sciences. | James B. Hoying (Advanced Solutions Life Science, Manchester NH USA)

**17h00** Presentation of selected Oral Communications.

**OC 06 -** Evaluation of the effectiveness of mouthwashes in controlling the oral microbiota. | Carlos Miguel da Silva de Sousa Veiga

**OC 07 -** Antimicrobial resistance of opportunistic pathogens isolated from periodontal and peri-implant biofilm. | Joana Magalhães Silva

**OC 08 -** Promoting oral cancer cell death by combining an apoptosis inducer with an antimitotic. | João Pedro Nunes Silva

**OC 09 -** Loss of prosthetic abutment screws on single crowns. Which is the best option to solve this problem? | Lara Sofia Barros Coelho Medina

**OC 10 -** The Influence of Saliva pH on the Fracture Resistance of Two Types of Implant-Supported Bis-Acrylic Resin Provisional Crowns - An In Vitro Study. | Sofia Alexandra Sousa dos Santos

**18h00** ***Closing session.***

*II International Congress of UNIPRO Research Unit 2023*

*Including*

*II Conference on Advances in Research on Oral Cancer*

Museu de Penafiel, 1st and 2nd June 2023

# INVITED SPEAKERS

## INVITED SPEAKERS

**Maria João Calheiros-Lobo**

Degree in Medicine (1985) and Dental Medicine (1989) - University of Porto, Portugal. Post-Graduation in Oral Implantology, Oral Surgery, Cosmetic Dentistry, Orthodontics and Chronobiology and Sleep Medicine. Mini-residency in Biomaterials and Adhesive Dental Medicine - University of Minnesota, USA. Invited Assistant Professor, since 1992, Conservative Dental Medicine Service (IUCS-CESPU). Researcher at FCT - PTDC/QUI/72683/2006; /WHO/5890/2004. Researcher at UNIPRO- Research Unit in Oral Pathology and Rehabilitation (IUCS-CESPU). Author and co-author of articles in international peer-reviewed journals in the field of salivary proteomics, and biomaterials in dental materials and oral rehabilitation (Scopus - Index h-12 and Index i10-13). Private clinical practice mainly in Dental Cosmetics, Implantology and Orthodontics.

**Vanessa Marcelino**

PhD student in Biomedical Sciences UNIPRO - Oral Pathology and Rehabilitation Research Unit. Researcher in group UNIPRO- Oral Pathology and Rehabilitation Research Unit, University Institute of Health Sciences (IUCS-CESPU). Dentistry Integrated Master's degree (IUCS-CESPU). Invited assistant at the University Institute of Health Sciences (IUCS-CESPU). Orthodontic Clinical Course - Trevisi Zanelato MBT Philosophy. Post-graduate Diploma in Interceptive Orthodontics (IUCS-CESPU).

**Júlio Fonseca**

Licenced in Dentistry in 2004 by the Department of Dentistry - Faculty of Medicine, University of Coimbra, Portugal. Post-Graduated in Oral Prosthetic Rehabilitation by the Department of Dentistry - Faculty of Medicine, University of Coimbra, Portugal. Master in Experimental Patology - Faculty of Medicine, University of Coimbra, Portugal (thesis in the Bruxism area). PhD in Temporomandibular Disorders at the Faculty of Medicine, University of Coimbra, Portugal, 2020. Invited Assistant until 2015 of the disciplines of Dental Anatomy, Fisiology of the Stomatognatic System, and Occlusal Rehabilitation of the Integrated Master in Dentistry of the Department of Dentistry - Faculty of Medicine, University of Coimbra, Portugal. Vice-President of the ´´Sociedade Portuguesa de Disfunção Temporomandibular e Dor Orofacial'' (SPDOF) between 2014-2018. President of the ´´Sociedade Portuguesa de Disfunção Temporomandibular e Dor Orofacial'' (SPDOF) between 2018-2021. Vice-President of the Sleep Section of the ´´Sociedade Portuguesa de Disfunção Temporomandibular e Dor Orofacial'' (SPDOF) since 2014. Member of the Deontologic Council of the Portuguese Dental Association. Member of the OMD Sector Skills Monitoring Committee. Author and Co-Author of several articles and presentations published/presented in national or international cientific journals and congresses. Conferencist and lecturer of several Courses in Prosthodontics, Oro-Facial Pain and Temporo-Mandibular Disorders areas. Private Practice in Prosthodontics, Orofacial Pain and Temporomandibular Disorders.

**Fernando Exposto**

DDS - Instituto Superior Ciências de Saúde Egas Moniz (ISCSEM), Portugal (2007). American Board of Orofacial Pain (ABOP) diplomate. Master in Dental Sciences - Danube University, Krems, Austria (2010-2012). Orofacial Pain residency, University of Kentucky, Lexington, USA (2013-2015). Master in Headache Disorders – Danish Headache Center, Copenhagen, Denmark (2016-2018). PhD fellow, Section of Orofacial Pain and Jaw Function, Department of Dentistry and Oral Health, Aarhus University, Denmark (2016 - 2019) Assistant Professor, Section of Orofacial Pain and Jaw Function, Department of Dentistry and Oral Health, Aarhus University, Denmark (2021 – present). Diplomate of the American Board of Orofacial Pain since 2016. 31 peer-reviewed publications. H-index 9 (Scopus). Citations: 203 (Scopus, May 2023).

**Victor LLoro**

Oral Rehabilitation Dentist / Oral Surgeon. Dentistry degree, Official Master of Research in Dental Sciences and Expert in Legal and Forensic Dentistry (Universitat de Barcelona Facultat d'Odontologia). PhD in Medicine and Translational Research (Universitat de Barcelona). Member of the Societat Catalana d'Odontologia i Estomatologia, the Aerospace Medical Association, the Asociacion Española de Ergonomia, the International Association of Aerospace Dentistry, the Sociedad Española Cirugia Bucal, the Societat Catalana Medicina Aeroespacial, Subacuatica i Ambiental and the Space Generation Advisory Council.

**Ana Lúcia Messias**

Assistant professor – Faculty of Medicine, University of Coimbra. Member of the EAO Editorial Office Committee. Member of CEMMPRE – Center for Mechanical Engineering, Materials and Processes, University of Coimbra. Member of LBIM – Bioinformatics and Medical Statistics Laboratory.

**Fernando Ferreira**

Degree in Dentistry. Degree in Pathologic, Cytologic and Thanatologic Anatomy. PhD (University of Barcelona). Post-Graduate in Legal Medicine. President of CESPU's General Assembly. Coordinator of CESPU Diagnóstico.

**Saman Warnakulasuriya**

Professor Warnakulasuriya is an emeritus professor of Oral Medicine and Experimental Pathology at King's College London, UK and was the Chairman of the Oral Medicine Division at King's College Hospital and at Guy's Hospital, London between 2005 -2015. He has made major contributions to cancer epidemiology, oral medicine and clinical trials. He is a leading expert on human carcinogens, especially tobacco, alcohol and areca nut that cause mouth cancer. His early work showed that smokeless tobacco and areca nut cause cancers of the mouth and have led the International Agency on Research on Cancer to confirm these substances as Class 1 carcinogens and to re-affirm an Europe-wide ban on smokeless tobacco use. Professor Warnakulasuriya has also been involved in developing the terminology and classification of oral potentially malignant disorders and studied their natural history and molecular changes during progression to malignancy. He has made substantial contributions to the world literature. Research interests: Epidemiology, natural history, screening and molecular markers of oral cancer and pre-cancer.

**Alexander Ross Kerr**

Dr. Ross Kerr received his DDS from McGill University in Montreal, Canada, and his MSD and certificate in Oral Medicine at the University of Washington. He is a Clinical Professor and the Director of Oral Medicine in the Department of Oral & Maxillofacial Pathology, Radiology & Medicine at New York University College of Dentistry and the recipient of NYU's distinguished teaching award. He is a past president of the American Academy of Oral Medicine, secretary of the American Board of Oral Medicine, steering committee member of the World Workshop on Oral Medicine, member of the executive committee of the European Association of Oral Medicine, and member of the Scientific Advisory Board for the Oral Cancer Foundation. His research experience includes the evaluation of current and emerging technologies for the detection and diagnosis of oral cancer and oral potentially malignant disorders. He has contributed more than 100 publications to the dental and medical literature.

**Juan Seonane**

Professor in Oral Surgery, University of Santiago de Compostela. Coordinator of the National Campaigns for the Prevention of Oral Cancer of the Spanish Dental Council. Past-president and current member of the Continuing Education Commission of the Spanish Dental Council. Academic in the medical-surgical section of the National Academy of Dental Sciences of Spain. Author of more than 200 scientific articles in the field of oral pathology.

**Alan Roger Santos-Silva**

Doctor of Dental Surgery (São Paulo State University, UNESP, Brazil) and specialist in Oral Medicine and Oral Pathology (Brazilian Federal Dental Council); Master of Science in Oral Medicine and PhD in Pathology at Piracicaba Dental School, The University of Campinas (UNICAMP, Brazil) and visiting researcher at the School of Clinical Dentistry (Oral & Maxillofacial Department), University of Sheffield, England. Oral Medicine specialist at the São Paulo State Cancer Institute (ICESP, São Paulo University Medical School; 2010-2011) and currently holds the position of Associate Professor in the Oral Diagnosis Department at UNICAMP. Coordinator of the Graduate Program (MSc and PhD courses) in Oral Medicine and Pathology at UNICAMP [CAPES 6 (2012-2016)]; Member of the academic Working Groups of the World Workshop on Oral Medicine VIII (American Academy of Oral Medicine) and the International Agency for Research on Cancer (IARC) Handbooks of Cancer Prevention to produce Volume 19 entitled "Oral Cancer Prevention" that will be edited by the World Health Organization (WHO). e-mails: alan@unicamp.br; alanroger@hotmail.com

**Luís Lima**

Luís Lima is a highly qualified researcher with extensive experience in cancer biomarkers. He obtained a BSc in Applied Biology from the University of Minho in 2005, an MSc in Molecular Medicine and Oncology from the Medical Faculty of the University of Porto in 2008, and a PhD in Biomedical Sciences from the Abel Salazar Biomedical Sciences Institute from the University of Porto in 2014. His research career began during his BSc studies, where he focused on studying microsatellite instability and loss of heterozygosity on chromosome in bladder cancer. During his MSc dissertation, he investigated the role of FAS/FASL genetic polymorphism on prostate cancer susceptibility. In his PhD, he developed a predictive model of BCG therapy response in bladder cancer using genetic polymorphisms and tumor-associated biomarkers. As a postdoctoral researcher, he worked with the Experimental Pathology and Therapeutics Group from CI-IPOP in collaboration with the Glycobiology in Cancer group, IPATIMUP, i3S. During this time, he focused on identifying glycobiomarkers as targets for bladder cancer chemoresistant cells and evaluating the role of circulating tumor cells (CTCs) in gastrointestinal cancer. In 2020, as a Junior Researcher, he started leading a research line and a team (currently with four members, two PhD and two MSc students) in cancer biomarkers, specifically in the role of CTCs in cancer management and more recently in fecal biomarkers for CRC screening. Lima has published over 35 research papers, with an h-index of 19 and a total citation count of 1435. Additionally, he has authored two book chapters, has one registered patent, and has supervised/co-supervised two PhD theses and seven MSc dissertations. Furthermore, he has participated in five projects as a fellow and researcher, and currently an exploratory project granted by FCT and a European project, where he is also a co-PI. Overall, Luís Lima is a highly accomplished and skilled researcher with a strong focus on cancer biomarkers and an impressive track record in academia.

**Lúcio Lara Santos**

Lucio Lara Santos. Completed the Title of Aggregate in Medical Sciences in 2019 by the Abel Salazar Institute of Biomedical Sciences of the University of Porto, PhD in Medicine in 2003 by the Faculty of Medicine of the University of Porto, Master in Oncobiology in 1993 by the Faculty of Medicine of the University of Porto and Doctor in Medicine in 1985 from the Faculty of Medicine of Agostinho Neto University (Angola). At the Portuguese Institute of Oncology of Porto Francisco Gentil EPE, he is a member of the Scientific Council of the IPOFG-CRP, a member of the Antibiotics Committee of the Department of Oncological Surgery, a member of the group responsible for the Oncological Registry, Coordinator of the Hepato-bilio-pancreatic Surgery Unit from the Digestive Pathology Clinic, Research Coordinator of the Experimental Pathology and Therapeutics group and Director of the Intermediate Care Unit. Currently, he is an Associate Professor at the Abel Salazar Institute of Biomedical Sciences of the University of Porto, Associate Professor at the Fernando Pessoa University, and he also develops teaching activities at 4 more universities in the country. He adds activities as a collaborator at the Institute for

Research and Innovation in Health, as well as at the Research and Studies Center of the Fernando Pessoa University. At the present time he has more than 156 publications in specialist journals, having written 13 book chapters and 7 books in the field of Oncology and Dentistry. He adds to this curriculum several missions in Guinea-Bissau, Angola, Cape Verde and Mozambique, in coordination with national and international entities, with the aim of improving cancer care in those countries.

**António Mata**

Full Professor; PhD in Biology, Oral Biology speciality; UICOB - Biomedical and Oral Sciences Research Unit; Research Group: GIBBO; Area of Interest: Oral Biochemistry, Oral Biology, Oral Medicine, Evidence Based Dentistry.

**Marta Relvas**

Graduate in Dentistry in 2002 by Cooperativa de Ensino Superior Politécnico e Universitário, completed the Master in Public Health in 2005 by Oporto University -School of Medicine, and Doktor (PhD) in Scientific advances in dentistry in 2012 by the University of Santiago de Compostela. Published 14 articles in journals and is the author of several poster papers at national and international congresses. Supervised 17 MSc dissertation(s). Has received 4 awards and/or honors. Principal investigator in 3 project(s) and Researcher in 3 project(s). Works in the area(s) of Medical and Health Sciences with emphasis on Health Sciences. Specialist in Periodontology and is an assistant Profesor at IUCS. He is a member of UNIPRO.

**Ana Sofia Vinhas**

1991-1997 | Degree in Dentistry (IUCS – CESPU); 2007-2010 | Master in Periodontology (IUCS – CESPU); 2016 | Specialty College of Periodontology of the Order of Dentists; 2019/09-2023/01 | Universidad de Sevilla: Sevilla, ES; Phd in Oral Pathology and Health: Local and systemic implications (Department of Stomatology Faculty of Dentistry of the University of Seville); 1997-2023 |DMD Professor on IUCS-CESPU; 2018/01-2023 | Coordination of Post-graduated Programm of Clinical Periodonics and Peri-implantology.

**James Hoying**

James (Jay) Hoying is a Partner and Chief Scientist at Advanced Solutions Life Sciences (ASLS) with more than 30 years of experience in basic and applied biological sciences with a focus in tissue biology, tissue vascularization, and tissue fabrication. At ASLS, he directs an active laboratory developing a variety of advanced, vascularized human tissue models and tissue therapeutics. Prior to joining ASLS, he was Professor and Chief of the Division of Cardiovascular Therapeutics at the Cardiovascular Innovation Institute (CII) where he developed a broad background in tissue fabrication, cell therapeutics, and translation of discoveries to industry and the clinic. Dr. Hoying is an inventor of the Angiomics® vascularization technology and holds numerous patents related to vascularizing tissues and related cell-based therapies.

*Invited Speaker 1*

# CAD-CAM ceramic blocks in adhesive rehabilitation of maxillary lateral incisor agenesis

**Maria João Calheiros-Lobo** [1,2,ǂ,*] **Ricardo Carbas** [3,4,ǂ], **Lucas F. M. da Silva** [3,4,ǂ] **and Teresa Pinho** [1,5,ǂ]

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## Abstract

**Background:** Treatment planning in clinical situations of maxillary lateral incisor agenesis (MLIA) is often complex and non-consensual. Whenever the biological parameters suggest a treatment option with space closure, complementary esthetic rehabilitation with modern restorative adhesive techniques may be necessary at an early age, requiring long-term adaptations. If space opening is the option, a resin-bonded bridge (RBB) can be an interim rehabilitation until skeletal maturity is achieved to place an implant-supported crown, or a definitive rehabilitation if the patient has financial restrictions or an implant is contra-indicated. Still, the scientific evidence for the best therapy to follow is lacking. Computer-aided design and computer-aided manufacturing (CAD-CAM) materials are versatile and tempting to use as esthetic restorative options. Micromechanical bonds and chemical interactions are needed to achieve long-lasting adhesive restorations. Yttria partially stabilized zirconia is an interesting tough esthetic material, but, despite research, its adhesive strength to the tooth and other ceramics is still hazardous. **Objectives:** To find a straightforward material to deliver minimal preparation RBBs for tooth replacement in MLIA, either definitive or interim. **Methods:** One aisle RBB made from three CAD-CAM ceramic blocks (VITA Enamic (ENA), Suprinity (SUP), and Y-ZPT) and one 3D printed material (ABS) were assessed by shear bond strength (SBS) and mode of failure, after adhered with the best match adhesive cement/CAD-CAM material to an artificial substrate, based on data obtained in previous testing. **Results:** The mean ± standard deviation SBS values were ENA (20.05 ± 7.47 MPa) < ABS (19.90 ± 1.60 MPa) < SUP (24.07 ± 3.94 MPa) < Y-ZPT (30.88 ± 10.07 MPa). The mode of failure was mostly adhesive for Y-ZPT, cohesive for SUP and ENA, and cohesive with plastic deformation for ABS. **Conclusions:** Despite the different mode of failure, the tested model of RBBs stand loads capable of supporting anterior maxillary physiological occlusal loads.

**Keywords:** CAD-CAM materials; maxillary lateral incisor agenesis; polymer-infiltrated ceramic; esthetic perception; adhesive interface

## Acknowledgments

This research was funded by CESPU, CRL (Grant number AlignAgen-GI2-CESPU-2022).

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*Invited Speaker 2*

# Occlusal changes with clear aligners: a longitudinal cohort clinical study

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## Abstract

**Background:** Clear aligners (CA) cover the teeth occlusal surfaces for approximately 22 hours per day [1], leading to a frequently reported posterior occlusal open bite, possibly altering the stomatognathic system [1-5]. **Objectives:** 1) To analyze occlusal changes during clear aligner treatment (CAT) and after completion using CA at night only; 2) to compare planned and obtained occlusal contacts; 3) to evaluate and characterize the most difficult teeth movements; 4) to characterize the masticatory performance (MP) after CAT; 6) to verify the relation between occlusal changes and case complexity and facial biotype and, finally, 7) to verify temporomandibular disorder's possible onset. **Methods:** A quantitative, comparative, and observational longitudinal cohort study, with two non-probabilistic convenience samples of 82 and 42 individuals, was performed. Meshlab®, ClinCheck®, and My-Itero® software were used at the beginning of the treatment (T0), after completion (T1), and 3 months later (T2). Case complexity was assessed through the Invisalign® tool, and MP by colorimetric technique. Diagnostic criteria for Temporomandibular Disorders (DC/TMD) Axis I and IBM SPSS® software were used for statistical purposes. **Results:** Statistically significant increases in posterior occlusal contact and areas were verified between T1 and T2. Changes in occlusal area (from T0 to T1) were statistically different between hyperdivergent (28.24 [15.51- 34 40.91]) and hypodivergent (16.23 [8.11- 24.97]) ($p = 0.031$), and between hyperdivergent (4.0 [2.0-5.0]) and normodivergent (5.5 [4.0-8.0]) for the anterior contacts at T1 ($p = 0.044$). Anterior contacts were higher than planned ($p = 0.037$). The hardest tooth movements were distalization, rotation, posterior intrusion, and extrusion. MP increased along with posterior occlusal contacts ($p<0.05$). Class I individuals presented higher anterior contacts compared to class II ($p=0.004$). **Conclusions:** Occlusal contacts decreased during CAT. Using CA at night enhances their recovery. Occlusal contacts obtained differed from the planned. No relation between Class Molar Angle, facial biotype, case complexity, and P was verified. During CAT, no signs and symptoms of TMD were verified.

**Keywords:** clear aligner; masticatory function; temporomandibular disorder; case complexity; occlusal contact

## Acknowledgments

This work was supported by UNIPRO—Oral Pathology and Rehabilitation Research Unit, 409 University Institute of Health Sciences (IUCS), CESPU, 4585-116 Gandra, Portugal, in the scope of 410 AlignAgen-GI2-CESPU-2022.

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*Invited Speaker 3*

# Disc displacement treatment: a clinical study

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## Abstract

**Background:** Conservative and first-line approaches, involving dentist intervention and physical therapy, are recommended for disc displacement (DD) treatment. The condylar distraction technique (RDC) is one of the most widely used physical therapy resources, repeated over an extended period of treatment [1-5]. **Objective:** The aim of this work was the study, design, development, and clinical evaluation of a functional device capable of performing and assisting patients in the condylar distraction maneuver. **Materials and Methods:** The conception, design, and execution of the functional prototype of the device were initiated through the analysis of the clinical conditions of operation and functional requirements; obtaining average anatomical measurements from image segmentation and/or shape survey techniques; development of 3D geometry; finite element study; machining, surface treatment; experimental evaluation in laboratory and clinical context and functional tests. The National Invention Patent was approved under no. 110605. Subsequently, a randomized controlled trial was conducted [5]: 40 patients with unilateral diagnosis by the RDC/TMD criteria of DD with or without reduction, with or without limitation of opening and arthralgia were randomized by a control group (G1) undergoing conventional therapy (anterior repositioning splint and manual distraction by the physiotherapist) and a test group (G2) undergoing conventional therapy plus condylar distraction in ambulatory by the patient with the distraction device. Patients were evaluated for 90 days for a set of physical and psychosocial variables of pain and mandibular function. **Results:** According to our study, the use of the distractor allowed a significant improvement in VAS I (pain at rest) in G2 (-5.0±2.29 cm) compared to G1 (-4.12±2.50 cm), and statistically different at 90d (p=0.005). Pain at rest and in function variation indicated a marked and immediate improvement with the establishment of distractor therapy, as well as in the 28-90 days range (the longest evaluation time); for the 3 openings, the differences throughout the study and the absolute values reached by G2 were always larger than in G1. The distractor allowed statistically significant improvements in the subjective perception of chewing and therapeutic efficacy, a decrease in the number of dentistry and physical therapy appointments (p<0.001), and also a lower (corrected daily) cost of treatment (p=0.024). **Conclusions:** The distractor proved to be extremely safe without any serious adverse effect.

**Keywords:** temporomandibular disorders; disc displacements; condylar distraction

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*Invited Speaker 4*

# Mechanisms of orofacial referred pain

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## Abstract

Musculoskeletal pain is an enormous societal challenge due to its high, and increasing, prevalence in the population, and the fact that there are no efficient preventive or treatment modalities. One of the most common features of mus-culoskeletal pain is the presence of pain referral and spreading (PRS). PRS is when pain travels from a pain source to another body part(s). When present, PRS are associated with increased disability, as well as healthcare and socioeconomic burden, when compared to localized pain [1-5]. A common theory regarding PRS is that it is due to the presence of trigger-points in the muscle and, as such, it is a pathophysiological situation and treatment is usually directed at these structures. However, we have shown that PRS can occur in healthy individuals by palpating the muscle of healthy individuals without any signs of trigger-points and that the occurrence of PRS is directly correlated with the painfulness of the palpation [1-5]. This indicates that PRS is likely a normal response of the muscle to noxious stimuli. In addition, we have also shown that, unlike what was previously thought, the location of PRS is not fixed and can be altered by noxious stimuli, and that the endogenous pain system can heavily modulate the occurrence of PRS [1-5]. In this lecture, I will give an overview of some of the latest findings regarding the pathophysiology of PRS and how it relates to clinical practice.

**Keywords:** muscle pain; referred pain; pain spreading

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*Invited Speaker 5*

# Aerospace Dentistry: finding the way to the stars we improve problems on Earth

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## Abstract

**Background:** This presentation is the result of a four-year-long research project oriented to establish whether dentistry is relevant to the space race, and if, consequently, the creation of a scalable dental module capable of housing a treatment center for dental pathologies on the next manned missions to the Moon and Mars is necessary and feasible. Space agencies around the world consider knowledge of aerospace dentistry to be a priority, both at a preventive level and in terms of treatment needs for space missions, in which a dental emergency could represent an important risk for the success of the mission. **Objective:** To assess the incidence and prevalence of dental and orofacial health problems in zero g conditions, to determine causal factors and to determine the requirements to be established for the outer space dental treatment module. To validate the Oral BioFilter (OBF®) device for the control of cross-contamination by aerosols and microdroplets. **Results:** Oral health events are related to cavities, followed by periodontal pathologies and third molar pathologies. The increase of IgA and salivary α-amylase and changes of the microflora have been observed in short-term space missions. These alterations could jeopardize the success of long-term space missions by causing oral and systemic pathologies. In case of dental event, OBF® devices have shown a significantly efficient reduction of biological aerosol cross-contamination during dental procedures. **Conclusions:** Implementing the space dental module must be a multidisciplinary project involving engineers, physicians, pharmacists, chemists, biologists, astronauts, cosmonauts, etc., based on the expertise and experience of dentists and on the evidence shown in documents such as line of research.

**Keywords:** aerospace dentistry; aviation dentistry; cross contamination control; aerosol

## Acknowledgments

This research project has received, for its preparation and development, the following grants: Grant of the School of Dentistry (Faculty of Medicine and Health Sciences) of the University of Barcelona, for financing the PhD project (*XXIII convocatoria d´ajuts per a la recerca per a estudiants de Doctorat i Postgrau de la UFR d´Odontologia*), 2020. Research project granted by the European Space Agency (ESA) for the development of a device to minimize the dispersion of the splatter and aerosols produced during dental treatment. The project was carried out in 2014-2016. Research project granted by EIT Health Spain Headstart 2016.

*Invited Speaker 6*

# Studies on biomechanics of dental implants – from conceptualization to practice

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## Abstract

Mastering the biomechanics of dental implants and implant-supported prosthesis is paramount to deliver lasting rehabilitations. With this presentation, we aim to present the workflow of the major methods of investigation in *in silico* and *in vitro* implant biomechanics. The presentation will focus on the good practice for conducting finite element studies and on the normative requirements for experimental studies, namely the International Standard Organization regulations that guide experimental testing of dental implants and materials for implant-supported prosthesis. Some studies [1-3] will be presented to demonstrate the applicability of the technical information displayed during the presentation.

**Keywords:** biomechanics; dental implants; finite element analysis; experimental studies; ISO regulations

## Acknowledgments

CEMMPRE is sponsored by national funds through FCT (Fundação para a Ciência e a Tecnologia), under the project UIDB/00285/2020.

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*Invited Speaker 7*

# Cytology applied to diagnosis

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## Abstract

Cytology as an art and science has been recognized since the 20th century, although its great increase has already been verified in the 18th century, with the works of Papanicolaou, and its staining with application to its two main branches: aspiration and exfoliative cytology. Exfoliative cytology has wide application to smears of cervical cells, respiratory and urinary epithelium, ascitic and pleural fluids, as well as skin and mucous cells. Fine needle aspiration cytology has wide application to palpable and non-palpable lesions. The implementation of cytology as a diagnostic technique allowed for an abrupt drop in mortality from cancer, with a strong expression since the 60s, in the early detection of cervical cancer. Cytology is nowadays a safe, simple, fast method with an excellent cost/benefit ratio. More recently, we have seen digitization and the application of algorithms, thus making telepathology and assisted diagnosis possible. In oral health in particular, we have been witnessing the growing application of a new technique of more in-depth exfoliative cytology, of the transepithelial type, all over the world – the brush biopsy/Cytology. This technique allows the observation of cells not only from the mucosa, but also from the conjunctiva. Liquid or conventional oral cytology has shown great diagnostic accuracy. Recent studies show that 63% of oral squamous cell carcinomas can be detected using cytology. CESPU Diagnóstico has been positioning itself as an accredited company for the manufacture of medical devices and developing an innovative technology for cytological diagnosis of the point of care type. Blue Stain technology, with application to liquid and conventional cytology, is now technically and scientifically accredited and available for universal use.

**Keywords:** cytology; diagnosis; brush biopsy/cytology; oral squamous cell carcinoma

*Invited Speaker 8*

# Oral potentially malignant disorders – challenges in diagnosis and management

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## Abstract

Oral potentially malignant disorders (OPMDs) include oral leukoplakia, proliferative (multifocal) verrucous leukoplakia, erythroplakia, oral submucous fibrosis, oral lichen planus, actinic cheilitis, dyskeratosis congenita, and oral lupus erythematosus. In 2020, based on the current evidence, two conditions, lichenoid lesions and oral graft *vs.* host disease, were added to the classification [1]. Differentiation of leukoplakia and erythroplakia from numerous other white and red patches that can be found in the oral cavity is a diagnostic challenge. In this diverse group of conditions, malignant transformation rates vary significantly within subtypes, ranging from around 1% in oral lichen planus to over 50% in conditions such as erythroplakia and proliferative verrucous leukoplakia. A major challenge faced by oral medicine specialists managing these conditions is to assess the risk of an individual patient to predict who may develop a malignancy. The application of adjunctive chair-side tests is still in a development stage to identify a high-risk lesion. The presence and severity of oral epithelial dysplasia in a biopsy is considered the gold standard for assessing the risk for malignancy development, but sampling errors and the subjectivity of reporting may limit an accurate prediction. Novel approaches, such as compilation of risk models by combining the dysplasia grade with ploidy status, supplemented by biomarker data on tissue-based molecular features [2], may optimize risk prediction. There are no effective medical therapies to manage OPMDs [3]. Surgical interventions may reduce malignancy development [4]. Long term regular follow up and periodic surveillance by oral visual examination to detect an early carcinoma remains the cornerstone of management and an effective way for downsizing the disease burden and possibly reduce the incidence of invasive cancer. Habit interventions, i.e., smoking cessation, alcohol moderation and improving diet, coupled with surgical interventions for early cancers detected through surveillance of potentially malignant disorders, could contribute to reduce the related mortality.

**Keywords:** leukoplakia; erythroplakia; oral potentially malignant disorders; malignant transformation

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*Invited Speaker 9*

# Artificial intelligence in the diagnosis of oral cancer/OPMDs

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## Abstract

Oral cancer and potentially malignant disorders (OPMDs) are a significant health concern globally. Early detection and management are critical for improving patient outcomes, but the current methods for diagnosis are limited and often subjective. Artificial intelligence (AI) has shown potential in improving the accuracy and efficiency of cancer diagnosis in various fields, including oral cancer and OPMDs. Several studies have explored the application of AI in oral cancer and OPMDs. One approach involves using machine learning algorithms to analyze various imaging modalities, such as digital photography, and optical coherence tomography (OCT). By training algorithms on large datasets of images, AI systems can accurately identify the potential to risk stratify suspicious lesions. Another approach involves using AI to analyze patient data, such as medical histories and risk factors, to predict the likelihood of developing oral cancer or OPMDs. These predictive models can assist clinicians in identifying patients who may require further monitoring or intervention. AI has also been explored in the development of novel diagnostic tools for oral cancer and OPMDs. Despite some promising results, several challenges remain in the implementation of AI in oral cancer and OPMD diagnosis. These include the need for large, diverse datasets to train AI models, ensuring data privacy and security, and addressing potential biases in algorithmic decision-making. **Conclusions:** AI has the potential to improve the diagnosis and management of oral cancer and OPMDs. While further research and development are necessary to overcome existing challenges, the application of AI in this field holds promise for improving patient outcomes and reducing the burden of oral cancer worldwide.

**Keywords:** artificial intelligence; oral cancer; oral potentially malignant disorders

*Invited Speaker 10*

# Diagnostic delay: new perspectives, targets for research and intervention

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## Abstract

Since the middle of the last century, avoiding cancer diagnostic delays has been a priority objective for professionals and policy makers. However, in the field of oral cancer, these efforts have not been able to increase diagnoses in early stages, nor drastically improve patient survival. In the last decade, we have moved from blame models – blaming the patient or professional for this delay – towards study models that include a conceptual framework – different time intervals that monitor the patient's path to treatment and contributing factors. The use of these models has allowed studies that associate long intervals until diagnosis with diagnoses in advanced stages, and long intervals until treatment with poorer survival in these patients. The interval associated with the patients, their delay in recognizing bodily changes and in seeking help, occupies a predominant role in the patients' path to treatment, but there is also room for improvement, in the interval of primary care and in the hospital interval. Interventions aimed at reducing the time to diagnosis and treatment have been carried out at different levels, being heterogeneous, and showing limited effectiveness.

**Keywords:** muscle pain; referred pain; pain spreading

## Acknowledgments

Project financed by the Ministerio de Ciencia e Innovación, Instituto de Salud Carlos III, and co-financed by the European Union (PI21/01206).

*Invited Speaker 11*

# Oral cancer in Latin America

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## Abstract

The International Agency for Research on Cancer (IARC/WHO) oral cancer prevention manual highlights Latin American countries as a hotspot of high incidence and high mortality rates for oral cancer. In this presentation, together with the prestigious research unit of IUCS CESPU, the historical, social, economic, clinical and pathological main aspects that impacted the countries of this international context and that created a dramatic human panorama will be discussed in view of the great physical and psychosocial morbidity that malignant tumors of the mouth generate for these populations.

**Keywords:** oral cancer; Latin America; epidemiology; incidence; mortality

*Invited Speaker 12*

# Exploring circulating tumor cells: advancements in identification and their implications for oral cancer

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## Abstract

Oral cancer poses a significant global public health challenge, demanding urgent attention. A considerable number of oral cancer cases is detected at advanced stages, resulting in a low likelihood of survival. Metastasis plays a crucial role in this unfavorable prognosis. This process is initiated by circulating tumor cells (CTCs), which instigate a cascade of events that ultimately lead to oral cancer-related deaths. Multiple studies have highlighted the potential of CTCs in oral cancer, indicating that CTCs enumeration and identification can play multiple roles in this context. This biomarker shows promise in predicting recurrence and also presents prognostic significance for both disease-free survival and overall survival. Additionally, the quantification of CTCs can serve as an indicator of therapeutic efficacy and provide valuable insights for ongoing patient monitoring. However, current CTC isolation approaches have limited sensitivity. The RUBYchip™ is a novel microfluidic technology that captures CTCs based on size and deformability directly from whole blood samples, demonstrating efficacy across different cancer types. Incorporating CTCs into clinical practice is crucial for early recurrence detection and disease monitoring. The RUBYchip™ surpasses standard techniques, offering superior performance and enhancing CTC-based diagnostics and monitoring capabilities. Our group has been actively engaged in optimizing and clinically validating this technology, yielding excellent outcomes in gastrointestinal cancers. These successes have highlighted its versatility and potential for application in various cancer types. In this context, oral cancer presents an intriguing model for utilizing this technology. The early detection and characterization of CTCs hold significant promise in enhancing the diagnosis, prognostication and even treatment of oral cancer, making it an area of great interest and potential impact.

**Keywords:** circulating tumor cells; oral cancer; metastasis; prognosis; RUBYchip™

*Invited Speaker 14*

# Periodontal disease etiopathogenesis and its relationship with systemic diseases, with a focus on diabetes mellitus

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## Abstract

**Background:** Periodontal diseases, including periodontitis and gingivitis, are chronic inflammatory diseases that cause the destruction of the tissues that support the tooth. Diabetes mellitus and periodontal diseases correspond to inflammatory diseases that have common pathogenic mechanisms, with the involvement of pro-inflammatory mediators. The worldwide prevalence of periodontal diseases ranges from 20 to 50%, according to the Global Burden of disease. In Portugal, only one national study was published in 2015 using the CPITN index [1-4]. A bidirectional relationship between type 2 diabetes and periodontitis has been documented in several studies. **Objectives:** The aims of this lecture are to analyze the definition, epidemiology and etiopathology characteristics of periodontal disease and make a comparison with world literature. **Material and Methods:** We will present data from etiologic and epidemiology characteristics of periodontal disease, showing results from current research in the Portuguese population and comparisons with other reports. **Results:** The prevalence of periodontitis and gingivitis was 48.6% and 26.9%, respectively. Concerning the severity of periodontitis, the most prevalent stages were severe and very severe. In our recent study from CHTS T1DM patients, the prevalence of periodontal disease was 59.1% for periodontitis, 36.4% for gingivitis, while 4.5% presented periodontal health. Regarding the severity of periodontitis, the most frequent stage was IV (38.5%), followed by stage II (26.9%), 18.0% having stage III and 15.4% stage I. In another study, regarding the inflammatory mediators, higher levels of IL-1β were found in periodontitis stage III/IV patients, compared to the healthy controls ($p = 0.006$). **Conclusions:** Periodontal disease is a prevalent disease in Northern Portugal, and is related to the presence of systemic diseases, such as diabetes mellitus. More studies with comprehensive samples of patients should be performed to confirm our results.

**Keywords:** periodontal disease; inflammatory diseases; gingivitis; periodontitis; diabetes mellitus

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*Invited Speaker 15*

# *In vitro* study on the behavior of different implant-abutment connections, in Klockner dental implants, in the absence of load and after load application – SEM and Micro-CT analysis

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## Abstract

**Background:** Ideally, prior to their clinical application, all implant components must demonstrate suitable durability in laboratory studies. Fatigue tests utilizing cyclic loading typically simulate masticatory function *in vitro*. **Objectives:** To evaluate the influence of implant-abutment connection design in torque maintenance after 3 mechanical requests. **Methods:** 4 KLOCKNER implants (External/Internal connection) were submitted to 3 different mechanical requests: single tightening, multiple tightening, multiple tightening, and cyclic loading. The removal torque values (RTV) of the screws were recorded after the 3 phases. 16 samples were evaluated by SEM and Micro-CT Surface topography, and axial displacement of abutment into the implant from each group was evaluated with SEM and Micro-CT and compared with an original sample. **Results:** After one single tightening and multiple tightening, for all connections, RTV were lower than those of insertion. Repeated tightening followed by cyclic loading was the phase that generated the lowest RTV. The Vega implant obtained very similar mean RTV in the 3 phases considered. The application of the tightening torque causes the appearance of contact marks on the faces of the hexagon of the abutment and the implant. The pillar-implant distances in SK2 and KL samples do not show statistically significant differences in the measurements, for any of the mechanical demands analyzed. Statistically significant differences were observed in measure b in Vega implants, and in a and b measures, for Essential implants. **Conclusions:** The connection design, in our study, influenced the maintenance of preload, under cyclic loading. Clinically, our results recommend retightening retaining screws, a few minutes after insertion. The application of mechanical compression loads causes deformation and contact marks in all models tested. At a general level, a clear intrusion of the abutment into the implant can only be confirmed in the Essential model.

**Keywords:** Klockner dental implants; SEM analysis; Micro-CT analysis; implant-abutment connection; torque maintenance

*Invited Speaker 16*

# Teaching a robot to 3D print tissue – introduction to Advanced Solutions Life Sciences

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## Abstract

3D tissue models hold great potential as tools for a variety of applications, including disease modeling, drug discovery, and therapeutic development. Typically, fabricated tissues, whether for academic, industry, or clinical use, are manufactured one at a time, "by hand", in a laboratory setting. Scaled, consistent production of even simple tissues (e.g., cells on a scaffold), much less tissues with more complex architectures and multiple components (e.g., with a vasculature), requires more effective fabrication and culturing solutions. Using our BioAssembly® robotic 3D tissue modeling platform, we are developing workflows to fabricate a variety of vascularized tissues and tissue models. Our approaches involve the integration of numerous fabrication methods (including bioprinting) with robotic controls to design, fabricate, and analyze these tissue models in an automatable and tissue-specific fashion. A key advantage of this system is its flexibility, matching the automation to the application. Due to our wide array of tools or Hands that autonomously attach to the robotic arm, BAB has the capacity to fabricate a broad variety of 3D tissue models, readily accommodating any size well plate or custom culture platform. Entire workflows, controlled by our BioApps™ software, limit human involvement, yet offer opportunities for user input during the operation, as needed. Our group is currently exploring applications related to vascularized adipose organoids [1], colorectal cancer patient-derived organoid (PDO) drug screening, living bone graft manufacturing for mandibular/oral reconstruction [2], thick vascular human liver tissue modeling [3], and more. Each 3D tissue application utilizes an automated, single-run process with BAB's robotic arm performing the sequence of required, varied, tasks as instructed by the user. With this approach, we envision users utilizing custom experimental and/or patient-specific data, in combination with off-the-shelf or patient-specific cells and materials, to fabricate tissue models with sufficient rigor and at scale to meet the application needs.

**Keywords:** 3D models; robot; tissues; BioAssemblyBot®; bioprinting

## Acknowledgments

Much of the work was performed by Senior Staff Scientists Sarah Moss, MS and Hannah Strobel, PhD. Research was partially sponsored by the Office of the Secretary of Defense and was accomplished under Agreement Number W911NF-17-3-003. We thank the Center of Integrated Biomedical and Bioengineering Research (CIBBR) at the University of New Hampshire, supported via the Center of Biomedical Research Excellence (COBRE) program through the National Institutes of Health (NIH), for use of their imaging resources.

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# SELECTED ORAL COMMUNICATIONS

*Oral Communication 1*

# *In vitro* evaluation of the effects of double insertion into bone on the surface of titanium alloy mini-implants

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## Abstract

**Background:** Anchorage is defined as the resistance to unwanted tooth movement. Mini-implants are very popular orthodontic anchorage devices because they are inexpensive, independent of patient cooperation and have an easy insertion protocol. Economic and environmental aspects raise the hypothesis of reuse of these devices. The changes caused by the insertion of mini-implants from bone may be decisive for their success (1-5). **Objective:** To evaluate the effect of double bone insertion on the surface of titanium mini implants. **Methods:** Bibliographic search in the PubMed platform, using the keywords "sterilized miniscrews"; "surface analysis"; "orthodontic mini-implants"; "retrieved miniscrew" and "scanning electron microscopy". Nine articles were selected. 30 mini-implants were divided into 3 groups: Group 1: control group, new mini-implants; Group 2: experimental group, mini-implants inserted into bone; Group 3: experimental group, mini-implants inserted twice consecutively into bone. The surface of the mini-implants in the 3 groups was evaluated by scanning electron microscopy (SEM). **Results:** The new mini-implants (G1) presented surface deformation and contamination. Dark stains were found in all groups, presumably originating from the manufacturing process and from the contact with the atmosphere. The recovered mini-implants (G2 and G3) present spiral edge wear contrary to the sharp edges of the new mini-implants. The most significant change found in the recovered mini-implants (G2 and G3) was the wear of the active tip (more rounded and shorter), mainly in the double inserted mini-implants (G3). **Conclusions:** The mini-implants that come from the manufacturer (G1) already have surface changes and impurities. The recovered mini-implants (G2 and G3) present generalized surface wear. The shortening and rounding of the active tip were found in G2 and G3 mini-implants, being more significant in G3 mini-implants.

**Keywords:** sterilized miniscrews; surface analysis; orthodontic mini-implants; retrieved miniscrew; scanning electron microscopy.

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*Oral Communication 2*

# Coronal repercussions of the maxillary central incisor torque in the first set of aligners

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## Abstract

**Background:** Coronal torque, the buccolingual inclination of the crown, is one of the key factors in orthodontic treatment. An adequate torque value has an impact on esthetics and soft tissue profile (1-5). **Objective:** analyze the efficacy of the maxillary central incisor torque in the *Invisalign* system and evaluate the relationship between torque movement of the maxillary central incisor and the patient's facial biotype. **Methods:** Quantitative, comparative, and observational longitudinal cohort study with a sample of 27 patients. The main inclusion criteria were definitive dentition (with or without third molars) undergoing orthodontic treatment with *Invisalign* esthetic aligners and individuals who had already completed, in full, the first series of orthodontic treatment with esthetic aligners without misfits. The planned movements were obtained from the Invisalign Doctor Site platform. Pre-treatment (T0) and after full use of the first set of aligners (T1) scanners were evaluated using *Geomagic Control X*™. Case complexity was assessed through the Invisalign tool. IBM SPSS software for statistical purposes was used. **Results:** We found statistically significant differences in the torque movement value between T0 and T1 in the proinclination sample ($p < 0.001$), as well as between achieved and planned values in this subgroup ($p = 0.011$). Regarding the relationship between facial biotypes and torque movement at T0, there are statistically significant differences between hypodivergent and hyperdivergent biotypes ($p = 0.025$). At T1, there are statistically significant differences between the hypodivergent and hyperdivergent biotypes ($p = 0.042$) and the normodivergent and hyperdivergent biotypes ($p = 0.029$). **Conclusions:** This study highlights the unpredictability of the torque movement of maxillary central incisors, which is more accentuated in the proinclination sample. Regarding the facial biotype, there were no significant differences between the planned and achieved torque values at T1 for the proinclination sample and the retroinclination sample.

**Keywords:** incisor; torque; orthodontic treatment; removable; orthodontic movement techniques

## Acknowledgments

This work was supported by *CESPU-Cooperativa de Ensino Politécnico Universitário,* Gandra, Portugal**,** in the scope of *AlignAgen-GI2-CESPU-2022.*

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*Oral Communication 3*

# Analysis of the impact of prison conditions on the oral and nutritional health of inmates in a prison in northern Portugal- preliminary results.

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## Abstract

**Background:** The prison establishment is a difficult environment for the promotion of oral health and intensifies unhealthy behaviors (1,2). Thus, this population has a higher prevalence of dental caries and periodontal disease, and all this is largely due to the greater consumption of sugar, drinks, poor foods from a nutritional point of view, drug abuse and oral negligence (3). **Objective:** Assess the impact of prison conditions on the oral health and nutritional status of inmates. **Methods:** A cross-sectional study was carried out with 53 male prisoners, aged between 18 and 70 years old. Respondents were subjected to nutritional and sociodemographic testing and an intraoral clinical examination to subsequently perform CPOD and periodontal classification. Nutritional status was assessed by Body Mass Index (BMI) and weight (Kg)/height(m2). **Results:** The average age of the sample was 42.8±9.2 years. It was observed that 79.6% had caries lesions. The mean CPOD was 18.16±8.44 and the component with the greatest weight was the number of missing teeth, with a mean value of 13,88±8,44. About the eating habits, 66.0% eat sugary foods and 71.7% eat foods with high oleic potential. Most participants (52.8%) have normal weight and 37.7% are overweight. It was found that 85.0% of overweight individuals are serving a sentences of more than 12 years. **Conclusions:** A positive, but weak, correlation was found between BMI and periodontal status. A higher prevalence of dental caries was associated with the type of diet and lifestyle. The conditions of detention and diet have an influence on oral health, requiring an effort to promote oral and nutritional health.

**Keywords:** oral health; prisoners; undernutrition; nutritional status

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*Oral Communication 4*

# Efficiency of arch expansion with the Invisalign system

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## Abstract

**Background:** The Invisalign technology aims to guarantee aesthetics and at the same time, to present good results, although the effectiveness of this system is still controversial. The expansion of the arch is possible with this system and, together with the intrusion of the lower incisors and the distalization of the upper molars, it is one of the most predictable movements, being able to help correct crowding and posterior dentoalveolar crossbites (1-3). **Objective:** To evaluate the effectiveness and predictability of maxillary and mandibular arch expansion during the first series of treatment with Invisalign clear aligners. **Methods:** For this clinical study, the tooth movement tables of 75 previously selected cases were analyzed regarding the width of the dental arch and expansion efficiency, through the Invisalign platform, considering the models of pre-treatment (T0), treatment planned (TP) and post-treatment (T1) by Clinchek software. **Results:** For each maxillary and mandibular measurement, there was a statistically significant difference between pre- and post-aligner values. The predictability/efficiency of the Invisalign software's ClinCheck were determined after completion of the treatment of the first series of aligners by comparing the expansion achieved on the digital models (T1) and the planned expansion (T0). At the maxillary level, there were statistically significant differences between planned and achieved expansion, at the level of the first molar where the achieved expansion was $0.23 \pm 0.94$ mm greater than expected, and at the canine level ($p < 0.001$), where the achieved expansion was $0.56 \pm 0.64$ mm less than predicted. At the mandibular level, statistically significant differences were only verified in the first molar, and the expansion obtained was greater than that predicted by ClinCheck. **Conclusions:** The Invisalign system can be considered effective in the expansion movement. Predictability was reasonable for the expansion movement.

**Keywords:** Invisalign; effectiveness; expansion; clear aligners

## Acknowledgments

This research received no external funding.

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*Oral Communication 5*

# Retention capacity of original denture adhesives and white brands for conventional complete dentures

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## Abstract

**Background:** Denture adhesives (DAs) promote stability, chewing ability, and quality of life [1-3]. **Objective:** To compare the effectiveness of original brand and white brand DAs in their retention of conventional complete dentures. **Methods:** This study followed the recommendations of the international standard ISO 10873 [4]. Three original brands of DA (Corega® Fixação 3D, GlaxoSmithKline®, Stafford Miller Ltd., Dungarvan Co. Waterford, Ireland), KuKident® Pro Procter & Gamble Technical Centres®, Ltd., Whitehal Lane, Germany and Elgydium® Fix, Laboratórios URGO® SL, Florida, Spain) were compared to three white brands (Fixação Extra Forte Pingo Doce®, Laboratórios Cosmodent®, Cantabria, Spain), Fixador de Próteses (Continente®, Propack®, Gmbh, Ladenburg, Germany) and Creme Fixador de Próteses (Auchan®, Ellipse®, Roubaix, France). Their retention capacities were analyzed using a mechanical test device. **Results:** The mean retentive ability of original brand adhesives ($M = 11.16$, $SD = 5.27$) was significantly higher ($t(298) = 11.88$; $p < 0.001$) than that of the white brands ($M = 5.92$, $SD = 1.18$). When comparing all brands, statistically significant differences were also observed, $F(5.294) = 707.68$ ($p < 0.001$). Generic adhesive results were more homogeneous. The results of the generic brands from Continente® ($M = 5.24$, $SD = 0.94$) and Auchan® ($M = 5.80$, $SD = 0.79$) were not significantly different, while the Pingo Doce® brand obtained significantly higher mean retention results ($M = 6.71$, $SD = 1.28$). **Conclusions:** The original DA brands have a significantly higher retentive ability than the white brands. Elygidim® Fix had the worst result from the three original brands, and the product from Pingo Doce® had the best result among the three white brands.

**Keywords:** denture adhesives; adhesion mechanism; saliva; complete denture; denture retention; oral health-related quality of life; alveolar ridge

## Acknowledgments

The authors would like to thank the Dentalmaia® prosthetics laboratory. We are also grateful for the availability and cooperation of the Department of Dental Sciences, Cooperative for Polytechnic and University Education (Cooperativa de Ensino Superior Politécnico e Universitário—CESPU).

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*Oral Communication 6*

# Evaluation of the effectiveness of mouthwashes in controlling the oral microbiota

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## Abstract

**Background:** Due to the variety and quantity of microorganisms present in the oral cavity, the clinician should be aware of the different antiseptics available and their effectiveness in controlling bacteria concentration before and after oral surgery [1,2]. Chlorhexidine (CHX) is considered the most effective and most used antiseptic available [3]. **Objective:** To evaluate the susceptibility of a set of 5 microorganisms to 9 different disinfectant mouthwashes. After the choice of the two most effective products, saliva samples were taken before and after a 1-minute rinse with both mouthwashes to evaluate the reduction of Colony Forming Units (CFUs). **Methods:** Part 1: The strains used were from the American Type Culture Collection. The mouthwashes tested contained different CHX concentrations. The halos around each disc were measured and the averages for each mouthwash and for microorganisms were obtained. The two most effective mouthwashes were selected. Part 2: Saliva samples were collected in a sterile vial from a healthy patient without oral pathology. The same patient performed a 1-minute rinse with one of the mouthwashes and, 30 minutes later, a new sample was collected. On a separate day, the collection procedure was repeated with the other mouthwash. The samples were stored and incubated at 37°C for one week and the CFUs were counted. **Results:** For the microorganisms considered, the mouthwashes that exhibited the highest efficacy were Eludril Extra® (EE), followed by Bexident Post® (BP). For the mouthwashes tested, the microorganisms that showed the highest susceptibility were *E. faecalis* and *C. albicans*. BP reduced CFUs by 90.01%, while EE reduced them by 97.77%. **Conclusions:** EE and BP were highly effective in reducing the concentration of microorganisms present in the oral environment, confirming what is advertised by both brands. We can therefore conclude that both mouthwashes can and should be considered before and after oral surgery procedures.

**Keywords:** oral microbiota; chlorhexidine mouthwash; antiseptic susceptibility

## Acknowledgments

This research has received no external funding.

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*Oral Communication 7*

# Antimicrobial resistance of opportunistic pathogens isolated from periodontal and peri-implant biofilm

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## Abstract

**Background:** According to the International Dental Federation, Dentists are responsible for prescribing 10% of all antibiotics for humans. Moreover, studies have shown that these prescriptions are frequently unnecessary. Since antimicrobial resistance (AMR) is one of the greatest threats to World Health, it is increasingly important to optimize the use of antibiotics in dentistry [1-4]. **Objective:** To screen twelve clinical isolates from periodontal and peri-implant biofilm on a panel of antibiotics commonly used for topic/systemic therapy in Dentistry. **Methods:** Antimicrobial susceptibility was tested on each isolate, using the Kirby-Bauer diffusion method to detect antimicrobial resistance of 4 *Enterococcus faecalis* and 2 *Pseudomonas aeruginosa* strains isolated from periodontal biofilm and 4 *E. faecalis* and 2 *P. aeruginosa* strains isolated from peri-implant biofilm. The antibiotics evaluated were Amoxicillin, Amoxicillin + Clavulanic Acid, Ciprofloxacin, Metronidazole, Clindamycin, Erythromycin, Tetracycline, Doxycycline and Cefotaxime. **Results:** All tested strains did not have inhibition zone to Metronidazole. All *E. faecalis* strains were susceptible to Ciprofloxacin; however, all *P. aeruginosa* strains were resistant to this antibiotic. The interpretation of susceptibility based on the diameters of the inhibition zones was not possible for most tested antibiotics due to the lack of information for oral bacteria in the tables provided to clinical laboratories by the European Committee on Antimicrobial Susceptibility Testing (EUCAST). **Conclusions:** Metronidazole is not only ineffective against most bacteria evaluated, but may also have a detrimental effect in Dentistry, as it may contribute to an increase of opportunistic pathogens. There is an urgent need to validate antimicrobial susceptibility interpretation tables for oral microorganisms.

**Keywords:** opportunistic pathogens; periodontal biofilm; peri-implant biofilm; antibiotics; antibiogram

## Acknowledgments

This research received no external funding.

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*Oral Communication 8*

# Promoting oral cancer cell death by combining an apoptosis inducer with an antimitotic

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## Abstract

**Background:** Head and neck cancer is the seventh most frequent cancer worldwide, and it includes oral cancer [1]. Oral squamous cell carcinomas correspond to approximately 90% of all oral cancers [2,3]. Despite promising preclinical results, inhibitors of mitotic kinesins and kinases failed in clinical trials, maybe due to their lack of effectiveness in inducing apoptosis when used as monotherapy [4,5]. Therefore, activating the apoptotic pathway in cells treated with mitotic kinesin and kinase inhibitors can be a good strategy to enhance the efficacy of these antimitotic agents. **Objective:** Kinesin spindle protein (KSP) participates in chromosome segregation, and its inhibition leads to spindle assembly checkpoint activation, forming monopolar spindles, which causes mitotic arrest. The objective of this study was to evaluate the antitumor potential of combining a KSP inhibitor with a pro-apoptotic inducer in oral cancer. **Methods:** To assess the inhibitors' cytotoxic activity, the IC50 was determined using the MTT assay. The Combenefit software was used to determine the effects of different concentration combinations, of which the lowest concentration of the drugs that resulted in the greatest cytotoxic effect was selected. Cell death was assessed by flow cytometry using annexinV/PI staining. Cell fate with the combination treatment was monitored and characterized through time-lapse microscopy. **Results:** This combinatorial approach showed synergistic effects by increasing apoptosis during mitotic arrest. **Conclusions:** The results of this study demonstrate that the anticancer effects of the KSP inhibitor were enhanced with the addition of a BCL2 family inhibitor, highlighting the potential of this combinatorial approach as a useful treatment strategy against oral cancer.

**Keywords:** antimitotics; BCL-2 family inhibitor; apoptosis; combination therapy; oral cancer

## Acknowledgments

This research was funded by CESPU - Cooperativa de Ensino Superior Politécnico e Universitário Crl [Grants Ref. Flav4Tumor-GI2-CESPU-2022; Ref. SGA4Cancer-GI2-CESPU-2022; and Ref. upPTXovcar-GI2-CESPU-2022]. JS gratefully acknowledges CESPU for financial support (BD/CBAS/CESPU/01/2021)

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*Oral Communication 9*

# Loss of prosthetic abutment screws on single crowns – which is the best option to solve this problem?

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## Abstract

**Background:** The loosening of abutment screws is one of the most cited mechanical problems, with an incidence between 4,6-12,7%, and different solutions are described [1]. **Objective:** To review the strategies to avoid the loss of abutment screws. **Methods:** A bibliographic search was done in PubMed with the MeSH terms "dental implants AND screw loosening OR screw preload OR preload loss". Articles presenting options to solve torque loss in abutment screw loosening in single implants were selected. **Results:** Several strategies have been developed to reduce the incidence of screw loss [2], related to: 1) the design of the prosthesis, 2) the properties of the screw/implant, 3) screwdriving techniques. Most of the time, the only option is to manipulate the screw either by retightening it after 10 minutes (to avoid the settling effect) or by applying different coating materials, which can promote greater preload stability. They can be solid lubricants like pure gold, tungsten carbide, diamond-like carbon, polytetrafluoroethylene (PTFE) tape, among others, or liquid lubricants – saliva (human and artificial), blood, Vaseline, chlorhexidine (gel or mouthwash), fluoride or a sealing silicone gel. In addition, some adhesives have been suggested to improve retention [3-5]. **Conclusions:** Most studies show how multifactorial the loss of abutment screws can be. Many strategies are described and, recently, screw coating with lubricants is under great development and seems to be a good option to solve loss of screw abutment.

**Keywords:** dental implants; screw loosening; screw preload; preload loss; screw coating

## Acknowledgements

This research received no external funding.

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*Oral Communication 10*

# The influence of saliva pH on the fracture resistance of two types of implant-supported bis-acrylic resin provisional crowns—an *in vitro* study

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## Abstract

**Background:** Temporary restorations play a fundamental role in oral rehabilitation [1,2]. A properly adapted implant-supported provisional restoration implies better esthetics, contouring and architectural modeling of the upper peri-implant tissue [3]. **Objective:** This study aimed to evaluate the influence of oral pH on the fracture resistance of implant-supported provisional restorations made with two brands of bis-acrylic resin (LuxaCrown® and Protemp™ 4) and to compare the fracture resistance of these two materials. **Methods:** Twenty crowns (ten manufactured using each brand) served as a control, and another forty crowns (twenty of each brand) were aged using artificial saliva with pHs of 4 or 7, for 7 days at 37 ºC, in an attempt to simulate the behavior of these materials inside the oral cavity. Subsequently, all crowns were subjected to the application of a force at a constant speed, in a universal testing machine, until fracture was achieved. **Results:** There were differences in fracture resistance between the two brands of temporary crowns studied. LuxaCrown® provisional crowns, when submitted to artificial saliva with pHs of 4 and 7, had superior resistance to fracture than Protemp™ 4 provisional crowns. **Conclusions:** The LuxaCrown® brand showed greater resistance to fracture than the Protemp™ 4 brand. Salivary pH did not influence the fracture resistance of provisional LuxaCrown® crowns, but did influence the fracture resistance of provisional Protemp™ 4 crowns.

**Keywords:** fracture resistance; bite force; CAD/CAM; implant provisional restorations; bis-acrylic resins; saliva pH

## Acknowledgments

We are grateful for the availability and cooperation of the Department of Dental Sciences, the Cooperative for Polytechnic and University Education (Cooperativa de Ensino Superior Politécnico e Universitário—CESPU).

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# *II International Congress of UNIPRO Research Unit 2023*

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Museu de Penafiel, 1st and 2nd June 2023

# POSTERS

*Poster 1*

# Antimicrobial effect of PRF and derivatives through minimum inhibitory concentrations: systematic review-preliminary study

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## Abstract

**Background:** Through the minimum inhibitory concentration (MIC), defined by the lowest concentration of an antimicrobial substance capable of inhibiting the visible growth of a microorganism, the minimum concentration of Platelet-Rich Fibrin (PRF) that will have this effect is perceived [1,2]. PRF consists of a centrifugation product obtained from physiological, autologous, blood, with high doses of growth factors, platelets, leukocytes, among others, proving to be relevant in tissue regeneration. **Objective:** To evaluate the inhibitory effect of PRF and its derivatives when in contact with microorganisms of the oral cavity, in order to prepare the research laboratory work. **Methods:** A search of scientific articles published between 2013-2023 was carried out in the PubMed platform. A total of 36 articles were obtained, after applying all the inclusion and exclusion criteria, with 5 articles with *in vitro* studies being selected for this work. **Results:** Most cultures with PRF-derived preparations showed a decrease in the initial number of bacteria after the contact period with the microorganisms. The antimicrobial activity was verified against *P. intermedia*, *F. nucleatum*, *A. actinomycetemcomitans* and mainly against *P. gingivalis* [3]. Specifically, between A-PRF+ and i-PRF, the latter demonstrated greater drive, with a lower MIC, in patients with periodontitis [4,5]. Surprisingly, the performance of *A. actinomycetemcomitans* in the presence of the L-PRF exudate resulted in an average bacterial increase [1,2]. **Conclusions:** PRF has a significant antimicrobial inhibitory activity. These effects will vary accordingly with the heterogeneity of each PRF sample and the microorganism with which it will be in contact.

**Keywords:** PRF; MIC; oral pathogen; bacteria

## Acknowledgments

This research received no external funding.

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*Poster 2*

# Relationship between gingival biotype and orthodontic treatment

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## Abstract

**Background:** Gingival biotypes are associated with the behavior of periodontal tissues, whether chemical, physical or bacterial, and with root coating procedures. The thick gingival biotype is more resistant to mechanical trauma and presents better predictability in the healing of periodontal tissues, while the thin gingival biotype causes tissue damage, since it presents less resistance to trauma [1-5]. Prior to orthodontic treatment, an evaluation of the gingival biotype should be performed that contributes to an appropriate clinical diagnosis. **Objective:** Analyze the relationship between gingival biotype and orthodontic therapy. **Methods:** Literature searches were performed in the PubMed database with the following keywords: "orthodontics," "tooth movement", "gingival recessions" and “gingival biotype” in the time range 2013-2023. **Results:** According to the advanced search expression, a total of 128 articles were identified. The bibliographic search of the last 10 years, in language other than Portuguese or English resulted in 52 articles. After the selection of articles accessible in the abstract, 42 articles remained. Based on title relevance, 34 articles were excluded, including 8 final articles. **Conclusions:** Patients with a thin gingival biotype are considered at high risk for root surface exposure. The thin gingival biotype is more common in females and is characterized by having a smaller area of keratinized tissue, therefore making it more susceptible to inflammation, from which the phenomenon of gingival recession reappears more easily.

**Keywords:** orthodontics; tooth movement; gingival recessions; gingival biotype

## Acknowledgments

This research received no external funding.

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*Poster 3*

# Aligners in maxillary expansion in mixed dentition: a systematic review

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## Abstract

**Background:** One of the most common skeletal deformities of the craniofacial region is maxillary atresia, which consists of a narrow palatal dome (1). Transverse maxillary deficiencies in growing patients can be corrected by RME (rapid maxillary expansion) or SME (slow maxillary expansion) (1). Transparent aligners for mixed dentition are an innovation in interceptive orthodontic treatment, providing an average treatment duration of 18 months in a first phase (depending on the severity of the cases) (2). **Objective:** Update the knowledge about the aligners for maxillary expansion in the mixed dentition in interceptive orthodontic treatment. **Methods:** Bibliographic search in *PUBMED* database of scientific articles between 2013 and 2023. **Results:** Several authors found maxillary expansion values in the mixed dentition between 2 and 6 mm (1,2,5), however, *Roberta Lione et al.* found lower values at the level of the permanent first molars (between 1,2 and 1,7 mm) (3). The aligners proved to be efficient in expanding the maxillary arch, as confirmed in *A. Gonçalves et al.'s* retrospective study, with the most accurate dental expansion movements in the maxillary second pre-molar (72.2%) and the least accurate in the deciduous canine (55.2%) (5). Invisible aligners can increase transverse dimensions in the posterior sector and to achieve more physiological anterior dental curves as noted by *E. C. Lombardo et al*. (4). **Conclusions:** Transparent aligners allied with a good patient compliance have proven to be effective in expanding the maxillary arch in mixed dentition. It is crucial for the dentist to be aware of the severity of the patient's condition, which may have implications for the treatment plan.

**Keywords:** maxillary expansion; mixed dentition; aligners; interceptive treatment

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*Poster 4*

# Opioid prescription patterns in dentistry: an overview

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## Abstract

**Background:** The opioid crisis is a serious public health problem associated with exacerbated opioid prescription and consumption [1,2]. Opioid analgesics that are administered to relieve dental pain have the potential to be abused, misused, or become addictive [1,3]. It is unknown whether dentists are overprescribing opioids and if they account for the majority of high-risk prescriptions [4]. Measures to increase the appropriateness and safety of opioid prescription in dentistry should be improved [4]. **Objective:** This review aims to evaluate opioid prescription patterns by dentists and the characteristics associated with potential opioid overprescription. **Methods:** An exhaustive search was performed in PubMed, without any time restriction. We considered research referring overprescription of opioids by dentists for pain control in invasive procedures. **Results:** Through this literature review, we found that the United States have higher opioid prescription than the United Kingdom, after invasive dental procedures [2,4]. From 2012 to 2019, in the United States, dentists prescribed more than 87.2 million opioids [5,4]. Moreover, 1 in 3 opioids prescribed by professionals exceed guidelines [3]. Dental patients are particularly vulnerable to opioid misuse, since they regularly have remaining opioid analgesics, which are a source for future consumption and self-medication [1,2,4]. In England, dentists prescribe codeine only; however, in the United States, they most often prescribe hydrocodone (62.3%-67.2%), codeine (23.2%-16.6%), oxycodone (9.1%-14.2%) and tramadol (4.8%-3.2%) [3,4]. In Portugal, for acute moderate to severe odontogenic pain, if non-steroidal anti-inflammatory drugs associated with paracetamol are not effective, an association with an opioid drug is recommended, with codeine being the first choice. Nonetheless, if there is contraindication or intolerance to codeine, tramadol can be used [5]. **Conclusions:** Opioid prescription to minimize pain in dentistry should be avoided to prevent their misuse, abuse and dependence [1]. Dentists should give preference to first-line treatment with non-steroidal anti-inflammatory drugs [1].

**Keywords:** opioid crisis; abuse; dependence; dentistry; overprescription

## Acknowledgments

This research was funded by Cooperativa de Ensino Superior Politécnico e Universitário (CESPU), project/grant CBTox-AtOpi-GI2-CESPU-2022.

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*Poster 5*

# Characterization of dental traits associated with ancestry in a Portuguese population through three-dimensional images

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## Abstract

**Background:** Human identification is one of the main goals of Forensic Odontology. For this purpose, comparative methods are used, which will allow the comparison of *postmortem* and *antemortem* victim records. In cases where there are no *antemortem* records, a biological profile is obtained by estimating the victim's ancestry, sex, age, and height, using reconstructive methods. Regarding ancestry, differences in the frequencies of certain dental traits in different populations can help in estimating the individual's ethnicity, restricting the number of candidates for identification [1]. Technological advances allowed the development of alternative methods for dental evaluation. Among these, intraoral three-dimensional (3D) images are increasingly used in dentistry, as they have a high level of accuracy and are easy to obtain and store [2]. The detailed analysis of the morphological traits through 3D images could suppose in many cases, advantages in terms of time and comfort. **Objective:** We intend to use 3D dental images to characterize a series of dental traces in the North of Portugal, to compare with data in the literature obtained from real teeth, and, thus, to evaluate the degree of proximity between them. **Methods:** Three-dimensional images of the dental arches were obtained after intraoral scanning. Different traits were classified in 76 individuals from a contemporary population in Northern Portugal, following the ASUDAS classification [1, 3]. **Results:** Dental traits are, in general, easily observable, except when the teeth receive treatments that hide them. Many of the traits studied present frequency percentages similar to those found in the literature. **Conclusions:** 3D images present sufficient morphological detail to be classified. This will allow obtaining a profile of the 3D dental traits of an individual, suggesting wider use in forensic odontology.

**Keywords**: forensic odontology; intraoral scanner; three-dimensional dental images; dental morphology; human identification

## Acknowledgments

This research received no external funding.

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*Poster 6*

# Application of CBCT technology in Forensic Odontology

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## Abstract

**Background:** Cone-Beam Computer Tomography (CBCT) is beginning to be widely used in dental clinics around the world since it is a non-invasive, rapid, cost-effective, and low-radiation technique. It generates high-resolution three-dimensional (3D) images of teeth, facial bones, and sinuses. Actors in legal medicine and forensic sciences closely follow this technological evolution and the trivialization of its use; the application of these devices in a forensic context begins to be promising. **Objective:** This study aimed to provide an overview of CBCT use in forensic dentistry [1]. **Methods:** A bibliographic search in PUBMED and SCOPUS platforms using a different combination of the keywords was done. After applying the inclusion and exclusion criteria, 68 articles were selected. **Results:** The thematic distribution of the articles was the following: 16% on comparative identification [1], 5% on identification by bitemarks [2], 44% on age estimation [3], 29% on sex estimation [4], and 10% on facial reconstruction [5]. The CBCT tool was particularly used for age estimation with high precision (especially in the pulp narrowing technique) but was also accurate for sex estimation, bitemark analysis, and facial reconstruction. The set of studies analyzed was carried out in 17 different countries; however, Brazil and Malaysia/China stand out for their high number. **Conclusions:** As the use of CBCT spreads, the quantity and quality of information increase exponentially, and professionals should be aware of the organization and availability of these potentially important antemortem data. Further studies should be made to fully understand the potential of CBCT technology in forensics.

**Keywords**: cone beam computed tomography; forensic dentistry; legal medicine; forensic radiology; human identification

## Acknowledgments

This research received no external funding.

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*Poster 7*

# The graftless technique in the maxillary sinus lift elevation with simultaneous implant placement

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## Abstract

**Background:** The sinus lift surgery and simultaneous implant placement are in constant evolution.[1] The use of bone grafts in the sinus lift has long been studied. However, there is a new scientific trend where there are good results with the graftless technique.[2,3] Atrophy of the posterior maxillary sector can be successfully rehabilitated using the technique of sinus elevation with simultaneous implant placement without using bone graft materials.[4] This technique can offer patients less invasive surgery compared to traditional surgery. The graftless technique has several advantages over conventional sinus lifts, with bone grafting including less morbidity, a lower risk of infection, being less expensive, and better accepted by the patient.[5] **Objective:** Evaluate the advantages and disadvantages of using the blood clot of the patient as the only material in the maxillary sinus lift with simultaneous implant placement **Methods:** Search the database of PubMed with the following keywords: sinus lift elevation AND implant placement AND bone substitute. The inclusion criteria were: patients partially or totally edentulous in the posterior maxillary region in need of augmentation of the maxillary sinus floor in order to be rehabilitated using fixed prostheses supported by implant; patients with pathology-free sinus; patients without periodontal disease. The exclusion criteria were: patients with poor and inadequate oral hygiene; patients with systemic disease; heavy smokers (25 cigarettes a day) were excluded too. **Results:** Of the 20 articles selected by title and abstract, we excluded 8 that dealt with the 2-stage technique in the sinus lift elevation, that did not study the technique without bone grafts, and articles older than ten years. **Conclusions:** The graftless technique is rewarding for the clinician and especially for the patients, as it reduces the total treatment duration for maxillary sinus lift surgery with simultaneous implant placement.

**Keywords:** sinus lift elevation; implant placement; bone substitute

## Acknowledgments

This research received no external funding.

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*Poster 8*

# Periodontal health status in a cohort of patients with type 1 diabetes mellitus: preliminary results

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## Abstract

**Background:** Type 1 Diabetes Mellitus (T1DM) is a chronic autoimmune disorder that leads to the destruction of pancreatic B cells and thus the total loss of insulin secretion. The evidence has shown that periodontal disease is a complication of diabetes and that this disease is more prevalent and severe in patients with DM when compared to those without DM (1-5). **Objective:** To investigate the prevalence of periodontal diseases and the severity and progression of periodontitis in 44 T1DM patients of the Endocrinology Unit of the Hospitalar Center of Tâmega e Sousa, Penafiel. **Methods:** A periodontal examination was done in order to file all the clinical parameters: plaque index (PI), probing pocket depth using a manual probe (CP15), clinical attachment level (CAL), bleeding on probing (BOP), gingival recession (REC), furcation involvement, and tooth mobility. At the time of study visit, clinical labs were done. **Results:** The patients analyzed were aged between 19 and 62 years (mean = 36.29; SD = 12.11), with the majority being male (65.9%). Analyzing the prevalence of periodontal diseases, we found that 26 patients (59.1%) had periodontitis, 16 (36.4%) gingivitis, and 2 (4.5%) periodontal health. The most frequent stage was IV (38.5%), followed by stage II (26.9%), 5 (18.0%) had stage III, and 4 (15.4%) had stage I. Of the 12 smokers who participated in the study, all had gingivitis or periodontitis. Concerning the relationship between periodontal disease and glycated hemoglobin, of a total of 23 subjects with periodontitis, 17 showed uncontrolled HbA1c values, and 78.6% of the individuals with gingivitis also had HbA1c values higher than 7%. **Conclusions:** The results show that the prevalence of periodontal disease is increased in T1DM patients. In addition, all smoking patients had periodontal disease. As for HbA1c, most patients had periodontitis (73.9%).

**Keywords:** type 1 diabetes mellitus; periodontal disease

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*Poster 9*

# Platelet activation, inflammatory cytokines and antimicrobial activity on L-PRF

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## Abstract

**Background:** Healing is a complex process involving various mechanisms, with platelets playing a crucial role [1]. They release growth factors that contribute to collagen production, cell division, angiogenesis, cell recruitment, and differentiation, facilitating healing. Platelets also secrete antimicrobial proteins, generate reactive oxygen species, participate in pathogen recognition, and modulate leukocyte behavior [2]. Platelet concentrates like leukocyte and platelet-rich fibrin (L-PRF) have gained attention for their regenerative properties [3,4]. By gaining insights into these processes, we aim to improve healing and inflammation management in clinical settings [5]. **Objective:** To evaluate *in vitro* effects of L-PRF on platelet activation, platelet-leukocyte interactions, and antimicrobial action. **Methods:** The L-PRF concentrate was prepared, following approved protocols, from 20 healthy donors. The L-PRF membrane and exudate were obtained through compression. The antimicrobial activity was assessed using the Kirby-Bauer agar diffusion method with three strains: *Enterococcus faecalis, Pseudomonas aeruginosa, and Candida albicans.* Flow cytometry and Cytometric Bead Array (CBA) were used to analyze platelet activation, platelet-leukocyte interactions, and inflammatory cytokines (IL-8, IL-1β, IL-6, IL-10, TNF, IL-12p70). The L-PRF exudate was added to autologous whole blood for flow cytometry analysis. **Results:** Platelet activation, assessed through activated GPIIbIIIa and P-selectin expression, showed clear activation responses in all samples. The L-PRF exudate consistently induced intracellular $Ca^{2+}$ mobilization in platelets. CBA analysis revealed variable cytokine levels in the L-PRF exudate. The L-PRF membrane exhibited inhibitory effects against all tested microorganisms. **Conclusions:** L-PRF products efficiently activated platelets and inhibited microbial growth, suggesting their value in the healing process. L-PRF exudate, alongside the membrane, has advantages for clinical trials. Further characterization and quantification of L-PRF components, as well as temporal factor release, are needed. Pre-clinical and clinical trials are essential for identifying optimal L-PRF activation and preparation methods. Future studies using clinical strains will be important due to promising results.

**Keywords:** L-PRF; autologous platelet concentrates; antimicrobial activity; flow cytometry; whole blood platelets

## Acknowledgments

Authors thank the *Oral Pathology and Rehabilitation Research Unit and CESPU University Institute of Health Sciences* for hosting this study.
Project Grant: PAAALPRF_PI2RL_IINFACTS_2021

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*Poster 10*

# Canine root dimensions as parameters for sex estimation in forensic identification

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## Abstract

**Background:** Sex estimation is essential in situations of identity reconstruction, as it can roughly halve the number of possible individuals to whom the remains belong. Since dentition is preserved in most cases where the remaining structures have been destroyed or damaged, forensic odontology stands out in this process. Several methods of sexual estimation using odontometric methods are described in the literature [1,2]; however, only a few consider tooth root measurements [3]. Developing methods of sexual estimation through dental roots is quite important since dental crowns are often damaged, making it impossible to apply approaches involving crown measurements. It is therefore desirable to develop alternative and more accurate methods of sexual estimation and to obtain specific data for each population. **Objective:** The aim of this study was to evaluate the discriminative power of the root dimensions of mandibular canines, specifically root length and cervical width, in forensic sexual estimation, in two populations: Portuguese and Mozambican. **Methods:** Canines were selected for this study as they present high sexual dimorphism, exceptional resistance to trauma and dental pathologies, and a protected and robust root inserted in the alveolar bone. 60 individuals from Portugal and 87 from Mozambique were selected, and orthopantomography was used for measurements. **Results:** Relevant results were obtained for cervical width in the Portuguese population. For this measure, an overall validity of 76.5% was obtained. Despite the statistically significant differences between sexes for the Mozambican population, the power to estimate individual sexes was very modest. **Conclusions:** Root dimensions of the mandibular canines, especially the cervical width, may be parameters of interest for sexual estimation. Larger samples are necessary to obtain conclusive results and to be able to evaluate their usefulness in different populations.

**Keywords**: sex determination; mandibular canine's root; forensic dentistry; forensic radiology; ancestry

## Acknowledgments

This research received no external funding.

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*Poster 11*

# Antifungal effect of L-PRF on *Candida albicans*

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## Abstract

**Background:** *Candida albicans* is one of the main microorganisms associated with periodontal and endodontic diseases [1]. It is an opportunistic commensal fungus that, in the oral cavity, causes oral candidiasis [2]. Platelet concentrates (PCs) have gained fame in recent years owing to their tissue-regenerating effect and antimicrobial properties [3]. Thus, there are several derivatives, including Leucocyte and Platelet Rich Fibrin (L-PRF), a second-generation platelet concentrate, which differs from the rest due to the presence of a high concentration of leukocytes that degranulate and release cytokines during blood clot formation, promoting protection against inflammation [1,4,5]. **Objective:** To inquire the inhibitory effect of L-PRF on the *Candida albicans* fungus. **Methods:** A search was carried out in PubMed with the expression "Candida albicans (AND) L-PRF". The search covered articles published in English between 2013 and 2022. A total of 4 articles was obtained, from which 2 were used. 1 Google Scholar article was added, as well as 2 articles cited by Melo-Ferraz *et al*.. **Results:** In an *in vitro* study carried out by Melo-Ferraz and associates, the antifungal effect of the L-PRF membrane was tested against strains of the *Candida albicans* fungus by the Kirby-Bauer method on Muller-Hinton agar. An inhibition zone between 12–13 mm was detected [1]. **Conclusions:** An antimicrobial effect by L-PRF was observed on *Candida albicans* and other microorganisms, thus demonstrating the versatility of this compound. More studies must be conducted to confirm its antimicrobial effect, mainly studies with strains isolated from clinical cases.

**Keywords:** *Candida albicans*; L-PRF

## Acknowledgments

This research received no external funding.

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*Poster 12*

# miRNA as salivary biomarkers and a useful tool in the early detection of oral cancer

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## Abstract

**Background:** The miRNA is a class of small non-protein-coding RNA molecules that contain 19 to 24 nucleotides to control translation and RNA degradation [1,2]. The dysregulation of miRNAs has been reported in a wide range of diseases and they play a crucial role in the process of carcinogenesis. It is associated with macromolecules called exosomes in its partially degraded form, allowing it to maintain its stability in saliva, making it an ideal biomarker for oral cancer [3]. **Objective:** The objective of this integrative systematic review is to determine the function of miRNA as salivary biomarkers of oral cancer and its effectiveness as a method of early diagnosis of the disease. **Methods:** A bibliographic search was carried out in the PubMed database (via the National Library of Medicine), Scopus,and the Cochrane Library between the years 2013 and 2023. The PICO strategy was used, and inclusion and exclusion criteria were written to choose useful articles for the present study. **Results:** Fifteen case-control studies were analyzed and, reported, of which 6 analyzed the relevance of miR-21 associated with the onset and progression of oral potentially malignant disorder (OPMD) [2,4,5]. Of all the markers analyzed in the studies, miR-21 is the one with the highest increase in salivary concentration. Another salivary biomarker used in 2 studies is mir-375, which suffers a decrease in concentration in oral cancer patients. **Conclusions:** According to these results, salivary miRNA can help in the diagnosis and prognosis of oral squamous cell carcinoma (OSCC). However, controlled clinical trials with a large sample size are needed to validate the differentially expressed miRNAs in the present review.

**Keywords:** oral cancer; cancer early diagnosis; biomarkers; microRNA; saliva

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*Poster 13*

# Efficacy of laser therapy in the treatment of Oral Lichen Planus lesions: an integrative review

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## Abstract

**Background:** Oral Lichen Planus (OLP) is a chronic inflammatory mucocutaneous disease affecting the oral mucosa with characteristic relapses and remissions. Atrophic-erosive forms usually present erythematous and ulcerative areas causing symptoms ranging from a mild burning sensation to severe pain that interfere with the patient's quality of life [1]. Topical application of corticosteroids is widely accepted as the primary treatment of choice. However, the prolonged use of steroids has certain local and systemic complications that include opportunistic candidiasis, mucosal atrophy, adrenal insufficiency, gastrointestinal disorders, hypertension and diabetes. To overcome these problems, the use of laser has been proposed as a potential alternative treatment strategy for the treatment of symptomatic OLP [2,3]. **Objective:** The aim of the study is to evaluate the effectiveness of laser therapy in the management of symptomatic OLP, determine whether standardized protocols can be used and compare it with conventional therapies. **Methods:** A systematic integrative review was performed with a search conducted on Pubmed, Medline, ScienceDirect and Cochrane Library databases. 17 articles were selected for this literature review. **Results:** All studies reported positive effects of laser therapy, however, there is a variety of heterogeneity in the number of patients treated, the follow-up period, the parameters used to evaluate the efficacy of the therapy and the laser parameters used in the treatment of OLP. **Conclusions:** Laser therapies are useful in the treatment of pain symptoms and can be used in the case of OLP lesions that do not respond to conventional treatments or when corticosteroid doses are too high for the patient, avoiding side effects [4,5].

**Keywords:** oral lichen planus; laser; laser therapy; low-level laser therapy; photodynamic therapy; phototherapy

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*Poster 14*

# MDPB in adhesive system

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## Abstract

**Background:** In the past, some dental product ingredients were suggested as having cavity disinfecting properties. As a result, adding antibacterial agents to adhesives would be advantageous in suppressing residual contamination after caries removal and in preventing recurrent caries at tooth-composite interfaces (1,2). Over time, resins based on quaternary ammonia (QAMs) were developed, and one of the first antibacterial compounds was methacryloyloxydodecylpyridinium bromide (MDPB) (3). MDPB has been extensively investigated and found to have significant antibacterial properties against a wide range of pathogenic bacteria, including facultative and obligatory anaerobes. **Objective:** The objective of this systematic review is to evaluate the antimicrobial activity of the MDPB monomer against oral bacteria in the adhesive system**. Methods**: Bibliographic research was performed in the PubMed database, with the search equation "((dental adhesives) or (bonding systems)) AND (antibacterial activity) AND (MDPB)", considering the articles published in English in the last 10 years. **Results:** All the studies analyzed validate the effective antibacterial effect produced by the adhesive system containing MDPB on essential bacteria in the different stages of oral biofilm formation, decreasing their metabolic activity and lactic acid, and also reducing demineralization around the restorations in both enamel and dentin, without ever compromising the physical and chemical properties of the adhesive system (4,5). **Conclusions:** The bonding agent containing MDPB exhibited excellent antibacterial activity, and its use could have significant implications for future more conservative dental treatments.

**Keywords:** dental adhesives; bonding systems; antibacterial activity; MDPB

## Acknowledgments

This research received no external funding.

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*Poster 15*

# How to optimize the role of Bio-Oss® in bone regeneration?

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## Abstract

**Background:** The most common material being used in the field of bone augmentation is deproteinized bovine bone, better known as Bio-Oss®, which is the most commercialized brand. Bio-Oss® is osteoconductive, biocompatible, allows adequate neoformation, low resorption rate and is available in large quantities [1]. Even though the calcination and sinterization process is carried out to eliminate the organic component that could potentially transmit diseases, it has the adverse effect of rendering the material unsuitable for osteoinduction [2]. Furthermore, bone formation can be influenced by the size of Bio-Oss® particles, with the result depending on whether the particles are small (0.25mm-1mm) or large (1mm-2mm) [3]. **Objective:** To evaluate the biochemical and biomechanical properties of Bio-Oss®. **Methods:** A search was performed in the PubMed database over the last 10 years using the following keywords: "alveolar ridge preservation"; "Bio-Oss"; "bovine bone"; "graft"; "bone substitutes". **Results:** 1265 articles were found, from which those outside the time range, animal studies, and studies not specific to the topic, were excluded, resulting in 4 relevant studies left. **Conclusions:** When biomaterial remains in the alveolus, it is important to consider the relationship between crystallinity and synthesis temperature. The temperature directly affects the potential biodegradation rate, and a lower synthesis temperature can improve surface texture and biodegradability. Calcination (600-1000°) and sinterization (1100-1200°) increase the crystallinity of the materials; Bio-Oss® being sintered has higher crystallinity, which leads to lower solubility and thus lower bone formation [4]. Regarding particle size, large particles have a porous morphology that gives Bio-Oss® osteoconductive properties, leading to increased bone formation. Moreover, large particles of Bio-Oss® breed to adequate inter-particle spaces which allows new vessels to grow at sites of bone defects and making it easier to replace for bone [3,5].

**Keywords:** alveolar ridge preservation; Bio-Oss; bovine bone; graft; bone substitutes

## Acknowledgments

This research received no external funding.

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*Poster 16*

# Periodontal changes - aligners *vs.* conventional appliances: a systematic review

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## Abstract

**Background:** Treatment with fixed appliances was one of the main achievements of modern orthodontics [1]. However, these systems bring numerous disadvantages at periodontal and dental level: such as changes in plaque index, gingival index, bleeding, pocket depth and composition of the oral microbiota [2-5]. Years later, removable invisible braces were introduced on the market and are now known for solving the aesthetic and discomfort problems of fixed appliances [1, 4]. In addition, they seem to bring some advantages in terms of periodontal health [3]. **Objective:** To evaluate and to compare the periodontal health of children and adolescents with invisible thermoplastic aligners and conventional fixed appliances. **Methods:** Research and analysis of articles present in referenced platforms such as PUBMED, SPRINGLER and ELSEVIER from 2012 to 2022. **Results:** Five studies were analysed in this systematic review. Several periodontal parameters were evaluated in pediatric and adolescent patients: plaque index (PI), gingival index (GI), pocket depth (PB) pocket bleeding (SPB) [2-5]. The oral microbiota was also analyzed [1,3]. Regarding fixed appliances, there was a decrease in periodontal health, with all indexes increasing at the end of treatment, contrary to aligners which, in some cases, improved periodontal indexes in the end [2,3,5]. This may demonstrate that aligners will be a better treatment alternative. As for the oral microbiota, neither of the two systems showed many differences, only differing about the bacteria *Streptococcus sanguinis* [1,3]. **Conclusions:** Invisible removable appliances are a good alternative for the treatment of children and adolescents without compromising periodontal health when compared to fixed appliances. However, more studies are necessary because there are still some discrepancies in literature.

**Keywords:** periodontal health; plaque index; children; aligners; fixed appliance

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*Poster 18*

# *Pseudomonas aeruginosa* and *Enterococcus faecalis*' interaction with platelet concentrates

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## Abstract

**Background:** *Enterococcus faecalis* and *Pseudomonas aeruginosa* are two of the many bacteria often found within the oral cavity, and are responsible for endodontic and periodontal diseases. Blood accelerates the healing process; therefore, natural platelet concentrates PRP, PRF and L-PRF, sourced from patients' blood, may stop bacterial proliferation, allowing the body to heal. The minimum inhibitory concentration (MIC) will enable us to determine the minimum concentration of PRP and PRF needed to eradicate or stop bacterial growth. **Objective:** To understand how platelet concentrates influence the growth of *E. faecalis* and *P. aeruginosa*. **Methods:** After a PubMed search with the expressions "Antimicrobial Minimum Inhibitory concentration (AND) PRF", "Platelet concentrate (AND) Pseudomonas aeruginosa", "Platelet concentrates (AND) Enterococcus faecalis" and the inclusion criteria "2013-2023", "English", a total of 45 results were obtained, from which 6 were selected. **Results:** L-PRF membrane inhibited *P. aeruginosa* and *E. faecalis* [1]. P-PRP inhibited *E. faecalis*, but not *P. aeruginosa*; P-PRP was active against *E. faecalis* at low platelet concentration ranges [2]. Calcium chloride activated P-PRP and PPP inhibited *E. faecalis* [3]. L-PRP, L-PRP cryo and P-PRP inhibited both *E. faecalis* and *P. aeruginosa*. However, after 2 hours of incubation with P-PRP, *Pseudomonas* inhibition diminished and, between 2-4 hours of incubation with L-PRP and L-PRP cryo, *E. faecalis* inhibition also decreased; the same happened with P-PRP after 4 hours [5]. PRP-1 and -2 were ineffective against *P. aeruginosa* [4]. **Conclusions:** Platelet concentrates are effective against bacteria. Further studies may determine which type of concentrates and methods to use for each bacterial strain. It is also of interest to compare ATCC strain results to those of clinical isolates.

**Keywords:** PRF; antimicrobial minimum inhibitory concentration (MIC); autologous platelet concentrates; *Pseudomonas aeruginosa*; *Enterococcus faecalis*

## Acknowledgments

This research received no external funding.

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*Poster 19*

# Cyanoacrylate adhesives as a substitute of sutures in the oral cavity

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## Abstract

**Background:** Postoperative success depends on the material selected to establish tissue synthesis. The chosen material should keep the tissues well coapted to provide a great healing process, prevent bleeding, and avoid contamination of the surgical wound. Cyanoacrylate is an alternative to conventional suture materials, since it has hemostatic, analgesic, and healing properties. Despite being more economical and resistant to traction and torsion, sutures can cause tissue irritation, more inflammation, and bacterial contamination (1-5). **Objective:** Compare the use of sutures and cyanoacrylate adhesives in the oral cavity and identify the effectiveness of both techniques in clinical practice. **Methods:** Literature searches were performed in the Pubmed database with the following keywords: "Tissue Adhesive", "Cyanoacrylate" and "Silk Suture" in the time range between 2013 and 2023. **Results:** According to the advanced search expression, a total of 72 articles were identified and selected. Posteriorly, the bibliographic search of the last 10 years in Portuguese or English resulted in 18 articles, which were analyzed in detail. After the selection, 10 articles were included based on the relevance of the title and abstract. **Conclusions:** Cyanoacrylate adhesives performed excellently, and current findings suggest that the adhesive is a better alternative to conventional suturing for wound closure. However, further studies are needed to substantiate these results, allow a better comparison between these two surgical techniques, and assess the overall cost-effectiveness of tissue adhesives compared to sutures in surgical procedures.

**Keywords:** tissue adhesive; cyanoacrylate; silk suture

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*Poster 20*

# Advantages of zirconium *versus* metal-ceramics for fixed prostheses: systematic review

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## Abstract

**Background:** Metal-ceramic prostheses are considered a good alternative for prosthetic rehabilitation due to their excellent mechanical properties [1]. Zirconia, on the other hand, has been presented as the material with the best performance in the aesthetic field [2]. **Objective:** To carry out a systematic review to compare the advantages of fixed zirconia prostheses with those of metal-ceramic fixed prostheses. **Methods:** A search was performed in PubMed using the advanced search strategy with the combination of keywords: "(zirconium [MeSH Terms]) AND (metal ceramic alloys [MeSH Terms])", including articles of the "Clinical Trial" and "Randomized Controlled Trial" types only, which were published in the last 10 years and in English. Eight articles were selected. **Results:** The 1-year survival rates for Zirconia and Metal-ceramic implants and crowns were 97.2% and 79.4%, respectively [3]; the fracture stress for Zirconia was 37.12 MPa and 44.12 MPa for Metal-ceramics [4]; therefore, the probabilities of fracture of the veneering ceramic are greater in Zirconia prostheses. As for aesthetics, the patients were highly satisfied with both the Zirconia and Metal-ceramic prostheses 3 years later [2]. **Conclusions:** Metal-ceramic prostheses have better resistance to fracture and a lower rate of complications than Zirconia prostheses, while both types of prostheses provide satisfactory aesthetic results.

**Keywords:** zirconium; metal ceramic alloys; dental crowns; dental marginal adaptation

## Acknowledgments

This research received no external funding.

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*Poster 21*

# The influence of non-surgical periodontal treatment with adjuvant methods on reducing HbA1c in type II diabetic patients

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## Abstract

**Background:** Type 2 diabetes mellitus and periodontal disease are both chronic diseases that affect global healthcare. The presence of diabetes may affect the development and progression of periodontitis, while periodontitis in turn may worsen a person's blood sugar control [1]. Periodontal disease is the sixth-most common complication of diabetes [2]. Researchers hope to find a treatment that can effectively treat both diseases simultaneously. Non-surgical periodontal treatment with adjuvant methods such as Chlorexidine [1,2], Metronidazole [3] and Doxycycline [4,5] was reviewed. **Objective:** The aim of this review is to demonstrate the influence of non-surgical periodontal treatment in combination with selected adjuvant methods on reducing glycosylated hemoglobin in patients with type 2 diabetes mellitus and periodontitis. **Methods:** Three bibliographic searches of scientific articles were performed in the Pubmed database between 2012 and 2023, with the main key words: “diabetes mellitus type 2”, “metronidazole”, “doxycycline”, and “chlorhexidine”. **Results:** 154 articles were found before applying the eligibility criteria. Inclusion criteria: articles published in English between 2012 and 2023; studies conducted on humans. After applying these criteria, 14 articles were considered relevant. **Conclusions:** The reduction of inflammation caused by periodontitis leads to a decrease in glycosylated hemoglobin levels in a short period of time [4]. However, after non-surgical periodontal treatment, periodontal parameters should decrease, which will normally lead to a decrease in blood glucose [5]. The influence of non-surgical periodontal treatment with adjuvant methods on reducing glycosylated hemoglobin has different outcomes. The addition of Chlorexidine remains uncertain, as opinions vary [1,2]. As for the antibiotics studied, the use of Metronidazole may help improve glycated hemoglobin levels [3], while the use of Doxycycline shows no conclusive evidence [4,5].

**Keywords:** diabetes mellitus type 2; metronidazole; chlorexidine; doxycycline

## Acknowledgments

This research received no external funding.

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*Poster 22*

# The relationship between maternal periodontitis and low birth weight infants

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## Abstract

**Background:** Maternal periodontitis is a prevalent condition suspected to be associated with adverse pregnancy outcomes, such as low birth weight (LBW). In 1996, Offenbacher was the first to mention the possibility of maternal periodontal infection being associated with LBW in his studies with humans. LBW has been defined by the WHO as a birth weight of < 2500 grams. LBW in babies is caused by intrauterine growth restriction, prematurity, or both, which can be closely associated with fetal and neonatal mortality and morbidity, inhibited growth, and cognitive development (1-5). **Objective:** The objective was defined with the PICO methodology to evaluate whether periodontitis is associated with low-birth-weight infants. **Methods:** Research was conducted in the PubMed database using the combination of keywords "Periodontitis" AND "Low birth weight" between 2013 and 2023 Articles with humans, in English, and with free full text available were chosen. **Results:** Out of a total of 60 articles, 15 were included after analyzing the titles and reading them in full to verify the existence of an association between periodontitis and LBW. One article was added through manual research, and information from WHO and EFP was collected as well. **Conclusions:** Maternal periodontitis is a potential independent risk indicator for low birth weight. Periodontal assessment and therapy should form part of the preventive antenatal care provided to women in developing countries because a worse periodontal status during pregnancy may negatively affect obstetrical outcomes, especially the prematurity rate and newborn weight.

**Keywords:** periodontitis; low birth weight

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*Poster 23*

# Three-dimensional evaluation of maxillary canines and repercussions on adjacent teeth: systematic review

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## Abstract

**Background:** Permanent maxillary canines are the second most frequently impacted teeth in the general population. One of the most severe complications associated with impacted canines (IC) is root resorption (RR) of adjacent teeth. Traditionally, conventional two-dimensional methods were used to diagnose IC, and it was difficult to localize and determine RR. With new advances in medical imaging technologies, Cone-beam computed tomography (CBCT) provides three-dimensional multiplanar images and information on dentofacial structures (1-5). **Objective:** To assess scientific evidence published during the last decade, concerning the RR of the adjacent teeth caused by the impaction of upper canines, based only on CBCT. **Methods:** The PRISMA methodology was applied, and a literature search was carried out in PubMed using the following keywords: "Cone-beam computed tomography", "Maxilla", "Cuspid", "Root Resorption", "Tooth, impacted". A total of 49 articles were initially screened. A bibliographic search of the last 10 years (2013-2023) resulted in 37 articles, whereas 20 remained for a full review according to the inclusion and exclusion criteria. Only seven articles were included. **Results:** Lateral incisors (LI) were more often affected than central incisors, and bilateral severe incisor RR was common. RR was significantly associated with female sex; however, there are controversial opinions. There was a higher risk of resorption when the cusp tip was in the apical third of the root of the adjacent tooth and the IC was located palatally, although some authors present different results regarding the location of them. **Conclusions:** Patients with maxillary IC present a high frequency of adjacent teeth RR. Those located beyond the mesial surface, palatally displaced, and at the apical third of the roots of adjacent LI were likely to suffer RR. Early detection of palatally IC and examination of risk factors for RR can serve as an alternative to a complex future treatment.

**Keywords:** cone-beam computed tomography; maxilla; cuspid; root resorption; tooth; impacted

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*Poster 24*

# The correlation between chronic mechanical irritation and oral cancer development – a systematic review

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## Abstract

**Background:** Squamous cell carcinomas (OSCC) account for approximately 95% of all oral cancers (OC) [1]. The main risk factors for OC are thought to be tobacco and alcohol [2,3]. They might not be the sole cause of cancer, as people not exposed to those variables may also have oral cancer. This fact suggests that there are additional causes, such as chronic mechanical irritation (CMI) that could be related to oral carcinogenesis [2]. **Objective:** To research the potential contribution of CMI to the development of OC. **Methods:** A systematic review was performed with a search conducted by the PubMed, Scopus, and Cochrane Databases, with several keywords including "chronic mechanical irritation"; "oral trauma", "dental prosthesis", "risk factors" and "oral cancer". **Results:** According to the eligibility criteria, 5 of the 129 articles found were considered relevant. According to Zheng *et al.* and Albuquerque *et al.*, the use of dentures was not linked to an increased risk of OC [4]. On the other side, there are studies that show that CMI is significantly associated with OSCC [3]. Nevertheless, the evidence is very weak and limited. **Discussion:** The lack of randomized controlled trials with homogeneous and representative samples of patients limits an important limitation for the comprehension of the impacts of CMI in the genesis of OC. Only the prospective case control study by Piemonte *et al.* reported this previous association [2,3]. However, several other studies do not support this potential association [5]. **Conclusion:** There is currently a lack of data supporting the link between OC and CMI. Therefore, more research into this relationship is required.

**Keywords:** chronic mechanical irritation; oral cancer; dental prosthesis; risk factors

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*Poster 25*

# Predictability of the maxillary canine – two-dimensional and three-dimensional evaluation: systematic review

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## Abstract

**Background:** Clinical and radiographic examinations are essential in the diagnosis of canine inclusion. Prevention may dictate an early interception treatment to avoid complications. Orthopantomography (OPG) is routinely used due to its low radiation and wide view of the jaws. With technological advancement, cone beam computed tomography (CBCT) appeared as a three-dimensional examination with a more detailed view [1-5]. **Objective:** Evaluate published scientific evidence on the reliability and results obtained with OPG compared to CBCT in the early diagnosis of impacted maxillary canines (IMC). **Methods:** The PRISMA methodology was applied, and a bibliographic search was done at PubMed with inclusion and exclusion criteria., Restricting the time to 10 years (2013-2023) and through advanced search 29 articles were found. Only 5 articles were selected. **Results:** IMC with the crown in sector 1 and apex in sector 2 (more vertical) in OPG correspond to a buccal position in CBCT; IMC with the crown in sector 2 and apex in sector 3 in OPG, correspond to a central position in the canine alveolus in CBCT; IMC with the crown in sectors 3, 4 and 5 and apex in sector 4 (more mesial and horizontal) in OPG, correspond to a palatal position in CBCT. Root resorptions (RR) are frequent when the canine crown is in sectors 3, 4 and 5. **Conclusions:** The location of the crown and root apex sectors of IMC on OPG can be used to determine the buccopalatal position on CBCT. The OPG finds the IMC in a more mesial position and with larger alpha angles (angle of the long axis of the canine with the interincisal line) (more horizontal) compared to the CBCT. The CBCT is more precise for locating IMC.

**Keywords:** tooth; impacted; cuspid; diagnostic imaging; radiographic panoramic; cone-beam computed tomography; maxilla

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*Poster 27*

# Rational evidence for loving and fearing fluorides

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## Abstract

**Background:** Topical fluorides are recognized by the scientific community as the most effective preventive and therapeutic measure for dental caries [1-2]. However, topical fluorides are not exempt from accidental and/or voluntary swallowing [3]. On the other hand, the toxicity of fluorides is reported by the scientific community [4-5]. **Objective:** The aim of this study was to identify the types of toxicity of ingested fluorides by analyzing their pharmacokinetics and pharmacodynamics. **Methods:** An advanced search was performed on PubMed with the keywords "fluoride pharmacokinetic", "fluoride pharmacodynamic" and "toxicity", using the Boolean operator "AND": (fluoride pharmacokinetic) AND (fluoride pharmacodynamic) AND (toxicity). No temporal filters were used and only randomized clinical trials and clinical trials were selected. A manual search was also performed. "Toxicity" was defined as a study variable, regardless of the type of toxicity that occurred and the location where it occurred. **Results:** Applying the advanced search expression without filters, 209 publications were found. When the "clinical trials" and "randomized clinical trials" filters were applied, 6 publications remained. Eight publications were added from the manual search. **Conclusions:** Depending on the dose and frequency of exposure, various types of toxicity accompanied by signs and symptoms have been identified. It is consensual that the use of fluorides in Dentistry, in the prevention and therapeutic of dental caries, should not be neglected as potentially toxic, if accidental swallowing occurs. Therefore, a rational use of fluorides in Dentistry is needed.

**Keywords:** fluoride pharmacokinetics; fluoride pharmacodynamics; toxicity

## Acknowledgments

This research received no external funding.

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*Poster 28*

# *In vitro* toxicity of saliva samples collected from firefighters exposed to fire-related events in human oral and intestinal cell models

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## Abstract

**Background:** Firefighters are the principal line of defense against fires [1], and occupational exposure as a firefighter was recently classified as carcinogenic to humans (Group 1) by the International Agency for Research on Cancer (IARC) [2]. Only a limited number of human *in vitro* studies explore the cellular toxicity mechanisms involved after fire-related exposures, and most of them focus on monocultures, inhalation route, and particulate matter as pollutants. Therefore, it is urgent to deeply understand the cellular toxicity involved in firefighters' health burdens. **Objective:** The present work aimed to assess the cytotoxicity of firefighters' saliva collected after controlled forest fire events in human *in vitro* oral and intestinal mono- and/or bi-culture models. **Methods:** Monocultures of oral (TR146 and HSC-3) and intestinal (Caco-2 and HT29 MTX) cell lines were initially exposed to firefighters' saliva samples for 24h, and then Caco-2 and HT29 MTX co-culture models seeded into Transwell membranes for 21 days were exposed for 4h. MTT assays were performed to assess cell viability. For the intestinal co-culture model, the trans-epithelial electrical resistance (TEER) was monitored, as well as the permeability of polycyclic aromatic hydrocarbons (PAH). **Results:** Amongst the tested monocultures, the cell viability of HSC-3 and Caco-2 cell lines was the most affected (≤70% for some samples), whereas for the intestinal co-culture model no major effects in barrier integrity and cell viability were observed after 4h of exposure. **Conclusions:** Fire-exposed saliva samples potentially affect cell viability, although its associated early cytotoxic effects and bioavailable levels of PAH are not fully elucidated yet.

**Keywords:** firefighters' exposure; oral and intestinal cell lines; 3D model; cell viability; permeability

## Acknowledgments

This work was funded by 4FirHealth (PCIF/SSO/0090/2019) and Gum4Fires (2022.05381.PTDC) projects through FCT-MCTES national funding. This work was also supported by UIDB/50006/2020, UIDP/50006/2020, LA/P/0008/2020 through FCT-MCTES. M.J. Bessa is thankful for the postdoc grant from project PCIF/SSO/0090/2019. M. Oliveira and F. Rodrigues are thankful for their scientific contracts (CEECIND/03666/2017 and CEECIND/01886/2020, respectively).

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*Poster 29*

# Stafne bone defect: a dual case study

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## Abstract

**Background:** Stafne's bone defect (SBD) was first described by Edward Stafne in 1942. Its etiology remains uncertain. It is considered a developmental anatomical impression caused by adjacent structures. Most cases are observed during radiographic examinations in the course of dental treatments [1-3]. **Objective:** The aim of this study was to describe in detail the various typical features of Stafne bone defect, through the representation of two clinical cases. **Methods:** The following work includes the analysis of two cases of Stafne bone defect encountered among patients at the Filinto Baptista University Unit Clinic in Gandra. A literature review was performed in Pub-Med, Science Direct, and Scielo with the following keywords: "Stafne's defect", "mandibular bone depressions", "Salivary glands", and "Oral pathology". **Results:** In the two clinical cases analyzed, it is possible to note that the side of the mandible where lesion is en-countered, position according to the mandibular canal, size, and sclerosis of the defect are very similar to the findings reported in the literature in various recent studies. **Conclusions:** It is essential for dental practitioners to know the characteristics of SBD aiming at a better diagnosis. SBD is a benign dental condition that requires only periodic follow-up. However, a correct and differential diagnosis is crucial for distinguishing it from other conditions and avoiding unnecessary surgical procedures [3,4,5].

**Keywords:** Stafne's defect; mandibular bone depression; salivary glands; oral pathology

## Acknowledgments

This research received no external funding.

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*Poster 30*

# Evaluation of mechanical strength through finite element analysis of temporary fixed protheses

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## Abstract

**Background:** Finite element analysis (FEA) allows to evaluate stress distribution through different designs and materials used in the elaboration of temporary fixed prostheses, by way of the creation of a finite element model (FEM) [1-5]. **Objective:** To compare the results of displacement between experimental and numerical tests carried on temporary fixed bridges, conventional and cantilever, with 4 elements. The stress distribution of the 4 materials used in the manufacture of this type of prosthesis was assessed. **Methods:** A virtual geometric model based on the experimental model used in the study of displacement has been designed, by introducing each of the Young's and Poisson's Modulus material. Four temporary resins were investigated using two different techniques: the CAD/CAM technique was applied to Telio® CAD and Vita CAD-Temp®, while the manual method was used on Protemp® 4 and Dentalon® plus. **Results:** The FEA recorded the highest Von Mises stresses on the occlusal surface, with the cantilever design in the region of the connectors. However, no significant differences were observed in Von Mises stresses for the different materials evaluated. The displacement results from the FEA study were superimposable to those from the experimental study. **Conclusions:** The highest values of Von Mises stresses were recorded on the occlusal surface and in the transition region (connector) between the prosthetic teeth for both investigated models. The association of the experimental study with the virtual one complements each study.

**Keywords:** CAD/CAM; fixed denture; dental stress; temporary denture; finite element analysis

## Acknowledgments

This research received no external funding.

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*Poster 32*

# Canine oral squamo-melanocytic tumor: a case report

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## Abstract

**Background:** The oral cavity is a common site for malignant tumors, accounting for about 7% of all canine cancers [1-5]. In the majority of the studies, melanoma is the most common malignant oral neoplasm in dogs (30% to 40%), followed by squamous cell carcinoma (17% to 25%) [1,4]. The median age reported for melanoma development (11 or 12 years) is slightly greater than that for squamous cell carcinoma (8 to 10 years) [2,4,5]. **Objective:** We described a case of primary oral squamo-melanocytic tumor with histopathological and immunohistochemical characterization. **Methods:** A canine male Pinscher, 12 years-old, was admitted to consultation due to the presence of an irregular mass on the oral cavity´s soft palate. An excisional biopsy was performed and sent for histopathological examination. The multinodular mass was 3x2 cm on its largest axes and macroscopically exhibited a mixed whitish and brownish color and friable consistency. **Results:** On microscopic examination, two distinguishable cell proliferations were observed: one squamous epithelial, forming cords and nests with rupture of the basal membrane and invasion of stroma, and other sarcomatoid, with spindle cells organized in bundles and containing scarce intra-cytoplasmic melanin pigment. Anisocaryosis and anisocytosis were moderate to marked in the two cell population, and the overall mitotic count was 5 mitoses per 10 HPF (40x objective, 2.37 $mm^2$). The biphasic nature of this neoplasm was confirmed with immunohistochemistry (Pan-cytokeratin and PNL-2), and a diagnosis of oral squamo-melanocytic tumor was made. The neoplasm progressed, and the animal was euthanized. **Conclusions:** We expect that our case will provide additional clinicopathological data on this unusual presentation of oral cancer, which seems to exhibit a poor prognosis.

**Keywords:** oral cancer; oral cavity; dog; melanoma; squamous cell carcinoma

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*Poster 33*

# Evaluation of BPA and Bis-GMA release from recent dental composite materials by LC-MS/MS

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## Abstract

**Background:** Bisphenol-A (BPA) is a xenoestrogen widely used as a synthetic precursor of resin monomers [1]. Nowadays, there is an increased need to develop BPA-free resin-matrix composites to avoid the health effects of BPA [2,3,4]. **Objective:** To evaluate BPA and Bis-GMA monomer release from six resin–matrix composites using a sensitive liquid chromatography-tandem mass spectrometry (LC-MS/MS) quantification method. **Methods:** Six composites with different manufacturer specifications were studied to evaluate the degree of release of BPA and Bis-GMA in a dental composite. The light-cured resin-matrix specimens ($n$ = 5 for each composite type) were incubated at 37 °C in 1 mL of a 75% ethanol-water solution in a sealed amber glass vial, which was refreshed daily for one week. The samples were analyzed by LC-MS/MS. **Results:** BPA was not detected in any resin-based materials studied. Release of Bis-GMA was observed for almost all samples during the experiment, except for AF and BF. The highest Bis-GMA concentration was released from ED, followed by BE, FS, and NC. **Conclusions:** There is a clear need for more accurate and standardized analytical methods to determine resin-based materials' short and long-term release. In addition, manufacturers should be required to report complete information on the chemical composition of dental products and to encourage the development of materials with no potential estrogenicity.

**Keywords:** bisphenol A (BPA); bisphenol A-glycidyl methacrylate (Bis-GMA); resin-based dental materials; LC-MS/MS; *in vitro* release

## Acknowledgements

This work was supported by CESPU-Cooperativa de Ensino Superior Politécnico e Universitário under the grant "OrthoAlignPI-4RL-IINFACTS-2019".
Sara C. Cunha acknowledges FCT for 2022.07841.CEECIND/CP1724/CT0014 contract. LAQV-REQUIMTE authors acknowledge financial support from PT national funds (FCT/MCTES, Fundação para a Ciência e Tecnologia and Ministério da Ciência, Tecnologia e Ensino Superior) through the project UIDB/50006/2020.

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*Poster 34*

# Oral health status and oral treatment among drug addicts

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## Abstract

**Background:** Drug users show several general health issues, and may have a variety of oral health problems [1-4]. Given widespread recreational drug use, dental professionals are likely to come across patients who take illegal substances currently or in the past [3]. **Objective:** This literature review aims to investigate the oral health status and the main oral alterations among drug addicts. **Methods:** An exhaustive search was performed in PubMed, without any time restriction. We considered research approaching the oral health of drug abusers and their treatments. **Results:** Aggressive caries, periodontitis, bruxism, poor oral hygiene, and general neglect have been recognized as oral side effects of illegal drug use [3]. About 70% of cannabinoid users develop xerostomia and show an increased risk of caries [3]. Moreover, these addicts have an increased risk of oral cancer and periodontitis [1-3]. Chronic users of stimulant drugs, like methamphetamines and cocaine, develop bruxism, erythematous gingival lesions, and show lacking, stained, rotting and crumbling teeth [1-3]. Users of opioids such as heroin and methadone frequently have caries, teeth loss, xerostomia, mucosal infections and periodontitis [1-3]. Hallucinogens, such as ecstasy and LSD, cause dry mouth and bruxism [1]. Addicts are difficult to reach as a target population, there are not enough appropriate settings or reliable assessment protocols for oral health studies, and the efficacy of the dental and general healthcare sectors that provide services to addicts could be improved [1]. In this way, the benefits of oral healthcare include reducing stigma, preventing HIV transmission and promoting pain relief [1]. **Conclusions:** Oral healthcare should be included in the variety of general health treatments offered to drug abusers [4]. In addition to medical treatment, education and prevention activities should be provided [2]. In conclusion, drug abuse negatively influences oral health.

**Keywords:** oral health; oral diseases; illicit drugs; drug abusers

## Acknowledgments

This research was funded by Cooperativa de Ensino Superior Politécnico e Universitário (CESPU), project/grant CBToxAtOpi-GI2-CESPU-2022.

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*Poster 35*

# Determination of age and gender using measurements of maxillary central incisor and first molar on CBCT - Santiago de Compostela university population

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## Abstract

**Background:** Forensic Dentistry plays an important role in human identification, and dental age estimation is an important part of the process. Secondary dentin deposition throughout an individual's lifetime and consequent modification in teeth anatomy is an important parameter for age estimation procedures [1-5]. **Objective:** The aim of the present study was to develop regression equations to determine age and gender in adults by means of linear measurements and ratios on sagittal, coronal and axial slices of maxillary central incisors using cone bean computed tomography (CBCT). **Methods:** Multiplanar measurements of upper central incisors were taken for a sample of 373 CBCTs. Subsequently, one-way analysis of variance (ANOVA) and multivariate linear regressions were performed for age estimation. **Results:** The equations obtained from axial linear measurements and ratios presented a standard error of the estimate (SEE) of ±10.9 years ($R^2$ = 0.49), and a SEE of ±10.8 years ($R^2$ = 0.50), respectively. The equation obtained for multiplanar linear measurements presented a SEE of ±10.9 years ($R^2$ = 0.52), while the equation for multiplanar ratios presented a SEE of ±10.7 years ($R^2$ = 0.51). **Conclusions:** CBCT measurements on upper central incisors were found to be an acceptable method for age estimation. Horizontal measurements, especially pulp measurements, improve the accuracy of age estimate equations. For gender determination, we did not obtain statistically significant values.

**Keywords:** dentistry; forensic; age estimation; gender estimation; cone beam computed tomography; CBCT

## Acknowledgments

This research received no external funding.

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*Poster 36*

# Is there an association between dental visit frequency and the risk of oral cancer? A systematic review and meta-analysis

**Lorena Mariano [1,*], Filomena Salazar [1], José Júlio Pacheco [1], Saman Warnakulasuriya [2] and Luís Monteiro[1,3]**

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## Abstract

**Background:** Assuming that the oral cavity is a habitat for bacterial species and that the presence of dental plaque may promote a tissue inflamma-tory process contributing to the risk of oral cancer [1], oral hygiene habits may influence the development of oral cancer. Regular dental visits provide an opportunity to improve oral health, reduce associated inflammatory conditions, and also play a crucial role in the early detection and prevention of oral cancer [2,3]. Epidemiological studies have focused on the association between oral habits such as dental visits and oral cancer [3-5]. Objective: To evaluate if dental visit frequency has an association with oral cancer risk. Meth-ods: This systematic review and meta-analysis (SRMA) followed the PRISMA guidelines We searched PubMed, the Cochrane library, and Scopus databases for the studies published before April 2023, with no limitation in regards to their publication date or language. A quantitative analysis was performed using the software program Review Manager (RevMan) version 5.3. Results: A total of 12 eligi-ble studies were included. Overall, the dental check-ups were associated with the occurrence of oral cancer. We found a protective ef-fect of regular dental check-ups (OR 0.60 95% CI, 0.51-0.70; $p < 0.00001$; I2: 0%) and oral cancer risk. Conclusions: This SRMA con-firms the causal association between oral cancer and poor oral habits. It also reinforces the importance of preventive measures regarding the promotion of good oral habits, and regular dental visits should be recommended.

**Keywords:** epidemiology and prevention; oral cancer; oral hygiene habits; cancer risk

## Acknowledgments

This research received no external funding.

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*Poster 37*

# Secondhand smoke increases the risk of oral cancer: a meta-analysis

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## Abstract

**Background:** Tobacco smoke constitutes the largest human exposure chemical carcinogens [1]. However, it is not only active smokers who are in contact with tobacco smoke [2]. Secondhand smoke is known to cause several diseases, including cancer [3,4]. **Objective:** To evaluate the potential association between secondhand smoke exposure and oral cancer risk. **Methods:** Following the PRISMA guidelines, a systematic review and meta-analysis were developed. PubMed, Scopus, the Cochrane Library, Open Grey, and ProQuest databases were searched for studies published up to May 2023. A meta-analysis was performed using Q tests and $I^2$ tests to evaluate the heterogeneity among selected studies. Fixed-effect or random-effect models were used according to the absence or presence of heterogeneity. **Results:** Six studies were included. Overall, secondhand smoke exposure was positively associated with the occurrence of oral cancer with an OR of 1.45 (95% CI 1.19 to 1.77, p = 0.0002) without significant heterogeneity ($I^2$ = 0%, p = 0.51). **Conclusions:** Our study supports the association between secondhand smoke exposure and oral cancer risk. These results could provide guidance to public health policymakers to further support effective smoking reduction and secondhand smoke exposure prevention programs worldwide.

**Keywords:** secondhand smoke; involuntary smoking; oral cancer; environment; prevention

## Acknowledgments

This research received no external funding.

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*Poster 38*

# Osseodensification crestal sinus floor elevation: a case report

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## Abstract

**Background:** Osseodensification is a surgical technique based on two essential assumptions: the biological characteristics of the bone and the use of specific drills (Densah), designed to prepare the surgical bed without bone loss [1]. Denshan burs rotate at 800-1500 RPM in a counterclockwise direction, increasing bone density and promoting the formation of new bone tissue [2]. **Objective:** To clinically and radiographially evaluate the effects of osseodensification in crestal sinus floor elevation. **Methods:** Patient treated in the Postgraduate Program in Implant Dentistry (CESPU) for rehabilitation of an edentulous space in the first upper right molar. Upon the evaluation of diagnostic imaging, the amount of remanescent bone was 4.5mm. Treament planned sinus bone graft elevation with Densah burs with immediate implant placement. Bio-Oss small particle size was the bone graft material used and pushed with Versah Burs rotating in a counterclockwise 150 rpm without irrigation until 12 mm. After sinus bone graft placement of implant Straumann BLT of 4,1 mm x 10 mm on the surgical site and Platelet-rich fibrin (PRF) achieving a primary stability of 60N/cm. **Results:** The postoperative radiographic imaging shows a vertical gain of about 8 m in bone height. The Osstell measure after a 5-month healing period displays an implant coefficient stability value of 81. **Conclusions:** The maxillary sinus floor elevation using Osseodensification is a valid solution to restore available bone quantity and also increases bone quality in cases of insufficient bone height under the maxillary sinus [3].

**Keywords:** osseodensification; bone density; primary stability; autografting; torque insertion

## Acknowledgments

Acknowledgments to the TPD Hugo Costa, Cátia Teixeira and Miguel Gonçalves.

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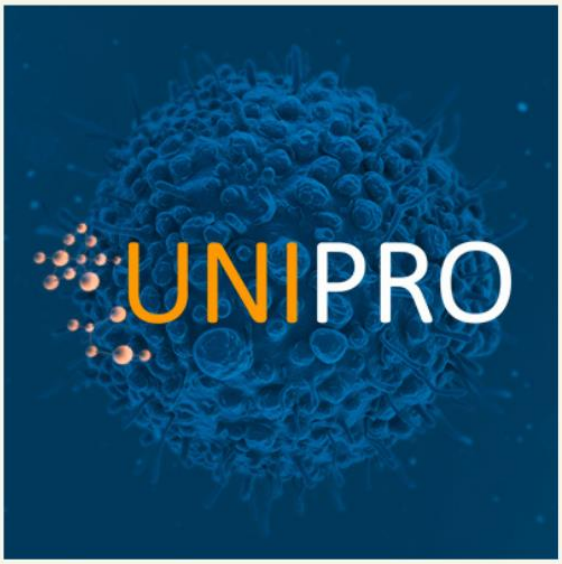


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