KU LEUVEN

OMFS
IMPATH

Yearbook 2021

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Preface

OMFS-IMPATH research group has been established 9 years ago. Progress and maturity go hand in hand as unsuccessful grant applications no longer cause utter disappointment but rather reflection and change of focus. Luckily brains quickly hide defeats and enjoy the sweetness of alloted grants. A quick look at www.omfsimpath.be reveals why 2021 has been a good year. No less than 7 PhD have been successfully defended and the pipeline is filled with motivated PhD candidates. With Professor Reinhilde Jacobs passing the milestone of scopus h-index 70 the tone is set for more. The publication output being consistently high (> 80/year), some omfsimpath researcher's findings yielded publications in journals with IF > 8, outperforming the regular OMFS Journals.

Clinical needs consistently raise relevant research questions translated into research projects. Artificial Intelligence no longer can be ignored as a basic requirement in OMFS clinic and in OMFS research. Advanced statistical techniques follow. 3D engineers have become an indispensible part of clinical OMFS teams. High level OMF Surgery can no longer exist without 3D engineering involvement. While in-house 3D biopolymer printing for long time was an option next to manually produced resin products this no longer is the case. Additive manufacturing (AM) of personalised surgical implants has become part of the daily work flow of major OMFS units. As in many other medical specialties the needs for AM are such that large hospitals can no longer deny the need for point-of-care AM-units (POCAM) within their walls. At the same time scientists, including our team, refocus on solutions with augmented reality and navigation instead to satisfy clinical needs in anatomic regions out-of-reach for surgical templates.

At the other end bioprinting is evolving fast as could be read in one of the defended PhDs. Necessary knowledge about cytokines and growthfactors supplement the acquired insights into bisphosphonates and monoclonal antibodies, not just in MRONJ but also as new treatment modalities in several non-odontogenic tumours although still as off-label use. Soon, the drowsy branch of OMFS, oral medicine, will rise again and constitute the 6th sense of omfsimpath:

1) optimized image acquisition with the least radiation dose;
2) presurgical planning via artificial intelligence, augmented and virtual reality tools;
3) image-based development of individualized surgical tools and navigation;
4) advanced applications for patient specific implants via 3D printing and bioprinting;
5) optimized visualization and surgical repair of the damaged trigeminal nerve pathway;
6) the use of monoclonal antibodies in oral pathologies.

OMFS-IMPATH is home to 40 researchers, representing over 17 different nationalities, working and living together in harmony. Just before this report is going to press, a major humanitarian crisis is unfolding in Europe. Weapons have replaced words. We continue to hope for peace and a unified Europe where all endangered people can be free to determine their own future.

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Team

A. STAFF

B. RESEARCHERS

C. VISITING PROFESSORS

D. VISITING RESEARCHERS

E. ADMINISTRATIVE COORDINATOR

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Team

The OMFS-IMPATH research group is an international multidisciplinary team of 40 MSc, PhD and postdoctoral researchers and clinicians. The multidisciplinary team is composed of maxillofacial surgeons, paediatric dentists, orthodontists, dentomaxillofacial radiologists, endodontists, biomedical scientists, and engineers. Research is ultimately aimed to develop and validate surgical tools and image-based solutions to advance in oromaxillofacial surgery, as such to strive for an optimized treatment outcome while minimizing peri- and postsurgical risks.

The team produces high quality research output, with up to 2 peer-reviewed publications a week. In 2021, the OMFS-IMPATH research group published more than 120 papers, of which 5% were in top 5 journals and 20% in the top 20 journals. Furthermore, 3 research projects and 2 academic chairs were obtained, providing funding for a total over €650.000. There were 4 newly started and 7 graduated PhD students.

For updates on research of the omfsimpath team, see www.omfsimpath.be.

DEPARTMENT OF IMAGING & PATHOLOGY - HEAD: PROF. TANIA ROSKAMS

Biomedical MRI	Uwe Himmelreich
Forensic Biomedical Sciences	Wim Van de Voorde
Medical Physics & Quality Assessment	Hilde Bosmans
Nuclear Medicine & Molecular Imaging	Koen Van Laere
Radiology	Chantal Van Ongeval
Theragnostic Laboratory	Yicheng Ni
Translational Cell & Tissue Research	Tania Roskams
Translational MRI	Vincent Vandecaveye
OMFS-IMPATH	**Constantinus Politis** www.omfsimpath.be

Tania ROSKAMS

Tania Roskams obtained her medical degree in 1989 at the University of Leuven. She specialized in Pathology (University of Leuven) and obtained her PhD in liver pathology in Leuven and Oklahoma University, USA. In 1996 she became head of the Liver Research Unit, in 2002 of the Research group Translational Research and Pathology and in 2015 Head of the Departement of Imaging & Pathology. She was nominated Professor in pathology in 2002. From 2007-2009 she was visiting professor at the University of Utrecht. In the clinical department she is responsible for hepatobiliary, pancreas and gastrointestinal pathology. Her main interest is liver research with special emphasis on liver progenitor cells and their role in regeneration and carcinogenesis.

Peter VERMAELEN

Peter Vermaelen obtained his degree in Medical Laboratory Technology in 1994 and gained experience in different clinical and research topics. In 2000, he joined the pre-clinical unit of the Nuclear Medicine & Molecular Imaging research group and was co-founder of the Molecular Small Animal Imaging Center (MoSAIC). Since 2012, he is as department manager responsible for the financial and personnel administration of the Department of Imaging & Pathology.

A. STAFF

Constantinus POLITIS

Constantinus Politis is Oral and Maxillofacial Surgeon. He is currently Full Professor and Chairperson of the Department of Oral and Maxillofacial Surgery at Leuven University Hospitals, KULeuven, Belgium. He is an invited Lecturer at the EHSAL in Brussels. He graduated at the Catholic University of Leuven in medicine (MD, summa cum laude), in dentistry (DDS, magna cum laude). He specialized in oral and maxillofacial surgery at the Catholic University of Leuven. Postgraduate training was additionally followed in Arnhem (Stoelinga), Aachen (Koberg), Copenhagen (Pindborg), Göteborg (Bränemark) and San Francisco (Marx). He holds an honorary professorship at the Fourth Medical Military University of Xi'an, China. He also holds a master degree in management (MM) from the Applied Economic Scienes at the University of Hasselt and a master degree in Hospital Management (MHM) from the Catholic University of Leuven. He became a recognition as medical specialist in management of health care data and is now member of the National Council of Hospital Facilities. He is Vice-President of the Professional Union of Belgian Oral and Maxillofacial Surgeons. He is President of the Belgian Royal Scientific Society of Oral and Maxillofacial Surgery. He is acknowledged trainer of OMFS trainees. He defended his doctor's thesis on the subject of complications of orthognathic surgery (PhD). His professional field of intrest is in orthognathic and orthodontic surgery and trigeminal nerve dysfunction. Clinical research projects include prevention and repair of iatrogenic trigeminal nerve injury, transplantation of teeth and orthognathic surgery. He has been granted membership of the Belgian Royal Academy of Medicine.
Researchgate: https://www.researchgate.net/profile/Constantinus_Politis2

Reinhilde JACOBS

Reinhilde Jacobs is dentist, Doctor in Dental Sciences (PhD University of Leuven), periodontologist (KU Leuven) and Master in Dental Radiology (University of London). She is full professor at the University of Leuven and visiting professor at Karolinksa Institutet, Stockholm, Sweden and the Dalian Medical University in China. R. Jacobs is heading the omfs impath research group of the KU Leuven (omfsimpath.be) and the clinical center of dentomaxillofacial radiology (UZleuven). She is Secretary General of the International Association of DentoMaxilloFacial Radiology. She is section editor of 5 journals (Journal of Dentistry, Clinical Oral Investigations, International Journal of Oral Implantology, European Journal of Radiology and Oral Radiology). She has received the D Collen Research Travel Award (1994), a postdoctoral fellowship of the European Commission (1994-95), the IADR Young Investigators Award (1998) and the Belgian Joachim Award in Odontostomatology (1999). In 2013, she received a Dr Honoris Causa at the "Iuliu Hatieganu" University of Medicine and Pharmacy in Cluj-Napoca. She is involved in many multidisciplinary and interuniversity research collaborations, with a specific focus on imaging research, artificial intelligence and bioprinting. She has been actively participating in 5 European projects and is (co-)author of 5 books and more than 500 publications in peer-reviewed journals besides multiple invited lectures and publications in other journals or books. Scopus (2022): h:70

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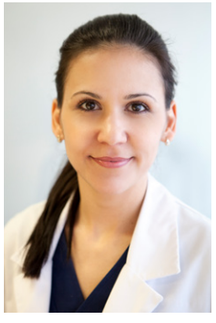
Paul LEGRAND

Prof. dr. Paul Legrand studied medicine at the KU Leuven and graduated as medical doctor in 1982. Afterwards he studied dentistry and graduated in 1984. He was trained as an oral- and maxillofacial surgeon at the KU Leuven and at the Rheinisch-Westfälische Technische Hochschule in Aachen. In 1988 he became a certified oral and maxillofacial surgeon. In October 1988, he founded the oral and maxillofacial surgery department in the Maria Hospital in Overpelt, where he was medical head of OMFS from 1988 to 2017. He is a certified OMFS instructor and a member of the OMFS accreditation committee. Furthermore, he is on the board of the association of Flemish oral and maxillofacial surgeons (VVMKA) and the VBS MKA.
Since 2011 professor Legrand was part-time affiliated with the UZ Leuven and in 2016 he was appointed guest lecturer at the KU Leuven. Since November 2018, professor Legrand is fulltime staff member at OMFS UZ Leuven.
In Belgium, professor Legrand is a pioneer in intravenous sedation in the OMFS department and he has made this is most important area of interest. His principal activities are dento-alveolar surgery, implantology and further development of intravenous sedation techniques.

Titiaan DORMAAR

Titiaan Dormaar is a Cranio-Maxillofacial and Cleft surgeon currently working in the department of oral and maxillofacial surgery at UZ Leuven. He obtained his MD from Maastricht University, where he was involved in a research project focusing on liquid ventilation in neonatal respiratory distress syndrome. He obtained his DDS from the Radboud University Nijmegen (the Netherlands). Before continuing his specialist training he spent 2 years in the UK, where he worked as a senior house officer in ENT and OMFS in Guildford and London. He completed his OMFS training at Utrecht University (the Netherlands). During his training in Utrecht he was the lead surgeon in an animal model research project on alveolar bone grafting with beta-TCP bone substitute in alveolar clefts. Following this he did a 3 year Fellowship in Cleft Surgery at Guy's and St Thomas' Hospital, London (UK), whilst he also provided regular on-call duties at King's College Hospital, a tertiary trauma centre.

Ruxandra Gabriela COROPCIUC



Ruxandra Gabriela Coropciuc graduated as double qualified (MD, DDS) Oral and Maxillofacial Surgeon from the University of Medicine and Pharmacy Carol Davila, Bucharest in 2013. She was trained in the Clinical Hospital or Oral and Maxillofacial Surgery, Bucharest and at Leuven University Hospitals. She joined the Department of Maxillofacial Surgery at the UZ Leuven Belgium in 2013. Her PhD research is focused on bisphosphonate-related osteonecrosis of the jaw bone. Her clinical field of interest is in oral implantology, salivary gland pathology and head and neck oncology and reconstruction. Being multilingually talented with backgrounds in Canada, Romania and Belgium allow her to easily address patients in Dutch, English, French or Romanian.

Michel BILA

Dr. Michel Bila graduated from Antwerp University in 2009 as Medical Doctor and graduated from Leuven University in 2012 as Master in Dentistry. He obtained his specialty degree in Oral and Maxillofacial Surgery in 2016. He further specialized in Head and Neck Oncology at the Maxillofacial and Head and Neck Service at University College London Hospitals. He is Clinical Staff Member in Oral and Maxillofacial Surgery at UZ Leuven. His clinical focus is Head and Neck Oncology and Reconstruction. His PhD research covers the use of immunotherapy in head and neck squamous cell carcinoma (HNSCC).

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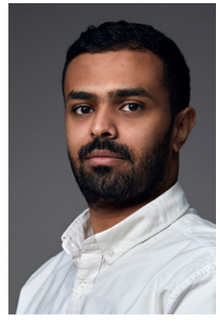
Robin WILLAERT

Dr. Robin Willaert finished his medical and dental studies at the Faculty of Medicine in Leuven University with the highest distinction. He successfully obtained his Board Certification in Oral and Maxillofacial Surgery in 2018. He is Clinical Staff Member in Oral and Maxillofacial Surgery at UZ Leuven. His clinical focus is Head and Neck Oncology and maxillofacial reconstruction using 3D technology. His PhD research covers orbital imaging and reconstruction surgery (PhD January 2021). He further specializes in Head and Neck Oncology in different centres in Australia, Scotland, South-Africa and different Asian Centers.

B. RESEARCHERS

Khalid Ayidh ALQAHTANI



Khalid Ayidh Alqahtani was born on 21 August, 1992. He achieved his Bachelor of Dental Surgery (BDS) degree from Prince Sattam Bin Abdulaziz University, Al-Kharj, Saudi Arabia in the year 2016. He worked as a demonstrator in the department of oral and maxillofacial radiology at Prince Sattam Bin Abdulaziz University from the year 2016 to 2018. He has obtained a postgraduate diploma in advanced medical imaging and is currently PhD student under the supervision of Prof. dr. Reinhilde Jacobs at the OMFS-IMPATH research group, KU Leuven. His main focus of research involves three-dimensional assessment of root resorption in orthognathic surgery.

Oliver DA COSTA SENIOR

Oliver da Costa Senior is a PhD candidate at the OMFS-IMPATH research group at the University of Leuven under promotorship of Prof. dr. Constantinus Politis, Prof. dr. Reinhilde Jacobs and Dr. Ir. Eman Shaheen. He graduated at the Catholic University of Leuven in Medicine in June 2018. Currently, he is an Oral and Maxillofacial trainee at the department of Oral and Maxillofacial Surgery at the University Hospitals of Leuven. His research is focused on the three-dimensional planning, follow-up and complications of orthognathic surgery with special interest in Segmental Maxillary Osteotomy and Surgical Assisted Rapid Palatal Expansion (SARPE).

Karla DE FARIA VASCONCELOS

Karla de Faria Vasconcelos is dentist (2006), Doctor in Dental Radiology (2015; PhD at State University of Campinas - Brazil, with one year of external internship at KU Leuven - Belgium), Master in Dentistry (2010; Federal University of Goiás - Brazil) and Specialist in Oral Radiology (2012; University of Campinas). She has worked, as Radiologist, in private radiology clinics, and as a Collaborator Professor of Graduate Program of Dentistry from the Federal University of Goias at the Discipline of “Imaging Diagnostic”. She performed postdoctoral research at Dental Radiology Department, Piracicaba, Brazil (Prof. dr. Francisco Haiter-Neto) and OMFS-IMPATH research group, Leuven, Belgium (Prof. dr. Reinhilde Jacobs), with a FAPESP fellowship (2015-2017). In 2018 she obtained the diploma of Postgraduate Studies in Advanced Medical Imaging at KU Leuven, Leuven, Belgium. At present she is postdoctoral researcher in the OMFS-IMPATH Research Group, under the supervision of Prof. dr. Reinhilde Jacobs and Prof. dr. Politis Constantinus. She has been involved in interuniversity research collaborations, with a specific focus on digital radiography, cone beam computed tomography, micro and nano-CT.

Kathia DUBRON

Kathia Dubron is a PhD candidate at the OMFS-IMPATH-research group at the University of Leuven under promotorship of Prof. dr. Constantinus Politis, Prof. dr. Reinhilde Jacobs and Dr. Ir. Eman Shaheen. She received her Medical Degree (MD) in 2017 and Master degree in Management (MM) in 2019 from the Catholic University of Leuven. Currently, she is an Oral and Maxillofacial surgery trainee at the University Hospitals of Leuven. Her research is focused on virtual planning of zygomatico-orbital complex fractures, with special interest in the implementation of artificial intelligence.

Bahaa ELGARBA

Bahaaeldeen Mohamed Abdalazeem Elgarba was born in Elryad, Saudi Arabia, in 1990. He obtained his bachelor’s degree in Dentistry at Tanta University in Egypt, between 2007 and 2012, followed by an internship of a year at Tanta. In 2014 and 2015, he worked as a dentist at the Egyptian Military Forces. Since 2014, he has been working as a general Dentist at Egyptian Ministry of Health. Afterwards, he became a resident and research assistant at the Department of Prosthodontics at Tanta University. Since then, he also has his own private clinic. Between 2016 and 2019, he obtained his master’s degree in Prosthetic Dentistry at Tanta University. Since 2020, he is assistant lecturer and researcher at the Department of Prosthodontics at the Faculty of Dentistry at Tanta University. His specialization is implant dentistry. In 2021 he came to Leuven as a visiting researcher at OMFS-IMPATH.

Mostafa EZELDEEN

Mostafa EzEldeen was born on July 19th, 1984 in Mansoura, Egypt. He obtained his Bachelor of Dental Medicine and Surgery (2007) from Mansoura University, Egypt and Master in Dentistry (2013), Summa cum laude, at the KU Leuven, Belgium. Further, he obtained a specialization in Paediatric Dentistry and Special Dental care (2012), at the KU Leuven under the guidance of Prof. dr. Frans Vinckier and Prof. dr. Dominique Declerck. In 2013, he obtained the diploma of Postgraduate studies in Advanced Medical Imaging at the KU Leuven under the guidance of Prof. dr. Reinhilde Jacobs. He works as a dentist in private practice and UZ Leuven (department of Paediatric Dentistry and Special Dental Care). Currently he is a PhD candidate (OMFS-IMPATH research group, KU Leuven, Belgium) with Prof. dr. Reinhilde Jacobs as his promoter. His research topics are; assessment of the patterns of healing in teeth and bone after regenerative processes using Cone Beam Computed Tomography, developing of reliable teeth segmentation methods, bio-3D printing and chemokine-mediated regeneration in the oral and maxillofacial region.

Koenraad GRISAR

Koenraad Grisar is a PhD candidate at the OMFS-IMPATH research group (Department Imaging and Pathology, Faculty Medicine, Catholic University Leuven), where he studies the autogenous transplantation of maxillary canines. He received his Medical Degree from the Leuven University in 2013. He graduated in June 2016 as Master of Science in Dentistry at Leuven University with a Master's Thesis in early dental implant survival and risk factors. He has had several articles published in internationally renowned journals on topics related to oral and maxillofacial surgery (Human papillomavirus and head and neck cancers; Osteoradionecrosis and medication-related osteonecrosis of the jaw, Dental implantology). Currently he is an oral and maxillofacial trainee at the University Hospital Leuven.

Yifei GU

Gu Yifei was born on April 17th, 1992. She achieved her degree in Bachelor of Medicine from West China college of Stomatology, Sichuan University, Chengdu, Sichuan, China (2010 - 2015). After that, she continued to obtain her degree in Master of Dental Medicine, majored in oral implantation, from West China college of Stomatology, Sichuan University, Chengdu, Sichuan, China, under the guidance of Professor Mo Anchun (2015-2018). During her Masters, she worked on the impact of non-steroid anti-inflammatory drugs on implant osseointegration, as well as the digital workflow in implant dentistry. She started working as a PhD candidate (OMFS-IMPATH research group, KU Leuven) from 2018, with Prof. dr. Constantinus Politis and Prof. dr. Reinhilde Jacobs as her promotors. Her research topic for PhD is related to tissue engineering for bone defect reconstruction by using biomimetic calcium phosphate/BMP-2 coated 3D printed implants.

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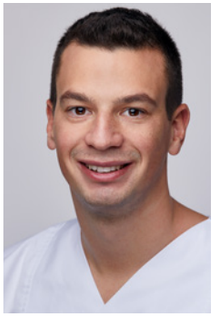
Team

Una IVKOVIĆ

Una Ivkovic was born in Belgrade, Serbia, in 1998. She studied her bachelor and master's degree in Biomedical Sciences at KU Leuven between 2017 and 2022. During her last year, she performed her master thesis partially at Karolinska Institutet in Stockholm, Sweden. There, she studied modelling of periodontal disease in vitro and continued the study on application of scaffolds in oral diseases back in Belgium at the research group under tutelage of prof. Jacobs and dr. Mostafa Ezeldeen. Starting September 2022, she will join our research group as an PhD in Biomedical Sciences under tutelage of prof. Jacobs.

Artúr KESZTYÜS



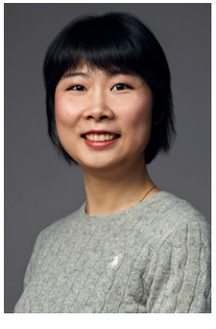
Artúr Kesztyüs graduated as a dentist in 2017 at the Semmelweis University Budapest, Hungary. Since that he has been working as a Phd student at the First Department of Pediatrics Semmelweis University and a part-time dentist. In January 2019 he started a joint degree programme under the supervision of Prof. dr. Reinhilde Jacobs (OMFS-IMPATH research group, KU Leuven) and Dr. Krisztián Nagy (First Department of Pediatrics, Semmelweis University Budapest) with the main research interest in three-dimensional cleft palate evalutation, surgical planning and follow-up supported by AI technology.

Pierre LAHOUD

Pierre Lahoud is a dentist, Doctor in Dental Surgery with Postgraduate training in Advanced Medical Imaging. He is a certified Emergency Medical Technician (EMT) and volunteered with the Red Cross between 2016 until 2018. He has concluded an internship in clinical training at UC Louvain in 2018 and performed his pre-doctoral research at the OMFS-IMPATH Research Group (KU Leuven), focusing on Artificial Intelligence driven segmentation for tooth auto-transplantation - graduating Magna Cum Laude in July 2020.

He is currently a Clinical Resident in Periodontology and Implant Surgery (Section Periodontology and Oral Microbiology – Department of Oral Health Sciences, KU Leuven) and a Ph. D. Researcher (OMFS-IMPATH Research Group, KU Leuven, Belgium) under the promotership of Prof. Dr. Reinhilde Jacobs (KU Leuven, Belgium), Prof. Dr. Marc Quirynen (KU Leuven, Belgium) and Prof. Dr. Michael Bornstein (Universität Basel, Switzerland). His research topics focus primarily on Artificial Intelligence-driven planning for treatments and surgeries in the oral and maxillofacial region. In May 2021, he was awarded the First Prize - IADMFR Maxillofacial Research Award 2021 (International Congress of DentoMaxilloFacial Radiology, Gwangju, South Korea).

Jiqing LI



Jiqing Li was born on April 15th, 1991. She achieved her degree in Bachelor of Dental Medicine from School of Stomatology, Shandong University, Jinan, China (2009-2014). She obtained her Master of Dental Medicine degree in Oral and Maxillofacial Surgery from West China College of Stomatology, Sichuan University, Chengdu, China, under the guidance of Professor Jihua Li and Professor Jing Hu (2014-2017). During her Masters, she worked on the effect of hyaluronidase on skin necrosis caused by hyaluronic acid. After her graduation, she worked as a general dentist at West China Hospital of Stomatology, Chengdu, China (2017-2018). Currently, she is a PhD candidate in OMFS-IMPATH research group, KU Leuven, with Prof. dr. Reinhilde Jacobs as her promoter. She is studying the effect of systemic diseases on patients undergoing orthognathic surgery.

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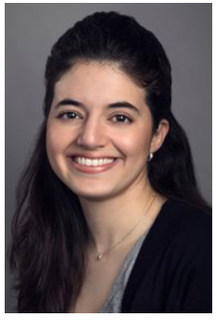
Hongyang MA

Hongyang Ma obtained his Bachelor of Dental Medicine and Surgery from Harbin Medical University and Master degree of Oral and Maxillofacial Surgery in Department of Oral and Cranio-maxillofacial Surgery, Ninth People's Hospital, Shanghai Jiao Tong University School of Medicine. Currently, he is a PhD candidate (OMFS-IMPATH research group, KU Leuven, Belgium) with Prof. dr. Reinhilde Jacobs as his promoter and Prof. dr. Constantinus Politis as his co-promoter. He studies the assessment of the long-term follow-up of patients performed with oral oncologic reconstruction surgery.

Joeri MEYNS

Dr. Joeri Meyns has a degree as a Medical doctor, Dentist and Maxillofacial surgeon. After obtaining his degree as a maxillofacial surgeon in 2011 he was a staff member at the Academic Hospital Maastricht (MUMC) for almost 4 years, where he further specialised in oral oncology and reconstructive surgery. He is Medical Head of the department of Oral and Maxillofacial Surgery at Ziekenhuis Oost-Limburg (ZOL) in Genk. His main speciality is orthognathic surgery and oncology. His PhD research is growth modification of the face in children.

Catalina MORENO RABIE



Catalina Moreno Rabie was born in Concepción, Chile, in 1992. She studied her bachelor and master degree in Dentistry at the University of los Andes in Chile between 2011 and 2016. During her last year of Dentistry, she did an internship in Clinical and Research training at KU Leuven, where she studied the mandibular bone on CBCT. After working as a general dentist in Chile, she enrolled in the Postgraduate Studies in Advanced Medical Imaging at KU Leuven (2018- 2019), her thesis topic was on guided endodontics. After graduation, she started a PhD in biomedical sciences in the KU Leuven under the tutelage of Prof. dr. Reinhilde Jacobs. Specifically, she is investigating the effects that antiresorptive medications have on the jaw bones and the potential risk factors to developing Medication-related osteonecrosis of the Jaws (MRONJ).

Nermin MORGAN

Nermin Morgan was born on September 20th, 1990. She obtained her degree in Bachelor of Dental Surgery (B.D.S) from Faculty of Dentistry, Mansoura University, Egypt (2007-2012). After her graduation she worked there as a teaching assistant in the department of Oral radiology and Diagnostic sciences (2013-2018). Meanwhile She has awarded her master's degree of Oral Diagnosis and Radiology (2017). During the same year she became a radiology specialist at Ministry of health, Cairo, Egypt. Her research work has focused on Cone Beam CT (CBCT), and its different clinical applications in maxillofacial region. Currently, she is a PhD Candidate in OMFS-IMPATH research group, KU Leuven, with Prof. dr. Reinhilde Jacobs as her promoter.

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Team

Delphine MULIER

Delphine Mulier is a PhD candidate at the OMFS-IMPATH-research group at the University of Leuven under promotorship of Prof. dr. Reinhilde Jacobs, Prof. Dr. Constantinus Politis, Prof. dr. Kris Vanhaecht and Dr. Ir. Eman Shaheen. She graduated at the Catholic University of Leuven in Medicine in June 2018. Currently, she is an Oral and Maxillofacial trainee at the department of Oral and Maxillofacial Surgery at the University Hospitals of Leuven. Her research is focused on the evaluation of the quality of care for orthognathic surgery.

Anna OCKERMAN

Anna Ockerman is a PhD candidate at the OMFS-IMPATH research group in cooperation with the Department of Cardiovascular Sciences. She performs research in the domain of antithrombotics in the oral and maxillofacial surgery and dentistry. More specifically, she investigates how to reduce bleeding complications after dental extractions in patients on non-vitamin K oral anticoagulants (NOACs) and what the influence of antithrombotic drugs is on the characteristics of Leukocyte Platelet Rich Fibrin (L-PRF) membranes. Her promotors are Prof. dr. Reinhilde Jacobs, Prof. dr. Constantinus Politis (Department Imaging and Pathology, KU Leuven) and Prof. dr. Peter Verhamme (Department of Cardiovascular Sciences, KU Leuven). Anna graduated in June 2017 as MSc in Biomedical Sciences (KU Leuven). Her Master's Thesis 'The eruption potential of wisdom teeth predicted by tooth inclination in a premature development stage', was awarded with the Best Master's Thesis Biomedical Sciences 2017, third place.

Flavia PREDA

Flavia Preda has graduated as Dentist (2012) and as Orthodontics Specialist (2015) at the University of Medicine and Pharmacy Carol Davila, Bukarest-Romania. Since then, she has practiced orthodontics in private dental clinics in both Romania and Belgium. Since 2019 she is a visiting Orthodontics Consultant in the cleft facility at Marie S. Curie Children's Hospital in Bukarest-Romania. Currently, she is a part-time PhD student in the OMFS-IMPATH research group at KU Leuven under the supervision of Prof. dr. Reinhilde Jacobs with the main research interest 3D supported and AI enhanced diagnosis and treatment planning for cleft patients.

Mehdi SALAR AMOLI

Mehdi is a PhD candidate at OMFS-IMPATH in collaboration with Faculty of Engineering Technology working under supervision of Prof. Veerle Bloemen and Prof. Reinhilde Jacobs. He studied biomaterials and tissue engineering for bachelor's at Amirkabir University of Technology in Iran working on multiphasic chitosan scaffolds for cartilage regeneration. He obtained his master's degree at Imperial College London in biomaterials and tissue engineering and worked under supervision of Prof. Molly Stevens and Dr. Ioanna Mylonaki on developing non-viral methods for nucleic acid delivery to the cells. He is currently working on development of methods for regeneration of dentin-pulp region through bio printing cell encapsulated materials.

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Team

Eman SHAHEEN

Eman (Emmy) Shaheen was born on July 12th, 1982 in Giza, Egypt. She graduated with honor from the faculty of Computer Sciences and Information Technology (2003), Cairo University, Egypt where she also worked as a teaching assistant from 2003 till 2007 with major in Image Processing. Meanwhile, she obtained her Master's Degree in Video Processing (2007) from Cairo University. In 2008, she joined the team of Medical Physics where she finished with distinction her pre-doctoral studies about mammography and breast cancer (2009) in Biomedical Sciences at the KU Leuven, Belgium. She was granted a PhD scholarship from the OPTIMAM project (UK) in 2010 to develop, simulate and validate 3D models of breast lesions and tools to optimize the performance of breast tomosynthesis. She obtained her doctoral degree in 2014, KU Leuven, Belgium. In the same year, she started working in the department of Maxillofacial surgery, University hospitals Leuven (Belgium) with Prof. dr. Constantinus Politis as clinical engineer with focus on 3D planning of orthognathic surgeries. Next to the patient related work, she is part of the research group of the OMFS-IMPATH research group (KU Leuven, Belgium) where she supervises students, supports different research projects related to 3D printing and 3D simulations. She is also collaborating with Materialise (Leuven, Belgium) as consultant to improve the CMF software for orthognathic surgeries next to other research related projects.

Sohaib SHUJAAT

Sohaib Shujaat was born on November 29th, 1985. He achieved his degree in Bachelor of Dental Surgery (B.D.S) from Lahore Medical and Dental College, Lahore, Pakistan (2004 - 2008). After his graduation, he worked as an Internee in all clinical departments of dentistry at Lahore Medical and Dental College, Lahore, Pakistan (2009-2010). He obtained his Master of Science (MSc. Dent Sci) degree in Oral and Maxillofacial Surgery (360 credits) with merit from Glasgow Dental School and Hospital, University of Glasgow, Glasgow, United Kingdom, under the guidance of Professor Ashraf Ayoub (2010-2012). During his Masters, he worked on 4-Dimensional facial soft tissue changes in oncology patients. From March 2013 till September 2017, he worked as a Lecturer in the Department of Oral and Maxillofacial Surgery and Course Director of Internal Medicine and Comprehensive Patient Management (CPM) for dental students at Imam AbdulRahman Bin Faisal University (Formerly University of Dammam), Dammam, Kingdom of Saudi Arabia. At the same instance, he served as a Specialist (Registrar) in the Department of Oral and Maxillofacial Surgery, King Fahd Hospital of the University. Currently he is a PhD candidate (OMFS-IMPATH research group, KU Leuven) with Professor Reinhilde Jacobs as his promotor. His research topic for PhD is related to three-dimensional analysis of hard and soft tissue changes in orthognathic surgery patients and to develop a start of art predictive model for treatment planning.

Maximiliaan SMEETS

Maximiliaan Smeets graduated from the Catholic University of Leuven in June 2018 as a Medical Doctor and is now an active Oral and Maxillofacial trainee at the University Hospital of Leuven. His research interests include oral oncology and Oral and Maxillofacial Surgery in general. Since 2020 Maximiliaan Smeets is a PhD candidate at the OMFS-IMPATH Research Group, and he focuses on the onset, etiology, and treatment of persistent trismus after oral oncology treatment. His research is mentored by Prof. dr. Constantinus Politis, Prof. dr. Reinhilde Jacobs, dr. Michel Bila, and Jeroen Van Dessel.

Dandan SONG

Dandan Song was born on March 11th, 1990. She achieved her degrees in both Bachelor and Master of Oral Medicine from Dalian Medical University, China. During her Master, she worked on the effect of the different implant placement and loading protocols on the osseoperception around the implant. Currently she is a PhD Candidate in OMFS-IMPATH Research Group, KU Leuven, with professor Reinhilde Jacobs as her promoter. She is studying the effect of the bisphosphates and radiation on the jaw bone and blood vessel changes.

Yi SUN

Yi Sun obtained his PhD in Biomedical Sciences, Master of Medical imaging and Bachelor in Electronic Engineering. Since 2007, he worked in the field of computer assistant surgery planning, with focus on oral and maxillofacial surgery. His main professional interest is template-based and image-guided solution for dental implant placement, design of digital splint for orthognathic surgery, orofacial reconstruction using fibular or DCIA flap. Currently he is responsible for the 3D surgical simulation team in the department of oral and maxillofacial surgery (UZ Leuven). His current research interest are: design of patient specific implant, tissue engineering by using 3D printed titanium scaffold and development of image-guided surgical simulation system (navigation system).

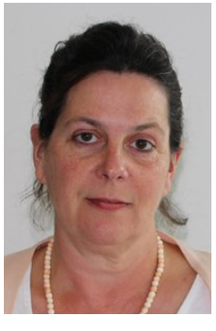
Isti Rahayu SURYANI

Isti Rahayu Suryani was born on November 20th, 1980. She obtained her Doctor of Dental Medicine (2006) from Faculty of Dentistry, UGM-Indonesia, Master of Biomedical Engineering (2012) from Graduate School of UGM-Indonesia and Specialist in Oral Radiology (2016) from Padjajaran University-Indonesia. She has worked as lecturer in Departement of Dentomaxillofacial Radiology, Faculty of Dentistry, UGM and also as Oral Radiologist at UGM Dental Hospital. Currently, she is PhD candidate in OMFS-IMPATH research group, KU Leuven from Desember 2019 with Professor Reinhilde Jacobs as her promotor. Her research focus on Imaging of Medication-related osteonecrosis of the jaw.

Kostas SYRIOPOULOS

Kostas Syriopoulos is dentist specialized in oral and maxillofacial radiology. He graduated as dentist from the University of Athens, Greece. He has a MSc degree (University of London) as well as a PhD degree (VU, Amsterdam) in Dental Radiology. He had an internship in the Dept. of Oral Radiology (Stellenbosch University, Cape Town). Further, he received the diploma in Health Physics level 3 (TU Delft). In the Netherlands Level 3 is a higher expert level of health physics, necessary for supervising in radionuclide laboratories or working in a medical profession with higher risk or responsibility, like clinical physics and nuclear medicine. From 2001 to 2016 he was a staff-member in the department of Dentomaxillofacial Radiology, ACTA, Amsterdam. Since February 2015 he has been a staff member in the Department of Imaging & Pathology, KU Leuven. His main professional interests are Diagnostic Radiology, Radiography Education and Radiation Protection.

Els TIJSKENS

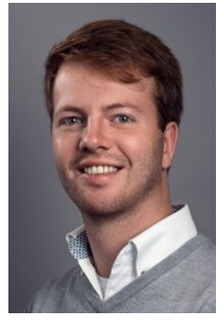


Els Tijskens graduated as a dentist in 1984 at KU Leuven. She has been working as an endodontist since 2000, and has a second line practice for paediatric endodontics and traumata. In 2011 she obtained a license to use N2O-sedation, which she is applying on indication. She is a Certified Member of the European Society for Endodontology (ESE), Fellow of the International Association for Dental Traumatology (IADT), founding board member and President of the Flemish Society for Endodontology (FSfE vzw). She has been lecturing to GP's at NIVVT for more than a decade. She is involved in reading the CBCT images at UZLeuven, and has been teaching Medical Imaging at UCLL opleiding Mondzorgkunde until August 2019.

Andres TORRES

Andres Torres was born on July 4th, 1988 in Bogota, Colombia. He obtained his degree as General Dentist in 2012 from the University of Los Andes, Santiago, Chile. During the training in Dentistry, he participated twice in a research internship on CBCT in Endodontics at the KU Leuven, Leuven, Belgium, led by Professor Reinhilde Jacobs. In March 2014 he achieved the equivalence of foreign diploma "Titulo de Cirujano Dentista" with the Flemish degree of "Master of Science in Dentistry". In 2015 he obtained the diploma of Postgraduate studies in Advance Medical Imaging at the KU Leuven, Leuven, Belgium. Further, he obtained a specialization degree in Endodontics in July 2017, under the guidance of Professor Paul Lambrechts at the KU Leuven, Leuven, Belgium.
He works as an Endodontic specialist in private practice. He is instructor of the Endodontic postgraduate at KU Leuven, Leuven, Belgium and visiting instructor of the Endodontic postgraduate at KI, Stockholm, Sweden. Currently he is a PhD candidate (OMFS-IMPATH research group, KU Leuven, Belgium) with Professor Reinhilde Jacobs as his promoter and Professor Paul Lambrechts as his co-promoter. His research topics are: 3-Dimensional Guided Endodontics, 3-Dimensional Assessment of Apical Radiolucencies, Characterisation of Root and Canal Morphology and Maxillary Sinus and Endodontics.

Fréderic VAN DER CRUYSSEN



Fréderic Van der Cruyssen is a PhD candidate at OMFS-IMPATH research group under promotorship of Prof. dr. Constantinus Politis, Prof. dr. Reinhilde Jacobs and Prof. dr. Tara Renton (Oral Surgery, King's College, Londen, UK). He received his Medical Degree from the Catholic University of Leuven in June 2017 with a Master's thesis on trigeminal nerve physiology. Currently he is an oral and maxillofacial trainee at the University Hospitals Leuven. His research is focused on traumatic trigeminal nerve injuries.
Some of his current projects are:

- Development and validation of magnetic resonance neurography to visualize peripheral trigeminal nerve anatomy and trauma
- Improving current diagnostic methods in assessing post-traumatic trigeminal neuropathy & implementing treatment protocols with attention for Quality of Life
- Prediction of post-traumatic trigeminal neuropathy using multimodal factors
- Costs and burden of disease in post-traumatic trigeminal neuropathy in Belgium
- Orofacial quantitative sensory testing

Jeroen VAN DESSEL

Jeroen Van Dessel has a MSc in Biomedical Sciences (KU Leuven) and Msc in Advanced Medical Imaging (KU Leuven). Currently, he is a PhD candidate at the Child- and Adolescent Psychiatry Research Centre, Catholic University Leuven, under promotorship of Prof. Dr. Marina Danckaerts. Where he studies the neural signature of delay aversion in ADHD using functional Magnetic Resonance Imaging. Besides his PhD in the psychiatry domain, he still remains active in dental radiology field as a researcher at the OMFS-IMPATH research group. He has achieved the second place in the European DentoMaxilloFacial Radiology Research Award (2012), the first place in the Odontológico Congresso de Universidade de São Paulo Research Award (2013) and the first place in the European DentoMaxilloFacial Radiology Research Award (2014). His research topics are developing and validating tools for objective bone quality and quantity assessment on Cone-Beam Computed Tomography and Micro-CT images.

Jonas VER BERNE

Jonas Ver Berne is an Oral and Maxillofacial Surgery trainee at the University Hospitals of Leuven. He graduated as a Medical Doctor from the Catholic University of Leuven in 2020 with a master's thesis in oral pathology under promotorship of Prof. dr. Constantinus Politis, Prof. dr. Reinhilde Jacobs, and Prof. dr. Erich Raubenheimer. During his medical education he did several internships at the OMFS-IMPATH research group, and was involved in research on the relationship between systemic diseases and orthognathic surgery. Currently, his research is focused on the use of Artificial Intelligence in oral and maxillofacial radiology.

Pieter-Jan VERHELST

Dr. Pieter-Jan Verhelst is a PhD candidate at the OMFS-IMPATH research group at the University of Leuven under promotorship of Prof. dr. Reinhilde Jacobs, Prof. dr. Constantinus Politis, Prof. dr. Hilde Peeters and Prof. dr. Gwen Swennen. He graduated at the University of Leuven in Medicine (MD, magna cum laude) in 2017 with a master's thesis on the fibula free flap in facial reconstruction. Currently, he is an Oral and Maxillofacial trainee at the department of Oral and Maxillofacial Surgery at the University Hospitals of Leuven. His research focusses on dentocraniofacial deformities, orthognathic surgery and condylar resorption. Some of his current projects are:

- Development and validation of an analysis protocol for condylar remodeling
- Etiological factors in condylar resorption
- Bridging the gap between 3D craniofacial phenotyping and genotyping

Laurence VERSTRAETE

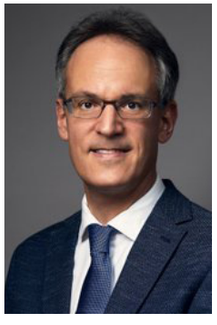
Laurence Verstraete is a PhD candidate at the OMFS-IMPATH research group at the University of Leuven under promotorship of Prof. dr. Constantinus Politis, Prof. dr. Reinhilde Jacobs and Dr. Ir. Eman Shaheen. She obtained her Medical Degree at the University of Ghent in June 2018. Currently, she is an Oral and Maxillofacial surgery trainee at the University Hospitals of Leuven. Her research is focused on the three-dimensional planning, evaluation and follow-up of orthognathic surgery with special interest in soft tissue analysis.

Xiaotong WANG

Xiaotong Wang received her degrees in both Bachelor and Master of Dental Medicine from Harbin Medical University, China. After her graduation, she worked as an Oral and Maxillofacial Surgeon in the First Affiliated Hospital of Harbin Medical University. Currently, she is a PhD candidate at OMFS-IMPATH research group with Prof. dr. Reinhilde Jacobs as her promoter. Her research is focused on Digital dentistry: development of AI-driven prediction and CBCT-based biomodels.

C. VISITING PROFESSORS

Michael BORNSTEIN



Michael Bornstein has been appointed in 2016 as Clinical Professor in Oral and Maxillofacial Radiology at the Faculty of Dentistry, The University of Hong Kong, Hong Kong SAR, China. In December 2018 he is been appointed as Associate Dean of "Research and Innovation" of the Faculty of Dentistry. He is a Visiting Professor at the OMFS-IMPATH Research Group, Department of Imaging and Pathology, University of Leuven, Belgium.In January 2020 he will take the position as professor and chair of the Departement of Oral Health & Medicine at the University Center for Dental Medicine Basel (UZB) of the University of Basel, Switzerland.He obtained his dental degree (1998) and thesis (Dr. med. dent., 2001) at the University of Basel. He continued with a specialisation in oral surgery and stomatology in Basel (1998-1999, Prof. Dr. Dr. J. Th. Lambrecht) and Bern (2000-2002, Prof. Dr. D. Buser). In 2004, he was visiting assistant professor at the Department of Periodontics (Prof. Dr. D. Cochran) at the University of Texas Health Science Center at San Antonio, USA, with a grant from the Swiss National Science Foundation. From 2007-2014 he was head of the Section of Dental Radiology and Stomatology, University of Bern. In 2009, he obtained the Habilitation (Privatdozent / PhD) and in 2014 he became Asscociate Professor in the field of „Oral Surgery and Stomatology“. His fields of research include cone beam computed tomography (CBCT) in clinical dental practice, diagnostic imaging, stomatology/ oral medicine, GBR procedures and dental implants. He has published over 150 original articles, and is the author / co-author of numerous case reports, review articles, and book chapters.

Krisztian NAGY

Krisztian Nagy is a Maxillofacial Surgeon with special interest and experience in cleft surgery. He has been working as the co-ordinator and leading surgeon of the Cleft Care Centre, at the 1st Department of Paediatrics, Semmelweis University, Budapest, Hungary. He has been also working as a Consultant Maxillofacial Surgeon, in AZ St-Jan Bruges-Oostende Hospital, Belgium since March 2012. He became Fellow of the European Board of Oro-Maxillofacial Surgery & Head and Neck Surgery (FEBOMS) in September 2012. He is currently Guest Professor at Leuven University, KU Leuven, Belgium. He graduated at the Semmelweis University Budapest, Hungary in medicine (MD, summa cum laude) and in dentistry (DDS, magna cum laude). He specialized in oral and Maxillofacial surgery at the Semmelweis University, at the KU Leuven and in AZ SInt Jan in Bruges, Belgium. His postgraduate training was additionally followed by clinical experiences in Bruges, Minden, Vienna, Wellington, Zürich and Taipei. He is now member of the European Association for Cranio-Maxillofacial Surgery (EACMFS), the European Academy of Facial Plastic Surgery (EAFPS) and the CranioMaxillofacial Section, Arbeitsgemeinschaft für Osteosynthesefragen (AO). He is acknowledged PhD tutor of 3 PhD students. He defended his doctoral thesis on the subject of “Objective methods for evaluation of surgical outcomes in cleft lip and palate surgery” (PhD). His professional field of interest is in orthognathic, cleft and craniofacial surgery.

2
Team

Claudia NOFFKE

Claudia grew up and matriculated in Germany. She obtained her under-graduate training as a Dentist at the University of Pretoria and managed her own private practice for several years. She completed her postgraduate training in Maxillofacial and Oral Radiology in 1992 and served as Lecturer in the Departments of Radiology and Diagnostics, University of Pretoria, and Oral Pathology at the Medical University of Southern Africa where she was appointed as Head of Maxillofacial and Oral Radiology in June 2001, a position from which she retired as a Full Professor in 2016. She participated actively in 46 international congresses and refresher courses and authored or co-authored an equal number of scientific papers in peer-reviewed journals. She is on the editorial boards of several distinguished journals in her field of expertise including the Radiology Section of the Oral Surgery, Oral Medicine, Oral Pathology and Oral Radiology (Triple “O”) and the Journal of Chinese Clinical Medicine. She recently co-edited the proceedings of the 2017 21st Congress of the International Association of Dentomaxillofacial Radiology in Kaohsiung, Taiwan. In recognition for her role as reviewer for Triple “O” she received the Lincoln Manson-Hing Award for distinguished service in Scientific Review from the American Academy of Oral and Maxillofacial Radiology and Elsevier Publisher. Claudia supervised- and served as external examiner for several Master’s and PhD degrees. She is currently on the Board of Directors and Regional Director (Africa) of the IADMFR and appointed since May 2018 as Guest Professor in the Department of Imaging & Pathology at the KU of Leuven. Her field expertise include ethics and legislation pertaining to radiation protection, fibro osseous disease and the radiological interpretation of gnathial tumours and cysts.

Erich RAUBENHEIMER

After receiving a MChD degree in Oral Pathology at the University of Pretoria, Erich Raubenheimer joined Medunsa in 1982 as Head of Oral Pathology and Acting Head of Anatomical Pathology. During the first years of appointment at this fledgling health sciences University he was responsible for the histopathology services rendered to the medical- and dental hospitals and regional community clinics. He obtained a PhD, DSc, FCP (SA) and CBCT certification with the American Academy of Oral and Maxillofacial Radiology, supervised 7 PhD degrees and a large number of Master's degrees. His research interests are in head and neck diseases and pathology of mineralized tissues, particularly the diagnosis of metabolic diseases of bone. Erich authored 139 papers in peer reviewed scientific journals (eight of which were on invitation) and contributed to three chapters of the 4th edition of the World Health Organizations' book on head and neck tumours. He was key note speaker at five international conferences and presented 99 invited scientific talks to specialist groups. Erich has a passion for the African elephant and regularly presents talks to interesting societies based on his scientific work on ivory and experience as an elephant tracker in Africa. Erich is presently employed as a senior consultant at Ampath, a large pathology practice in South Africa, holds an extraordinary professorship at the University of Pretoria and a guest professorship at KU Leuven. He is married to Claudia, a remarkable woman who blessed him with four successful children.

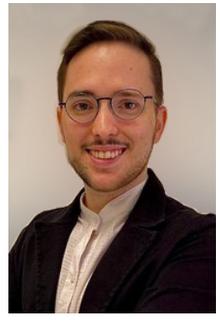
2
Team

D. VISITING RESEARCHERS

Soroush BASERI SAADI

Soroush Baseri Saadi received an Associate's degree in the field of General Electronics from "Shamsipour Technical College/University" in Tehran, in 2005. In 2009, he graduated as a Bachelor of Science from "Islamic Azad University (IAU) - South Tehran Branch'', Iran, in Electrical Engineering-Electronics. After graduation, he did his military service in the Army University of Medical Sciences as Second Lieutenant Officer in charge of a Biomedical Engineering team. Then he was employed in the Kian hospital as a Biomedical Engineer to design, maintain and operate with medical equipment. In July 2016, he graduated as a Master of Science in Biomedical Engineering from Vrije Universiteit Brussel. During his master education, he extensively worked on several Biomedical Image Processing and Biomechanical Simulation projects. At the same time, in order to maintain his living cost, he used his skills to work part-time. To gain work experience in a more advanced degree after graduation, he again cooperated with the Kian Hospital as a R&D member, designer of medical equipment and Surgical Navigation Engineer. After that, he was invited to work as a software developer, R&D member and designer of medical apparatus for a manufacturer of biomedical equipment, Dentus Co. However, since he has always had an interest to be a researcher, and to continue his education to a more advanced level and work in an academic environment, he never stopped advancing his skills in Medical Image Processing. He is highly interested in research positions in the fields of designing medical equipment, Biomedical Image Processing and Deep Learning.

Rocharles FONTENELE



Rocharles Fontenele was born in Jaguaretama, Brazil, in 1995. He obtained his dental degree in 2016 at the Federal University of Ceara, Brazil. In 2018, he obtained his master's degree in Oral Radiology at the University of Campinas, Brazil. Currently, he is a PhD candidate in Oral Radiology at the University of Campinas under the supervision of Prof. Dr. Deborah Queiroz Freitas. He was granted a scholarship by Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (Brazilian government) to collaborate with the OMFS-Impath research group, under the supervision of Prof. Dr. Reinhilde Jacobs, for one year as part of his doctorate.

Fernando FORTES PICOLI

Fernando Fortes Picoli is dentist, Doctoral Course Student in Dentistry (Federal University of Goias, Brazil), has master degree in Dentistry (Federal University of Goias, Brazil), he is also Specialist in Orthodontics and Forensic Odontology. Since 2010 he has been working as Forensic Expert at Scientific Police of Goias (Brazil) and has expertise in violent death crime scene exams (more than 2 years working as a Crime Scene Investigator), Forensic Ballistics (had worked for more than 5 years at the Ballistics Crime Lab in firearms and ammunition exams) and Forensic Dentist (since 2018 has been working at the Goiania's forensic morgue). In the field of Forensic Odontology, the main skills are related to human identification, human traumatology (pathology of trauma, especially firearms wounds) and human age estimation (doctoral research project ongoing). He has experience with the use of computed tomography and radiography for Forensic Odontology purposes. He is (co) author of 1 book and almost 30 publications in peer-reviewed journals.

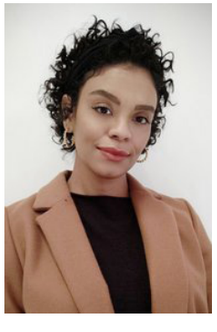
Mauricio GERHARDT

Maurício Gerhardt was born in Porto Alegre, Brazil, in 1990. He obtained his dental degree in 2012 and his Master in Prosthodontics (2018) from the Pontifical Catholic University of Rio Grande do Sul, Brazil. Currently, he is a PhD candidate in prosthodontics at the same university under the supervision of Prof. Dr. Rosemary Shinkai. He was granted a scholarship from the Brazilian government (CAPES) to collaborate with the OMFS-Impath research group, under the supervision of Prof. Dr. Reinhilde Jacobs, for one year as part of his doctorate.

Fernanda NOGUEIRA REIS

Fernanda Nogueira Reis was born in Rio de Janeiro, Brazil, in 1992. She is a dentist (Federal University of Rio de Janeiro-2016), Specialist in Oral Radiology (Federal University of Rio de Janeiro-2018), Master in Bucco-Dental Biology with emphasis in Forensic Dentistry (University of Campinas- 2019), and Ph.D. candidate in Oral Radiology at the University of Campinas with Prof. Dr. Cinthia Tabchoury as her promoter. She was granted a scholarship by the Brazilian government to do part of her Ph.D. in the OMFS-IMPATH research group under the supervision of Prof. Dr. Reinhilde Jacobs. Her research topic for Ph.D. is related to the use of Artificial Intelligence for Orthodontic and Orthognathic applications.

Nicolly OLIVEIRA SANTOS



Nicolly Oliveira Santos was born on February 20th, 1993 in Sao Paulo, Brazil. She graduated as a dentist at University Center Nove de Julho (2011 - 2015) and achieved her Master degree in Oral Radiology at University of Campinas (2017 - 2019). During her Master, she worked with fractal dimension analysis of bone and digital imaging. Currently, she is a PhD candidate in Oral Radiology at University of Campinas and was granted by the Brazilian government to do an internship in the OMFS-IMPATH research group, to develop part of her thesis under the supervision of Prof. Dr. Renhilde Jacobs. Her research topic for PhD is related to the diagnosis of cysts and tumours in panoramic and cone beam computed tomography images by Artificial Intelligence.

Jader Camilo PINTO

Jáder Camilo Pinto obtained his degree as General Dentist in 2007 from Lavras University Center, Brazil and he obtained a specialization degree in Endodontics in 2011 from the same university. In 2018 he concluded his master degree in Dentistry with emphasis in Endodontics at Sao Paulo State University, Brazil (UNESP). He is performing his doctorate in Dentistry at UNESP under supervision of Prof. Dr. Mario Tanomaru Filho. Currently, he was granted by FAPESP (SP-Brazil) to do an internship in the OMFS-IMPATH research group under supervision of Prof. Dr. Reinhilde Jacobs, as part of his doctorate course.

E. ADMINISTRATIVE COORDINATOR

Nele VANLOOCKE

Nele Vanloocke is currently working as the administrative coordinator for the OMFS-IMPATH research group at the Department of Imaging and Pathology, KU Leuven. She has a Master's Degree in Western Literature and has a professional commercial background as well as experience as an all-round project coordinator.

3

Research

3
Research

A. PROJECTS

NATIONAL FUNDING

M3-OBSERVATORIUM

Epidemiological study on the surgical removal of third molars.

In samenwerking met Vlaams Ziekenhuisnetwerk KU Leuven

VLAIO

AIPLANT

CBCT-based Automated Implant PLANning for single implant Treatments

FWO

TOOTH AUTOTRANSPLANTATION

The development and clinical application of CBCT-based tooth auto transplantation.

TREASURE

Dentomaxillofacial paediatric imaging: an investigation towards low dose radiation induced risks

EXTRACT-NOAC

Use of new oral anticoagulants in oral surgery

PRIMORDIAL

An artificial intelligence (AI) driven prediction model to detect risk factors for medication-related osteonecrosis of the jaws.

INTERNAL FUNDING

CRANIVAL

Departmental grant BEPAT

KU LEUVEN

BOF CELSA/18/038

Harmonization of the use of cone-beam computed tomography for developmental disorders in the maxillofacial region.

KU LEUVEN

BOF C24/18/065

Beeldkwaliteitsoptimalisatie van dentale cone-beam CT

KU LEUVEN

INTERNATIONAL FUNDING

NZ ROYAL SOCIETY CATALYST FUND

Digital Dentistry Collaboration

DDC

INDUSTRIAL FUNDING

BETCON

Beste behandeling voor kaaknecrose

Kom op tegen Kanker

BETCON

B. AWARDS

November 2021
SCIENTIFIC AWARD FOR MR NEUROPATHY
LUTV LEUVEN

Fréderic Van der Cruyssen

November 2021
SECOND PRIZE DIGITAL DENTISTRY SOCIETY GLOBAL CONGRESS

Maurício Gerhardt, Rocharles Fontenele

November 2021
FIRST PRIZE RESEARCH SESSION DIGITAL DENTISTRY SOCIETY GLOBAL CONGRESS

Rocharles Fontenele, Maurício Gerhardt

September 2021
SECOND PRIZE SENIOR CLINICAL SCIENCE
ROBERT FRANK AWARD 2021

Catalina Moreno Rabie

CED IADR

September 2021
SECOND PRIZE SENIOR BASIC SCIENCE
ROBERT FRANK AWARD 2021

Anna Ockerman

CED IADR

April 2021
FIRST PRIZE POSTER PRESENTATION
IADMFR CONGRESS 2021

Jáder Camilo Pinto

April 2021
FIRST PRIZE ORAL PRESENTATION
IADMFR RESEARCH AWARD 2021

Pierre Lahoud

C. PUBLICATIONS

INTERNATIONAL PEER-REVIEWED PUBLICATIONS

Aerden, T., Verstraete, L., & Politis, C. (2021). The need for secondary orthognathic surgery after high condylectomy in patients with active unilateral condylar hyperplasia.. *INT J ORAL MAXILLOFAC SURG.* doi:10.1016/j.ijom.2021.04.007

Alqahtani, K., Shaheen, E., Shujaat, S., EzEldeen, M., Dormaar, T., de Llano-Perula, M. C., Politis, C., Jacobs, R. (2021). Validation of a novel method for canine eruption assessment in unilateral cleft lip and palate patients. *CLINICAL AND EXPERIMENTAL DENTAL RESEARCH, 7(3)*, 285-292. doi:10.1002/cre2.397

Bachaoui, S. E., Dobbeleir, M., De Ketele, A., & Politis, C. (2021). Spontaneous bilateral coronoid process fracture of the mandible after BSSO: A case report.. *J STOMATOL ORAL MAXILLOFAC SURG.* doi:10.1016/j.jormas.2021.07.012

Belmans, N., Gilles, L., Welkenhuysen, J., Vermeesen, R., Baselet, B., Salmon, B., Baatout, S., Jacobs, R., Lucas, S., Lambrichts, I., Moreels, M. (2021). In vitro Assessment of the DNA Damage Response in Dental Mesenchymal Stromal Cells Following Low Dose X-ray Exposure. *FRONTIERS IN PUBLIC HEALTH, 9*, 13 pages. doi:10.3389/fpubh.2021.584484

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BOOK (CHAPTER) PUBLICATIONS

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Jacobs, R. (2021). Cone Beam CT in Implant Dentistry. *IN DIGITAL DENTISTRY SCIENCE AND CLINICS* (pp. 29-43). Quintessence.
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OTHER PUBLICATIONS

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D. CHAIRS

ANTHOGYR-STRAUMANN CHAIR FOR ORAL AND MAXILLOFACIAL SURGERY
3 YEARS (01.09.2018-30.11.2024)

The purpose of the Chair is prevention and treatment of neuropathic pain following dento-aveolar and dental implant surgery. Professor Politis is the chair holder and professor Jacobs is the co-chair holder.

DENTSPLY SIRONA CHAIR FOR ORALAND MAXILLOFACIAL SURGERY
3 YEARS (01.01.2019 - 31.12.2021)

The purpose of the Chair is prevention and treatment of nerve damage following implant surgery. Professor Politis is the chair holder and professor Jacobs is the co-chair holder.

NOBEL BIOCARE CHAIR FOR ORAL AND MAXILLOFACIAL SURGERY
YEARLY (01.10.2013 - 30.09.2022)

To support the research concerning the damage of the inferior alveolar nerve during mandibular surgery.

THE ALEAMED & KLS MARTIN CHAIR FOR OMFS
3 YEARS (01.08.2019 - 31.07.2022)

To support research in the field of trigeminal neuropathy in OMFS.

E. DOCTORAL THESIS DEFENSES

OMFS-IMPATH SUPERVISED PhDs

Ezeldeen, M. (2021).
Dental tissue regeneration in children, Can we mimic nature?.

Grisar, K. (2021).
What's in a canine; development of clinical guidance notes for autogenous transplantation of maxillary canines.

Ockerman, A. (2021).
The influence of anticoagulants on bleeding and healing after dental extraction.

Shujaat, S. (2021).
Skeletal relapse in orthognathic surgery. A three-dimensional update to the hierarchy of surgical stability.

Song, D. (2021).
Neural and bony changes following oral implant placement.

Willaert, R. (2021).
New prospects in diagnosis and treatment of orbital disorders: imaging analysis and patient-specific treatment.

OMFS-IMPATH COSUPERVISED PhDs

Castro Sarda, A. B. (2021).
Regenerative potential of platelet concentrates in periodontal surgery.

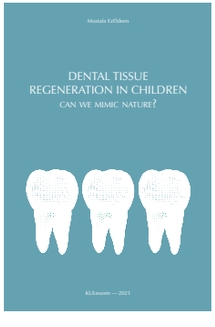
Mostafa EzEldeen

Dental Tissue Regeneration in Children: can we mimic nature?

Mostafa EzEldeen, the author of this PhD manuscript, obtained his Bachelor of Dental Medicine and Surgery (2007) from Mansoura University, Egypt and Master in Dentistry (2013), Summa cum laude, at the KU Leuven, Belgium. Further, he obtained a specialization in Paediatric Dentistry and Special Dental care (2012) at the KU Leuven. In 2013, he obtained the diploma of Postgraduate studies in Advanced Medical Imaging at the KU Leuven. He works as a dentist in private practice and UZ Leuven (Department of Dentistry, Paediatric Dentistry and Special Dental Care). He obtained his PhD under the guidance of Prof. Dr. Reinhilde Jacobs (Department of Imaging and Pathology, KU Leuven), Prof. Dr. Ivo Lambrichts (U Hasselt), and Prof. Dr. Ghislain Opdenakker (Rega Institute, KU Leuven). His research topics are assessing the healing patterns in teeth and bone after regenerative processes using Cone Beam Computed Tomography (CBCT), development of reliable teeth segmentation methods, CBCT-guided tooth autotransplantation, bio-3D printing and chemokine-mediated dental tissue regeneration. He has received the; 1st place research award from the International Association of Dental Traumatology (2014), Journal of Endodontics Award (2016) for the best article in the category of clinical research, and the Belgian Albert Joachim Award in the Odontostomatology (2018).

The general aim of this PhD project was to bridge part of the gap between in vitro studies and the clinical application for dental tissue regeneration. This aim was approached systematically, on the one hand, through the study of two clinical models involving tissue repair and regeneration, namely tooth autotransplantation (TAT) and regenerative endodontic treatment (RET). On the other hand, we explored the concept of chemokinemediated dental tissue regeneration by applying chlorite oxidized oxyamylose (COAM).

Based on the findings of this PhD, we can draw the following general conclusions:



1. 3D analysis of TAT and RET outcomes from clinical CBCT data can offer valuable insights into healing and hard-tissue formation patterns.
2. Optimized application of digital technologies such as image segmentation and 3D printing based on CBCT images can improve the standard level of care.
3. TAT has outstanding long-term clinical success with evidence of periodontal ligament and pulp-dentin complex healing.
4. Critical gaps are present in our knowledge regarding the healing/ regeneration of the pulp-dentin complex.
5. The chemokine binding and antimicrobial properties of COAM are preambles for further studies on chemokine delivery.

3
Research

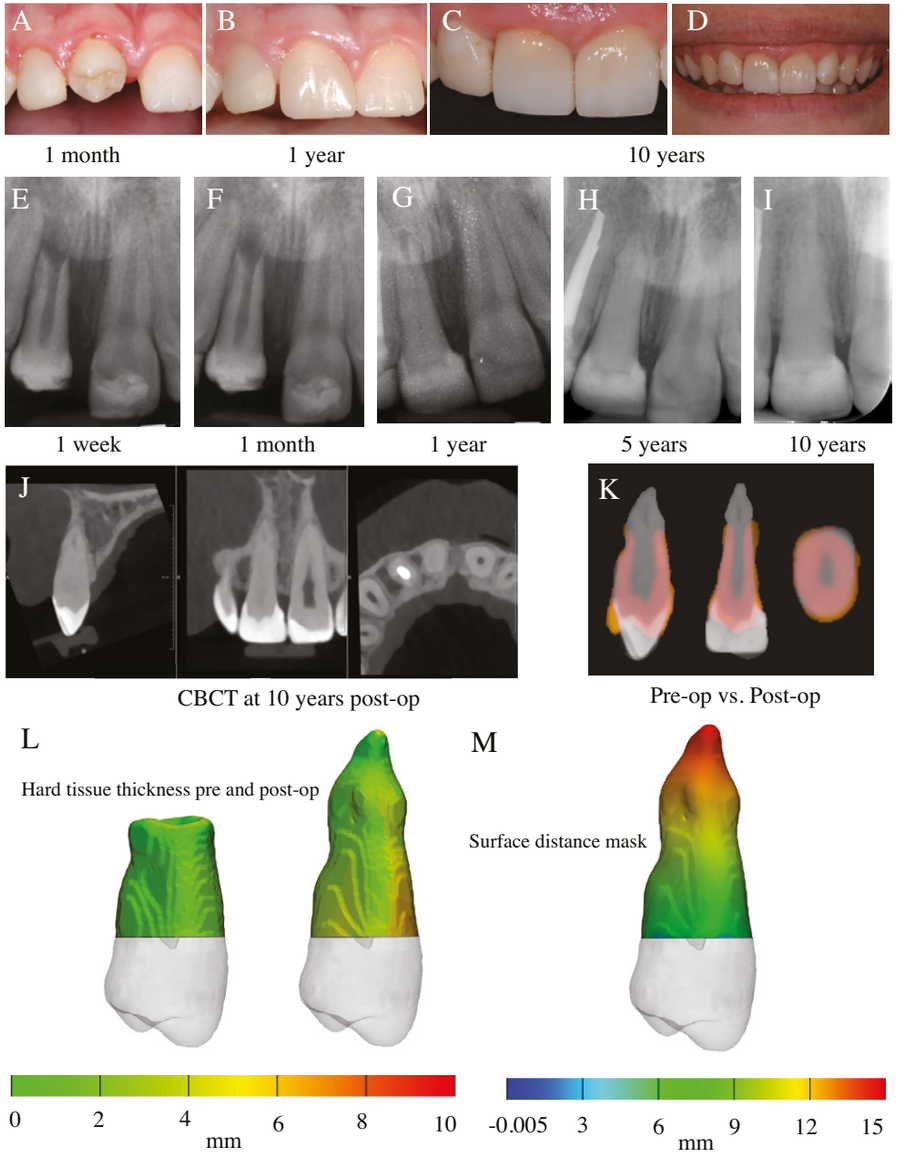
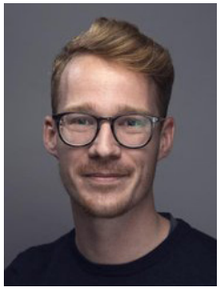


Figure 3: Long-term outcome after TAT, lower left second mandibular premolar to the site of the maxillary right central incisor. Clinical and esthetic outcome at 1 month (A), 1 year (B), and at 10 years (C &D), (E, F, G, H, & I) radiographic follow-up and successful outcome at 10 years, (J&K) CBCT at 10 years post-op, (L) 3D analysis of the hard tissue thickness, pre-op: maximum dentin thickness= 4.1mm [mean=1.7mm (±0.5)], post-op: maximum dentin thickness= 5.9mm [mean=3.1mm (±1.4)], (M) Surface distance mask representing tissue change post-op

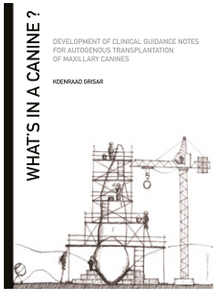
Koenraad Grisar

What's in a canine?



Development of clinical guidance notes for autogenous transplantation of maxillary canines

Koenraad Grisar was born in Hasselt, Belgium on November 17th 1988. After obtaining his Medical Degree from KU Leuven in 2013, he obtained his Master of Science in Dentistry from the same university in 2016. Subsequently, he started his training in oral and maxillofacial surgery, which he finished in 2020. In 2017, he started his PhD research. Currently he is an oral and maxillofacial surgeon at the Jessa Hospital (Hasselt) and the Sint-Trudo Hospital (Sint-Truiden).



Impacted maxillary canines can present themselves in a variety of ways. In the vast majority of cases, the routine treatment approach is sufficient and the clinician will achieve a successful end result. However, there is a subset of critical impactions where this standardized approach may fall short and the choice is ultimately made to remove the canine. The overall aim of this thesis was to compose recommendations that will help to identify critically impacted maxillary canines and at the same time support the decision-making process for further treatment options. The findings of this doctoral thesis show that there is a subgroup of critically impacted maxillary canines with increased failures rates after standardized treatment. Autotransplantation of these canines has proven to have acceptable short- and long-term outcomes. However, other treatment alternatives should further be investigated.

Maxillary canines can become impacted due to unfavorable positioning inside the alveolar bone or proximity to neighboring structures that impede spontaneous eruption within the normal eruption sequence. Impacted canines with a high and/or horizontal position are considered to be difficult to treat either because of the challenging surgical access or due to a clinically disadvantageous or long eruption path. For some cases, this might tilt the cost/benefit balance towards inefficiency, especially when a first attempt has already failed. Failure to respond to conventional orthodontic or surgical options, defines maxillary canine impaction as critical. Recurrently, critically impacted canines are removed when the treatment outcome proved to be or is expected to be disappointing.

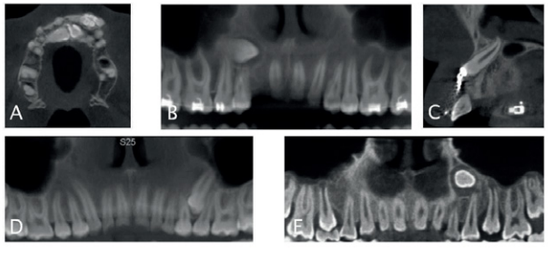


Figure 1. *Critical maxillary canine impaction. A: Associated local pathology (presence of odontoma), B: Horizontal position, C: Severe root dilaceration, D: Transposition, E: High vertical position*

Anna Ockerman

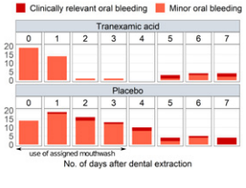
The Influence of Anticoagulants on Bleeding and Healing after Dental Extraction

Anna Ockerman, the author of this PhD manuscript, graduated in 2017 as Msc in Biomedical Sciences (KU Leuven), and worked as a PhD researcher at the OMFS-IMPATH Research Group in cooperation with the Department of Cardiovascular Sciences from 2017 to 2021. Her promotors were Prof. dr. Reinhilde Jacobs (Department of Imaging and Pathology, KU Leuven), Prof. dr. Constantinus Politis (Department of Oral and Maxillofacial Surgery, UZ Leuven), and Prof. dr. Peter Verhamme (Department of Cardiovascular Sciences, KU Leuven). Her PhD research focused on the management of postoperative bleeding and healing after dental extraction in patients treated with antithrombotic drugs.

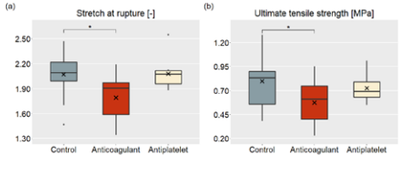
The current PhD project is about patients on antithrombotic medication undergoing dental extractions and focusses on two genuine concerns.

1. Oral bleeding after dental extraction in patients on non-vitamin K oral anticoagulants is a frequent problem, and it is not sure how to reduce the risk of bleeding. A placebo-controlled, double blind, randomized clinical trial was set up to evaluate if the use of tranexamic acid mouthwash, an antifibrinolytic agent, after dental extraction reduces bleeding in this patient population. The results indicated that tranexamic acid mouthwash does not reduce peri-operative bleeding or early bleeding (until one day) after dental extraction, but may reduce delayed bleeding (more than one day after) and bleeding in case multiple teeth are extracted.
2. Variation of leukocyte- and platelet-rich fibrin (L-PRF) membranes was noticed in the clinical practice and antithrombotic medication may be one of the causing factors as they interfere with blood coagulation, a process that is crucial for the generation of L-PRF. As L-PRF membranes are used to guide healing and enhance tissue regeneration and as hemostatic method, the variability amongst the membranes may have clinical implications. Therefore, experiments were set up to compare properties of L-PRF membranes between patients taking antithrombotics and controls. It was shown that L-PRF membranes of patients on an anticoagulant therapy, but not on antiplatelets, are weaker, rupture faster and contain less leukocytes than membranes of patients not taking antithrombotic drugs.

Text Figure 1
Patients treated with tranexamic acid reported less delayed bleeding (later than day 1 after the dental extraction) compared to placebo. The number of minor bleeding events, clinically relevant bleeding events, and early bleeding events (on the day of the dental extraction and one day thereafter) was similar between patients treated with tranexamic acid and placebo mouthwash.



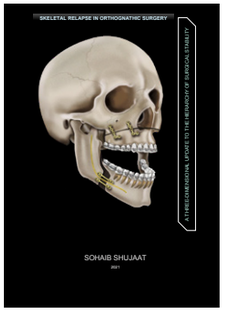
Text Figure 2
L-PRF membranes originating from patients taking anticoagulants could not be stretched as far as and were weaker than L-PRF membranes originating from patients not taking these drugs (control). L-PRF membranes originating from patients on antiplatelets showed comparable stretch and ultimate tensile strength than control membranes.



Sohaib Shujaat

Skeletal Relapse in Orthognathic Surgery: a three-dimensional update to the hierarchy of surgical stability

The author, Sohaib Shujaat achieved his degree in Bachelor of Dental Surgery from Lahore Medical and Dental College, Lahore, Pakistan (2004-2008). In 2012, he obtained his “Master of Science” (MSc. Dent Sci.) degree in Oral and Maxillofacial Surgery with merit from Glasgow Dental School and Hospital, University of Glasgow, Glasgow, United Kingdom. From March 2013 till September 2017, he worked as a Lecturer, Course Director for Internal Medicine/ Comprehensive Patient Management and Specialist (Registrar) in the Department of Oral and Maxillofacial Surgery at Imam AbdulRahman Bin Faisal University and King Fahd Hospital of the University, Kingdom of Saudi Arabia. He worked as a Medical (Scientific) Editor, Substitute Lecturer and a Mentor for Master and PhD students at KU/UZ Leuven, Belgium (2017-2021). He was a PhD researcher in the OMFS-IMPATH research group from September 2017 till June 2021 with Prof. dr. Reinhilde Jacobs as his scientific promoter. His research topic for PhD was focused towards the 3D relapse in orthognathic surgery patients and latest advancements in 3D printing.



Orthognathic surgery is considered to be a cornerstone for surgically treatingdentofacial deformities. It is associated with unwanted relapse over time. The evidence related to hierarchy of orthognathic surgery stability has been mostly based on 2D methodologies and lack of true 3D-based prospective evidence exists. This doctoral thesis aimed to assess the 3D skeletal and pharyngeal airway space relapse following orthognathic surgery and to observe whether 3D printed patient-specific skeletal models can offer a realistic bone replication. The outcomes of this thesis could allow a more careful treatment planning and application of patient-specific skeletal models could act as an in vitro surgical medium to control the early relapse risk factors and improve classical surgical techniques.

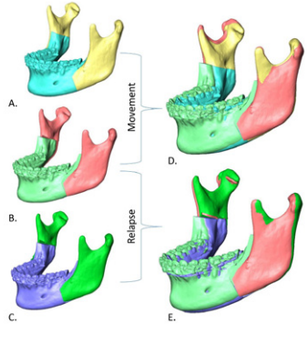
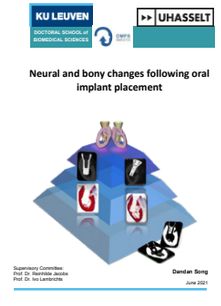


Illustration of the superimposed distal and proximal segments resulting from the transformation matrix for retrieval of translational and rotational parameters using singular value decomposition algorithm. **A-C.** *segmented mandibular distal and proximal segments preoperatively (T0), immediately after surgery (T1) and 1 year follow-up (T2),* **D.** *superimposed distal and proximal segments at T0-T1,* **E.** *superimposed distal and proximal segments at T1-T2*

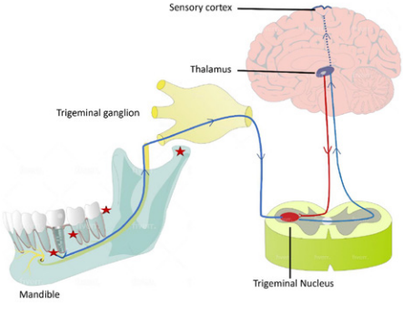
Dandan Song

Neural and bony changes following oral implant placement

Dandan Song was born in Jiangsu, China on March 11th, 1990. She achieved her degrees in both Bachelor and Master of Oral Medicine from Dalian Medical University. During her master, she worked on the effect of different implant placement and loading protocols on the osseoperception around the implant. After applying for a full PhD position with the support by China Scholarship Council, she started PhD training in the OMFS IMPATH Research group at KU Leuven in October 2017, under supervision of Prof. Dr. Reinhilde Jacobs and Prof. Dr. Ivo Lambrichts (UHasselt). During this period, her research was focused on investigating neural and bony changes following oral implant placement.



Dental implants are the most successful treatment in replacing missing teeth. Apart from restoring anatomical and mechanical function, it is questioned whether restoring the physiological feedback pathway could also be achieved? Since introducing the concept of osseoperception, multiple in vivo methodologies have been applied for evaluating this peri-implant perception. However, the morphometric evidence of peri-implant mechanoreceptors and the potential effect of surgical and loading strategy on the sensory feedback received little attention. This doctoral thesis was intended to assess the effect of various implant placement and loading protocols as well as the local application of platelet-rich/poor plasma on peri-implant innervation. The findings of this PhD could provide guidelines for treatment planning in clinic practice and add more substantial reference to our knowledge on the physiological integration of dental implants, serving the perceived quality of life upon dental implant placement.



Sensory pathway for tooth/implant stimuli. Once a stimulus exerted on a tooth, it would activate periodontal sensory endings. This functional mechanoreceptive input might be derived from temporomandibular joint, periosteum, gingiva, periodontal ligaments (PDLs), mucosa, and alveolar bone receptors (red stars), through the trigeminal neurons located at trigeminal ganglion, the signals would be sent to ventral posterior nucleus of thalamus. Lastly, these signals would be replayed to sensory cortex and received by organisms, which eventually forms the complete neurosensory pathway feedback, whereas for implants, some of the mechanoreceptors do no longer play a role.

4

Lecturing

A. SCIENTIFIC CONTRIBUTIONS AT CONGRESSES

- Oral presentations
- Poster presentations

B. INVITED LECTURES

A. SCIENTIFIC CONTRIBUTIONS AT CONGRESSES

ORAL PRESENTATIONS

Ács, L., Bányai, D., Nemes, B., Nagy, K., Ács, N., Bánhidy, F., Rózsa N.K. (2021)
Effect of subpregnancy factors on the formation of isolated cleft palate
General Assembly of the Hungarian Society of Pediatricians, 24-26 June 2021, online

Aerden, T., Willaert, R., Dormaar, T., Coropciuc, R., Bila, M., Legrand, P., Miclotte, I., Politis, C. (2021)
Secondary correction of enophtalmia
KBVSMFH voorjaarsvergadering, 20 March 2021, online

Beckers, R., Govaerts, D., Desmedt, M., Dormaar, T., Coropciuc, R., Willaert, R., Bila, M., Legrand, P., Miclotte, I., Politis, C. (2021)
Vascular anomalies of the lip,cheek and neck areas
KBVSMFH voorjaarsvergadering, 20 March 2021, online

Brasil, D., Binst, J., Machado Santaella, G., Haiter-Neto, F., Jacobs, R. (2021)
Effect of cone-beam CT detector size and projection geometry on scatter-induced image noise.
72nd AAOMR Virtual Annual Session, 14 December 2021, online

Brijs, K., Coropciuc, R., Dormaar, T., Legrand, P., Bila, M., Willaert, R., Segers, H., Politis, C. (2021)
Bisphosphonates and monoclonal antibodies in oral pathology in children
KBVSMFH najaarsvergadering, 27 November 2021, Genval, Belgium

Croonenborghs, T., Bila, M., Jacobs, S., Willaert, R., Coropciuc, R., Dormaar, T., Legrand, P., Politis, C. (2021)
Management and reconstruction in pediatric head and neck sarcoma
KBVSMFH najaarsvergadering, 27 November 2021, Genval, Belgium

Croonenborghs, T., Smeets, M., Peeters, F., Van Dessel, J., Politis, C., Willaert, R., Bila, M. (2021)
Comparing the predictive validity of 9 comorbidity scales for the risk assessment of 30-day free flap failure in head and neck reconstruction.
25th Congress of the European Association for Cranio Maxillo Facial Surgery, 14 July 2021, online

Da Costa Senior, O., Dormaar, T., Willaert, R., Bila, M., Coropciuc, R., Legrand, P., Politis, C. (2021)
Management of premature orthodontic bone anchor failure in children
KBVSMFH najaarsvergadering, 27 November 2021, Genval, Belgium

De Kock, L., Verhelst, P., Dormaar, T., Bila, M., Coropciuc, R., Legrand, P., Willaert, R., Politis, C. (2021)
Remodeling of condylar fractures in children and young adults. A Single-Center retrospective original study.
KBVSMFH najaarsvergadering, 27 November 2021, Genval, Belgium

Govaers, L., Coropciuc, R., Dormaar, T., Willaert, R., Bila, M., De Ceulaer, J., Politis, C. (2021)
Recurrent bilateral dislocation of the temporomandibular joint in a 2-year-old. A case report and review of literature.
KBVSMFH najaarsvergadering, 26 November 2021, Genval, Belgium

Grisar, K., Nys, M., The, V., Vrielinck, L., Schepers, S., Jacobs, R., Politis, C. (27/11/2021)
Long-term outcome of autogenously transplanted maxillary canines
KBVSMFH najaarsvergadering, 27 November 2021, Genval, Belgium

ORAL PRESENTATIONS

Grymonprez, E., Dobbeleir, M., Dormaar, T., Willaert, R., Bila, M., Coropciuc, R., Legrand, P., Politis, C. (2021)
Orbital fractures in children: A 10 year retrospective analysis
KBVSMFH najaarsvergadering, 27 November 2021, Genval, Belgium

Kesztyüs, A., Buzár, A., Preda, F., Shaheen, E., de Faria Vasconcelos, K., Ferreira Leite, A., Moreno Rabie, C., Nagy, K., Jacobs, R. (2021)
The cleft palate collection for research on optimized imaging of cleft lip and palate treatment
23rd International Congress of DentoMaxilloFacial Radiology, 28 April 2021, Gwangju, South Korea, online

Kesztyüs, A., Buzár, A., Shaheen, E., De Faria Vasconcelos, K., Nagy, K., Jacobs R. (2021)
Radiological phantom heads created by reverse surgical design
General Assembly of the Hungarian Society of Pediatricians, 24-26 June 2021, online

Kesztyüs, A., Buzár, A., Shaheen, E., De Faria Vasconcelos, K., Nagy, K., Jacobs R. (2021)
Radiological phantom heads created by reverse surgical design
Hungarian Society of Facial, Maxillofacial and Oral Surgery, 22 November 2021, online

Kesztyüs, A., de Faria Vasconcelos, K., Shaheen, E., Buzár, A., Nagy, K., Jacobs, R. (2021)
Creation of radiological cleft phantom skulls using a reversed virtual planning technique
KBVSMFH najaarsvergadering, 27 November 2021, Genval, Belgium

Lahoud, P., Diels, S., Niclaes, L., Van Aelst, S., Willems, H., Van Gerven, A., Jacobs, R. (2021)
Development and validation of a novel artificial intelligence driven tool for accurate mandibular canal segmentation on CBCT.
23rd International Congress of DentoMaxilloFacial Radiology, 28 April – 1 May 2021, Gwangju, South Korea, online

Maleux, O., Mulier, D., Meeus, J., Dormaar, T., Coropciuc, R., Willaert, R., Bila, M., Legrand, P., Miclotte, I., Shaheen, E., Politis, C. (2021)
Body dysmorphic disorder or healthy surgical consuming?
KBVSMFH voorjaarsvergadering, 21 March 2021, online

Moreno Rabie, C., Lapauw, L., Gaêta-Araujo, H., Ferreira-Leite, A., Coucke, W., Jacobs, R. (2021)
Radiographic Predictors of MRONJ in Patients Undergoing Tooth Extraction.
CED-IADR Oral Health Research Congress, 16-18 September 2021, Brussels, Belgium

Nagy, K., Farkas, Z., Swennen, G. (2021)
Experiences with the oral Z-plasty combined with intravelar veloplasty for soft palate cleft closure.
KBVSMFH najaarsvergadering, 27 November 2021, Genval, Belgium

Nys, M., Garip, M., Mulier, D., Coropciuc, R., Bila, M., Dormaar, T., Willaert, R., Politis, C. (2021)
IV sedation in children: pitfalls.
KBVSMFH najaarsvergadering, 27 November 2021, Genval, Belgium

Ockerman, A., Hendrickx, A., Willekens, W., Fehervary, H., Vastmans, J., Coucke, W., Jacobs, R. (2021)
L-PRF membranes from patients on anticoagulants differ from controls.
CED-IADR Oral Health Research Congress, 16-18 September 2021, Brussels, Belgium

Ockerman, A., Miclotte, I., Vanhaverbeke, M., Vanassche, T., Belmans, A., Vanhove, J., Verhamme, P. (2021)
Tranexamic Acid to Reduce Bleeding in Patients Treated with Non-Vitamin K Oral Anticoagulants Undergoing Dental Extraction: The EXTRACT-NOAC Randomized Clinical Trial.
International Society on Thrombosis and Haemostasis (ISTH) Congress, 17 July 2021, Philadelphia, USA, online

Peeters, M., Politis, C., Bila, M., Geusens, J., Van der Cruyssen, F. (2021)
#2263 - Extracranial head and neck schwannomas: a case series of a tertiary care center.
25th Congress of the European Association for Cranio Maxillo Facial Surgery, 14 July 2021, online

Pinto, J. C., De Faria Vasconcelos, K., Ferreira Leite, A., Pedano De Piero, M. S., Guerreiro-Tanomaru, J., Jacobs, R., Tanomaru-Filho, M. (2021)
Efeito do alargamento forminal na formação de microtrincas e transporte apical: avaliação por NanoCT
13º Congresso Internacional da Sociedade Brasileira de Endodontia, 28-30 October 2021, Curitiba, Brazil.

Shi, Q., Sun, Y., Politis, C., & Yang, S. (2021)
In-situ formation of particle reinforced Al matrix composites by laser melting + remelting strategy in laser powder bed fusion of Fe2O3/AlSi12 powder mixture.
ICAMMP 2021: International Conference on Additive Manufacturing Materials for Production, 24-25 July 2021, Barcelona, Spain.

Smeets, M., Van Dessel, J., Bila, M., Croonenborghs, T.-M., Goormans, F., Sun, Y., Politis, C. (2021)
Influence of preoperative assessable variables on chronic trismus
25th Congress of the European Association for Cranio Maxillo Facial Surgery, 14 July 2021, online

Starovoyt, A., Grzegorz, P., Shaheen, E., Putzeys, T., Politis, C., Wouters, J., Verhaert, N. (2021)
Applications of a Novel Contrast-Enhanced MicroCT Method for Insertion Trauma Studies.
Association for Research in Otolaryngology 44th Virtual MidWinter Meeting, 20-24 February 2021, USA, online

Swennen, G., Abeloos, J., De Backer, T., De Ceulaer, J., De Clercq, C., De Ketelaere, F., Lamoral, P., Neyt, N., Supply, K., Veys, B., Diez-Fraile, A., Nagy, K. (2021)
Presentation of a new design of nasal stents for nasal molding and retaining in cleft patients.
KBVSMFH najaarsvergadering, 27 November 2021, Genval, Belgium

Van Cleemput, T., Verhelst, P., Dormaar, T., Coropciuc, R., Bila, M., Willaert, R., Legrand, P., Politis, C. (2021)
Avulsion of upper permanent incisors: pitfalls of replantation
KBVSMFH najaarsvergadering, 27 November 2021, Genval, Belgium

Van der Cruyssen F. (16/9/21)
Management of trigeminal nerve injuries European association for craniomaxillofacial surgery
EACMFS, 16 September 2021, online

Ver Berne, J., Grosjean, L., Bila, M., Dom, M., Legrand, P., Coropciuc, R., Dormaar, T., Politis, C. (2021)
Intra-oral anastomosis in microvascular reconstruction
KBVSMFH voorjaarsvergadering, 21 March 2021, online

ORAL PRESENTATIONS

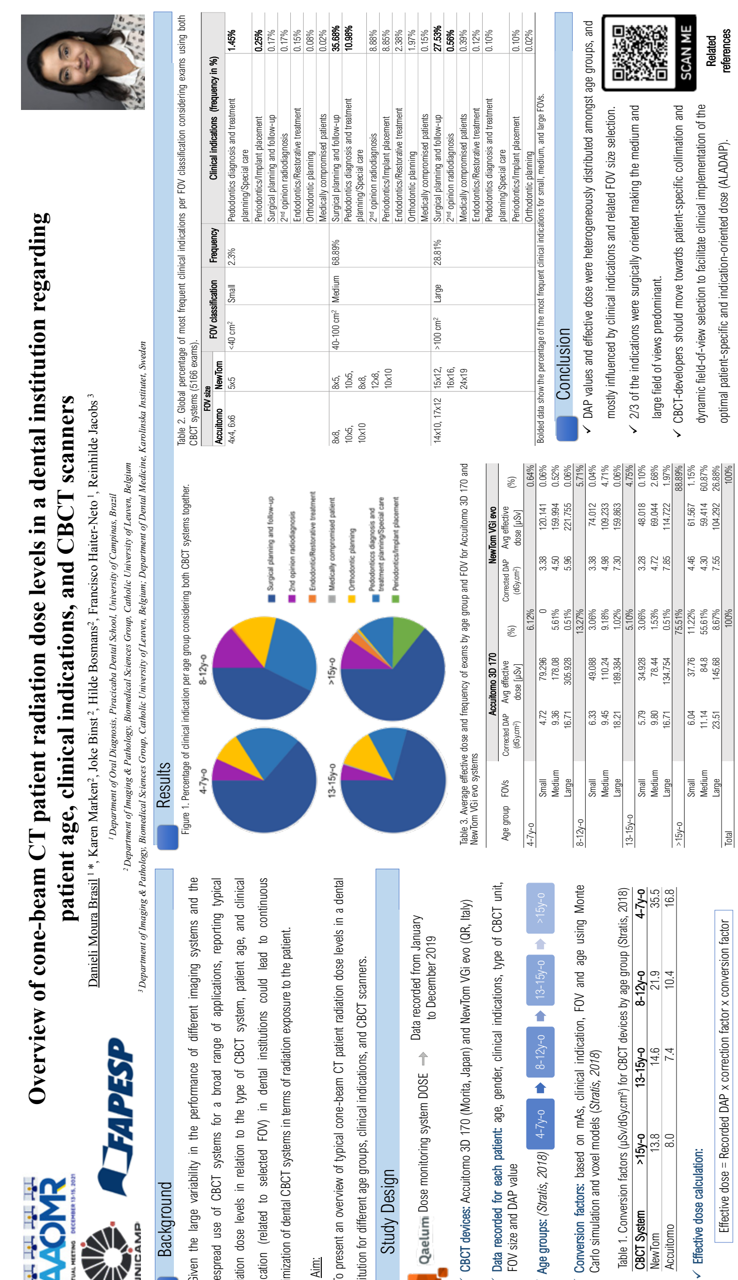
Ver Berne, J., Van der Cruyssen, F., Brijs, K., Croonenborghs, T., Willaert, R., Bila, M., Dormaar, T., Legrand, P., Politis, C., Coropciuc, R. (2021)
Salivary gland obstruction in children: A 10-year review at a tertiary center
KBVSMFH najaarsvergadering, 27 November 2021, Genval, Belgium

Willaert, R., Corthals, S., Ureel, M., Shaheen, E., De Cubber, J., Vermeersch, H. (2021)
Survival and success of extra-oral implants in an oncologic setting: a prospective clinical and radiological analysis
25th Congress of the European Association for Cranio Maxillo Facial Surgery, 14-16 July 2021, online

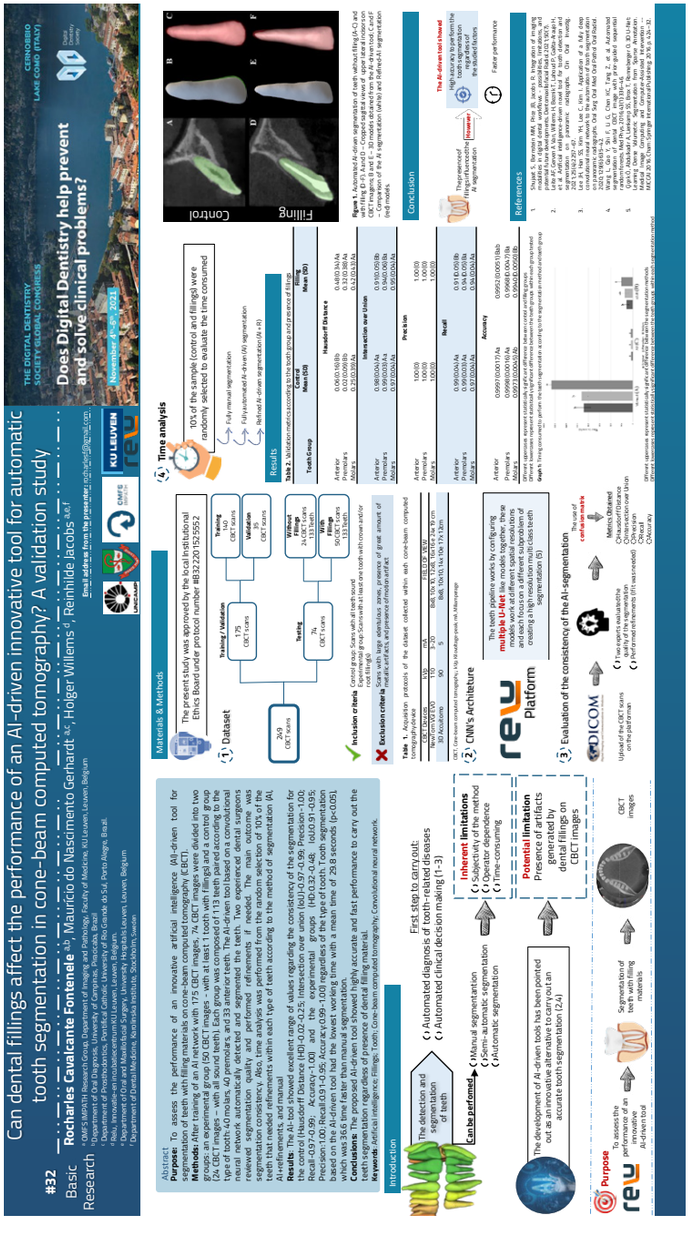
Würsching, T., Kesztyűs, A., Pottel, L., Diez-Fraile, A., Swennen, G., Nagy, K. (2021)
Comparison of different methods for the segmentation of the alveolar defect and the design of a 3D surgical template in cleft patients
KBVSMFH najaarsvergadering, 27 November 2021, Genval, Belgium

POSTER PRESENTATIONS

Brasil, D., Merken, K., Bosmans, H., Haiter-Neto, F., Jacobs, R. (2021)
Overview of cone-beam CT patient radiation dose levels in a dental institution regarding patient age, clinical indications, and CBCT scanners
72nd AAOMR Virtual Annual Session, 15 December 2021, online



Cavalcante Fontenele, R., do Nascimento Gerhardt, M., Willems, H., Jacobs, R. (2021)
Can dental fillings affect the performance of an AI-driven innovative tool for automatic tooth segmentation in cone-beam computed tomography? A validation study.
Digital Dentistry Global Congress, 4-6 November 2021, Cernobbio, Italy



Chopra, S., Ockerman, A., Vranckx, M., Östgren, P., Krüger-Weiner, C., Lund, B., Benchimol, D., Jacobs, R. (2021)
Prediction of wisdom tooth eruption
The Annual Swedish Dental Congress, 17 November 2021, Stockholm, Sweden

Prediction of wisdom tooth eruption

Shivi Chopra[*1], Anna Ockerman[2,3], Myrthel Vranckx[2,3], Peter Östgren[4], Carina Krüger-Weiner[5], Daniel Benchimol[*1], Reinhilde Jacobs[*1, 2, 3]

1 Section of Oral Diagnostics and Surgery, Division of Oral Diagnostics and Rehabilitation, Department of Dental Medicine, Karolinska Institutet, Stockholm, Sweden
2 OMFS-IMPATH Research Group, Department of Imaging and Pathology, Faculty of Medicine, University of Leuven, Leuven, Belgium
3 Department of Oral and Maxillofacial Surgery, University Hospitals Leuven, Leuven, Belgium
4 Department of Oral and Maxillofacial Radiology, Eastmaninstitutet, Folktandvården Stockholms län AB, Stockholm, Sweden
5 Department of Oral and Maxillofacial Surgery, Eastmaninstitutet, Folktandvården Stockholms län AB, Stockholm, Sweden

Introduction

- Third molars often fail to fully erupt
- Impaction of third molars is associated with various pathologies
- Indications for surgical removal of wisdom teeth remain a matter of debate

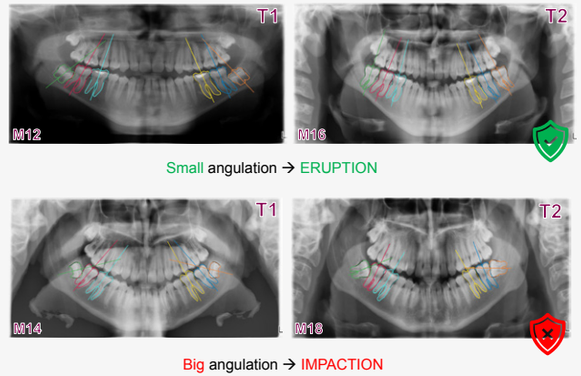
Aim

- Develop a prediction model for eruption of third molars based on molar angulations

Material and methods

- Panoramic radiographs
- Two time-points (T1, T2)
  - 8-15 and 16-23 y
- 508 patients
- Angulations measured with AI-driven tool (Vranckx et al., Int J Environ. Res Public Health, 2020)
- Level of development and eruption manually graded
- General linear mixed model

Results



$$y = \text{intercept} - a * M2 - b * M3 \text{ with } p = \frac{e^y}{1 + e^y}$$

y = calculation of third molar eruption
p = chance of third molar eruption

Conclusions

- Mandibular wisdom tooth eruption is significantly correlated with tooth angulation, already in a premature development stage
- More angulated premature wisdom teeth may not erupt , while very few axially erupting wisdom teeth (3 %) may show full and optimal periodontal eruption
- Yet, more data analysis is needed to strengthen the prediction model

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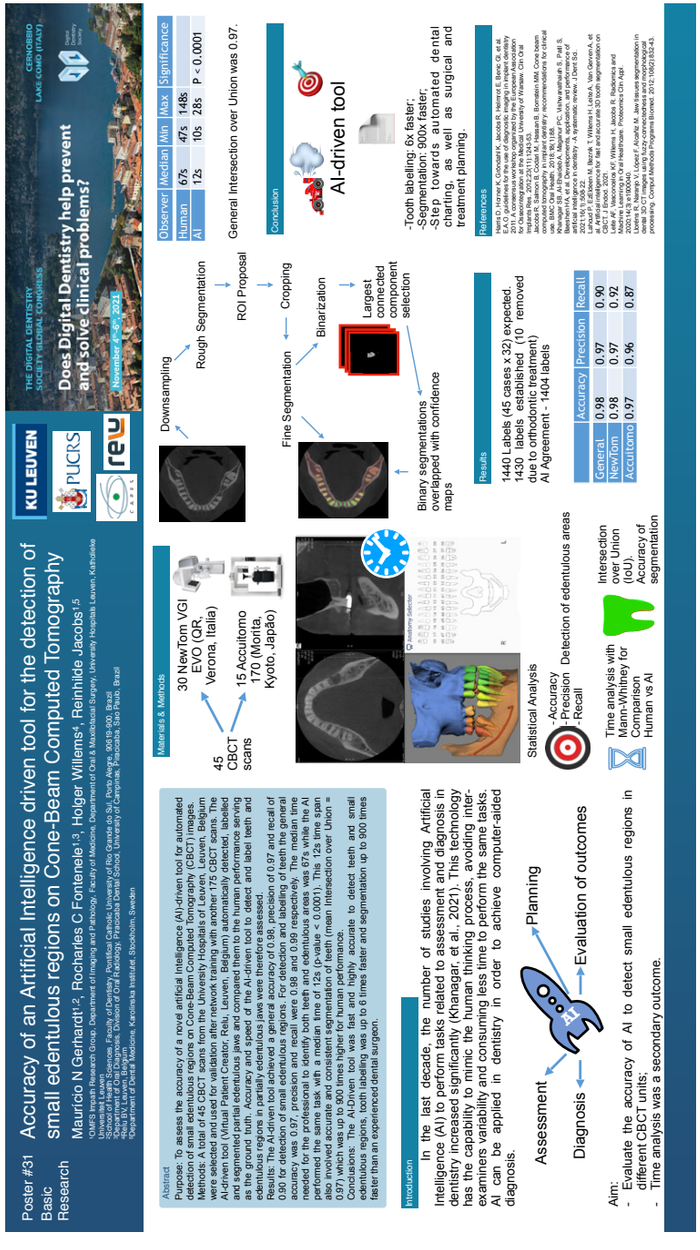
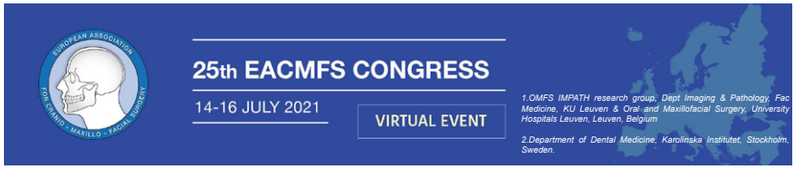
Telefon: +46 8 524 881 50

Karolinska Institutet

do Nascimento Gerhardt, M., Cavalcante Fontenele, R., Willems, H., Jacobs, R. (2021)
Accuracy of an Artificial Intelligence driven tool for the detection of small edentulous regions on Cone-Beam Computed Tomography.
Digital Dentistry Global Congress, 4-6 November 2021, Cernobbio, Italy



Ma, H., Shujaat, S., Van Dessel, J., Bila, M., Sun, Y., Politis, C., Jacobs, R. (2021)
Adherence to computer-assisted surgery in maxillofacial reconstruction
25th Congress of the European Association for Cranio Maxillo Facial Surgery, 14-16 July 2021, online



Adherence to computer-assisted surgery in maxillofacial reconstruction

Hongyang Ma[1*], Sohaib Shujaat[1], Jeroen Van Dessel[1], Michel Bila[1], Yi Sun[1], Constantinus Politis[1], Reinhilde Jacobs[1,2]

Abstract

To investigate the adherence of computer-assisted surgery (CAS) and to identify the factors influencing the compliance of CAS in maxillofacial reconstruction. A retrospective analysis of 136 computer-assisted maxillofacial reconstructive surgeries. Age, gender, disease aetiology and related parameters were recorded. Apart from descriptive data reporting, categorical data were related by applying Fisher-exact tests and post-hoc testing test in case of significance (P < 0.05). Overall, 179 (85.2%) surgeries completely adhered to the original plan. A total of 136 bone flap grafts were performed, In the mandible group, 118 (83.9%) patients underwent a full adherence plan, which was the highest compared with the midface group and skull group with a 76.9% and 60% adherence rate respectively (p = 0.03). More cases with fully adherence surgeries were found in the small defect size group compared with the large defect size group without statistical significance (p = 0.56). Bone flaps with less than two segments (93.1%) were more prone to fully adherence surgeries without statistical significance (p = 0.04).

Research Methodology

Patients and Methods

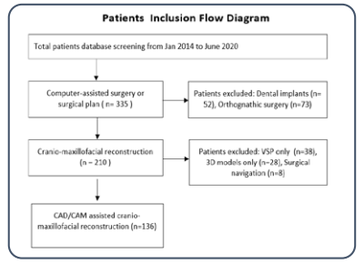


Figure 1. Patient inclusion and exclusion chart

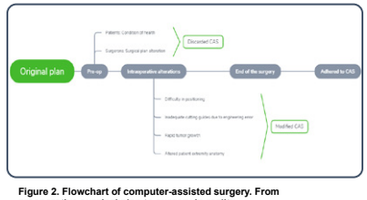


Figure 2. Flowchart of computer-assisted surgery. From preoperative surgical plan to surgery in reality.

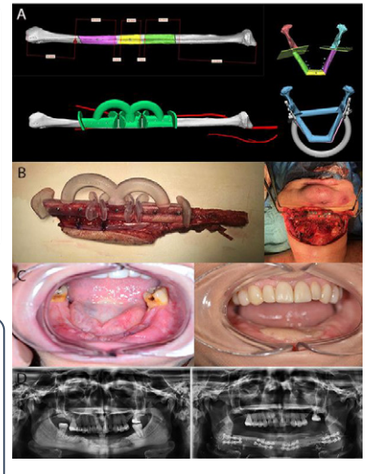


Figure 3. Workflow of Computer-assisted Planning and Execution in oral and maxillofacial reconstruction cases. Preoperative virtual analysis and planning (A), Intraoperative photos of fibular fabrication assisted by guided templates (B). The preoperative and postoperative intraoral photos of a 60 SCC female received mandibular reconstruction (C). The preoperative and postoperative panoramic x-rays of the patient (D).

Results

Reasons	Numbers (N)	
	Partial adherence	Discarded surgical plan
Unfitness of cutting guides or pre-bent plates	6	0
Tumour growth or surgical region alteration	3	1
Patients' health condition (Extremity anatomy, pain, infection)	3	4
Subjective reasons (Plan changed by patients or surgeons)	2	5

Table 1. Partial or discarded executed plan with reasons

Conclusions

CAS is a mainstream technique in various types of maxillofacial reconstructive surgery with good adherence to the execution plan. Increased bone flap segments and larger defect sizes may lead to a high probability of incomplete or discarded execution plans. Future prospective studies with a more detailed patient checklist are welcomed to confirm these hypotheses and establish solid conclusions.

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Ma, H., Van Dessel, J., Bila, M., Geusens, J., Politis, C., Jacobs, R. (2021)
Long-term follow up of oral oncology patients after mandibular reconstruction.
The Joint European Congress on Head and Neck Oncology (ECHNO) and the International Congress on Innovative Approaches in Head and Neck Oncology (ICHNO). 30 June – 3 July 2021, Brussels, Belgium

KU LEUVEN

OMFS IMPATH

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Long-term follow up of oral oncology patients after mandibular reconstruction

Hongyang Ma[1], Sohaib Shujaat[1],Jeroen Van Dessel[1], Michel Bila[1], Yi Sun[1], Constantinus Politis[1], Reinhilde Jacobs[1,2*]

Abstract

The aim of this study was to assess the survival of patients with oral squamous cell carcinoma (OSCC) after immediate mandibular reconstruction using a vascularised fibular flap (VFF) and to identify risk factors affecting overall survival and postoperative outcomes. A retrospective study of patients with OSCC diagnosed Potential risk factors and postoperative outcomes were recorded and analysed. At the end of year 5, patients had an overall cumulative survival rate of 0.52. Overall, advanced pN stage, poorly differentiated tumour, positive/proximal surgical margins, vascular invasion, perineural invasion and tumour recurrence were significantly associated with decreased cumulative survival. Tumour recurrence was associated with positive/proximal surgical margins, moderate, poorly differentiated tumours, extracapsular spread, computer-assisted surgery and early complications. Pain was significantly associated with extracapsular spread and early complications. The five-year survival rate for patients with advanced OSCC after mandibular segmental resection with fibular free flap reconstruction was 52.4%. Clinical/pathological risk factors such as pN stage, tumour differentiation, surgical margins, vascular invasion, nerve terminal invasion, and tumour recurrence had a significant impact on overall cumulative survival.

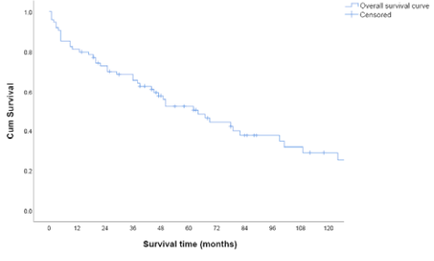

FIGURE 2. Overall cumulative Kaplan-Meier survival curve.

Surgical workflow and postoperative outcomes

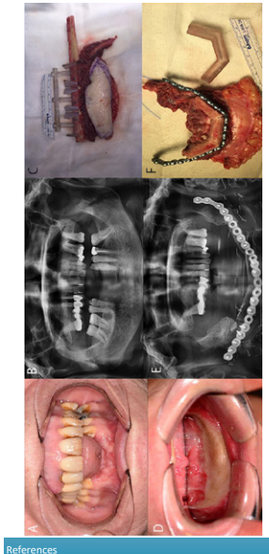

FIGURE 1. SCC of the mandible in a 70-year-old female. (A) SCC at mandibular symphysis; (B) Panoramic x-ray images of preoperative pathological mandible with virtual surgical plan ; (C) Fibular flap preparation by patient-specific fibular cutting guide; (D) Intra-oral photo in one year after surgery; (E) Panoramic x-ray images of postoperative reconstructive mandible by a vascularized fibular flap; (F) Fibula harvesting by pre-bent titanium plates.

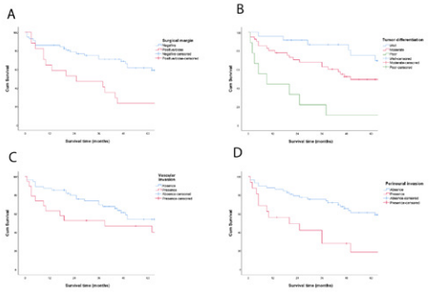

FIGURE 3. Kaplan-Meier survival curves of **the cumulative survival rate by risk factors**: **In accordance with surgical margin (A); In accordance with tumor differentiation (B); In accordance with vascular invasion (C); In accordance with perineural invasion (D).**

Conclusions

Clinical/pathological risk factors, such as pN stage, tumour differentiation, surgical margins, vascular invasion, peripheral nerve invasion and tumour recurrence, had a significant impact on overall cumulative survival. Adequate identification of risk factors and their impact on post-operative outcomes at the diagnostic stage allows for tailoring of 3D-oriented patient-specific treatment regimens to improve survival in OSCC patients.

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Ma, H., Van Dessel, J., Shujaat, S., Bila, M., Sun, Y., Politis, C., Jacobs, R. (2021)
Survival analysis and risk factor assessment of dental implants after jaw reconstruction
EAO Digital Days, 12-14 October 2021, online.

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Poster Number:PO-SU-016

CLINICAL RESEARCH - SURGERY

Survival analysis and risk factor assessment of dental implants after jaw reconstruction

Hongyang Ma[1], Jeroen Van Dessel[1], Sohaib Shujaat[1], Yi Sun[1], Michel Bila[1], Constantinus Politis[1], Reinhilde Jacobs[1, 2], [1]Department of Oral and Maxillofacial Surgery, University Hospitals Leuven, Leuven, Belgium, [2]Department of Dental Medicine, Karolinska Institutet , Stockholm, Sweden

Abstract

This study aimed to evaluate the 5-years survival of dental implants and to identify potential risk factors in patients who underwent a maxillofacial reconstruction with a vascularized free flaps. The distributions of implant survival were estimated. The overall long-term survival (81%) of implants placed in the reconstructed area can assure an excellent prognosis of implant-supported prostheses irrespective of the treatment procedure.

Results

The cumulative survival rate was 96% at 1 year, 87% at 2 years, and 81% at 5 years (Fig.2). Age, gender, nicotine use, radiotherapy, etiology, defect site, flap type, flap complication, type of bone graft, and dental implant length and insertion stage did not show any influence on implant survival. However, systemic disease and oral hygiene were determined as significant factors influencing the survival rate.

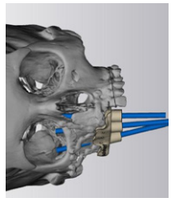

Figure.1. Digital dental implant surgical plan after jaw reconstruction

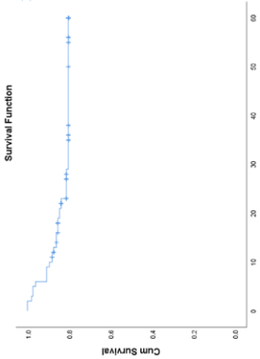

Figure 2. The cumulative survival rate of inserted dental implants

Conclusion

The survival rate of implants is significantly lower patients with a poor oral hygiene and systemic disease after maxillofacial reconstruction with free vascularized bone flap. The overall long-term survival (81%) of implants placed in the reconstructed area can assure an excellent prognosis of implant-supported prostheses irrespective of the treatment procedure.

Background and Aim

Dental implants have been increasingly used for prosthetic rehabilitation after oral and maxillofacial reconstruction by vascularized bone flaps (Fig.1). However, the survival rate and factors affecting the survival of osseointegrated dental implants are still to be further examined especially in the long term.

Methods and Materials

All patients had undergone a maxillofacial reconstruction with a vascularized free bone flap. The factors associated with implant survival or failure were identified over a follow-up period of 5 years. The distributions of implant survival were estimated by Kaplan-Meier curves and compared through log-rank tests.

References

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Presented at EAO Digital Days 2021

ICDMFR 2021

Automatic Segmentation of Maxillary Sinus

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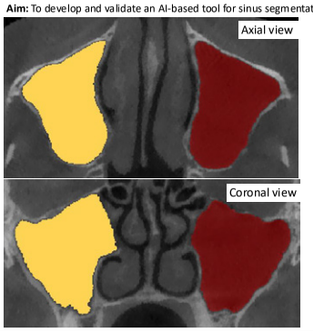
Introduction

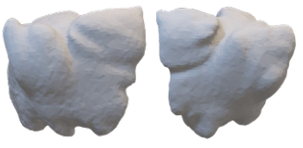
Segmentation of sinus radiographic images allows for comparison between right and left sides in the context of development evaluation, forensic identification, volumetric measurement and surgical planning as sinus augmentation. If such segmentation could be automated via AI while keeping anatomical accuracy, clinicians would surely gain in time and consistency.

Aim: To develop and validate an AI-based tool for sinus segmentation.



Materials & Methods

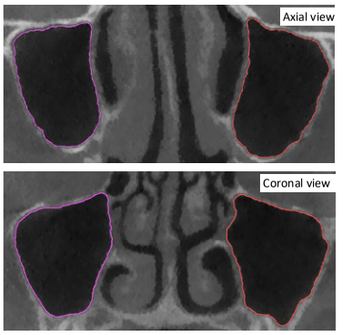
50 CBCT images were manually segmented and labelled using Materialise Mimics Medical 22 software (Materialise, Belgium). Then, STL files of right and left sinuses were separately exported. This allowed for development of an AI driven algorithm based on deep convolutional neural networks (Relu, Leuven, Belgium). Afterwards, another 20 CBCT cases were used for validation of the automatic segmentation tool in terms of system accuracy, time analysis and consistency.



Right_STL Left_STL

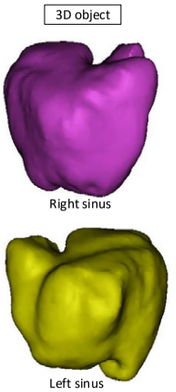
Results

Automatic segmentation is significantly faster (< 1 min) and consistent while reaching the same accuracy in comparison to manual segmentation as performed by the dento-maxillofacial radiologist.



Conclusion

The developed automatic segmentation tool proofs to be highly accurate, and fast for segmentation of the normal sinuses.



Morgan, N., Willems, H., Van Gerven, A., Vandenbroeck, N., Shaheen, E., Jacobs, R. (2021)
Automatic segmentation of maxillary sinus
23rd International Congress of DentoMaxilloFacial Radiology, 28 April – 1 May 2021,
Gwangju, South Korea, online

ICDMFR 2021

Evaluation of ten cone-beam computed tomography devices for endodontic Assessment of fine anatomical structures

Jáder Camilo Pinto[1,2*], Victor Aquino Wanderley[1,3], Karla de Faria Vasconcelos[1], André Ferreira Leite[1,4], Ruben Pauwels[5,6], Mansour Nadjmi[1], Matheus Lima Oliveira[3], Mario Tanomaru-Filho[2] and Reinhilde Jacobs[1,7]

1 OMFS IMPATH research group, Department of Imaging and Pathology, Faculty of Medicine, University of Leuven, Belgium. 2 Department of Restorative Dentistry, São Paulo State University (UNESP), School of Dentistry, Araraquara, SP, Brazil. 3 Department of Oral Diagnosis, Division of Oral Radiology, Piracicaba Dental School, University of Campinas, Brazil. 4 Department of Dentistry, Faculty of Health Sciences, University of Brasília, Brazil. 5 Aarhus Institute of Advanced Studies, Aarhus University, Aarhus, Denmark. 6 Department of Mechanical Engineering, Catholic University of Leuven, Leuven, Belgium. 7 Department of Dental Medicine, Karolinska Institutet, Stockholm, Sweden.

Introduction

Cone-beam computed tomography (CBCT) contributes to the assessment of endodontic complexity, directly impacting clinical decision making. However, accurate detection of fine endodontic structures remains a challenge. In a clinically realistic scenario, image quality provided by CBCT devices may differ significantly, especially in the presence of artifacts generated by high-dense objects. Therefore, the present study aimed to assess the performance of ten CBCT devices for detection of selected fine endodontic structures.

Materials and Methods

A dedicated anthropomorphic fully dentate skull phantom (Figure 1A) was scanned two times using ten CBCT devices (Table 1): without any metal (Figure 1B) and with an endodontically treated tooth containing a metallic pin (Figure 1C).

Figure 1 - A) Phantom of a dry human skull with mandible covered in mix-D; B) Phantom without metal; C) Phantom with endodontic treated premolars with metallic pin.

Analysis

- All CBCT images were registered based on an industrial CT image reference (Figure 2)
- Narrow canal, delta ramification and isthmus
- Three experienced observers ranked the images from 1 (best) to 10 (worst)
- Fleiss Kappa statistics were calculated for each CBCT device
- A general linear mixed models were applied to compare image quality among CBCT devices ($\alpha = 0.05$).

Table 1 - CBCT devices, manufacturers, codes and comparable scanning parameters

CBCT devices	Manufacturer	Code	FOV (cm)	kV	mA	Voxel size (mm)
3D Accuitomo 170	J. Morita, Kyoto, Japan	A	4 X 4	90	5	0.08
Veraview X800	J. Morita, Tokyo, Japan	B	4 X 4	100	7.9	0.08
X1	3Shape, Copenhagen, Denmark	C	4 X 4	90	12	0.1
NewTom VGi evo	Cefla Dental Group, Imola, Italy	D	5 X 5	110	3	0.1
OP 3D Pro	Instrumentarium, Tuusula, Finland	E	5 X 5	90	8.6	0.085
OP 3D	Instrumentarium, Tuusula, Finland	F	5 X 5	95	4	0.08
CS 9300	Carestream, Rochester, NY, USA	G	5 X 5	90	4	0.09
ProMax 3D Max	Planmeca, Helsinki, Finland	H	6 X 6	96	12	0.075
Orthophos SL 3D	Dentsply Sirona, Charlotte, USA	I	5 X 5	85	6	0.079
Spectral Dental UEG	UEG Medical, Shangai, China	J	6 X 6	110	8	0.075

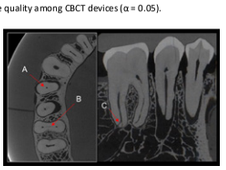


Figure 2 - Reference images (axial and sagittal views) from industrial micro-CT showing all evaluated endodontic diagnostic tasks. A – narrow canal, B – isthmus, C – delta.

Results

Table 2 - Comparison of mean scores (range) among all CBCT devices for evaluating narrow canal, delta ramifications and isthmus in two different conditions (metal-free and with metal)

Narrow canal middle				Narrow canal apical				Delta				Isthmus			
Metal-free		With metal		Metal-free		With metal		Metal-free		With metal		Metal-free		With metal	
CBCT Device	Mean Score (Range)	CBCT Device	Mean Score (Range)	CBCT Device	Mean Score (Range)	CBCT Device	Mean Score (Range)	CBCT Device	Mean Score (Range)	CBCT Device	Mean Score (Range)	CBCT Device	Mean Score (Range)	CBCT Device	Mean Score (Range)
C	1.1 (1-1)	I	1.7 (1-2)	B	1.0 (1-1)	A	1.0 (1-1)	A	1.1 (1-1)	A	1.1 (1-1)	A	2.7 (1-6)	G	1.3 (1-2)
A	2.3 (2-3)	A	2.0 (1-4)	A	2.7 (2-4)	B	2.7 (2-4)	B	2.0 (2-2)	D	2.3 (2-3)	C	2.7 (1-5)	E	3.0 (1-5)
B	2.7 (3-7)	D	3.0 (2-4)	C	3.0 (2-4)	D	3.0 (3-3)	G	4.3 (3-6)	E	3.7 (3-4)	G	3.0 (2-4)	A	3.7 (2-6)
D	4.0 (4-4)	C	3.3 (3-4)	D	4.0 (3-5)	G	3.3 (2-4)	C	4.7 (4-5)	C	4.3 (3-5)	B	4.0 (2-6)	B	4.3 (2-7)
I	5.3 (4-6)	G	5.0 (5-5)	G	4.3 (3-5)	F	5.7 (5-7)	E	5.0 (3-6)	B	5.0 (2-8)	E	4.3 (3-7)	D	5.0 (3-6)
G	6.3 (6-7)	H	6.3 (6-7)	I	6.0 (6-6)	E	6.3 (5-8)	I	5.3 (4-7)	I	6.3 (6-7)	I	4.7 (4-5)	F	6.0 (4-7)
H	7.7 (5-10)	E	6.7 (6-7)	H	7.3 (7-8)	H	6.7 (6-7)	D	5.7 (3-7)	G	6.7 (6-7)	D	7.3 (6-9)	I	6.0 (5-8)
E	8.0 (7-9)	B	8.7 (8-9)	E	7.7 (7-8)	C	8.3 (6-10)	J	8.3 (8-9)	F	7.0 (4-9)	J	8.3 (7-10)	C	7.0 (4-9)
F	8.0 (7-9)	J	8.7 (8-10)	F	9.0 (9-9)	J	8.7 (8-9)	H	8.7 (8-9)	H	9.0 (8-10)	F	8.7 (8-10)	H	8.7 (8-9)
J	9.7 (9-10)	F	9.7 (9-10)	J	10.0 (10-10)	I	9.3 (9-10	F	10.0 (10-10)	J	9.7 (9-10)	H	9.2 (9-10)	J	10.0 (10-10)

Shades of grey indicate statistical similarity among received scores (95% significance). Lighter grey highlights the best ranked and darker grey the worst ranked. The CBCT codes are defined in Table 1.

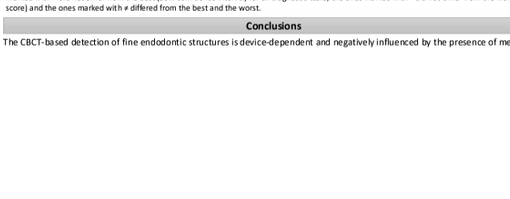


Figure 3 - Comparison of CBCT images with the hypothetical best and worst device in two conditions (metal-free and with metal). The CBCT devices marked with + did not differ from the best (95% confidence interval) for all diagnostic tasks, the ones marked with - did not differ from the worst (lower score) and the ones marked with ≠ differed from the best and the worst.

Conclusions

The CBCT-based detection of fine endodontic structures is device-dependent and negatively influenced by the presence of metal.

Pinto, J. C., Wanderley, V. A., De Faria Vasconcelos, K., Leite, A. F., Pauwels, R., Nadjmi, M., Oliveira, M. L., Tanomaru-Filho, M., Jacobs, R. (2021)
Evaluation of ten cone-beam computed tomography devices for endodontic assessment of fine anatomical structures
23rd International Congress of DentoMaxilloFacial Radiology, 28 April – 1 May 2021,
Gwangju, South Korea, online

Salar Amoli, M., Yang, H., Anand, R., EzEldeen, M., Jacobs, R., Bloemen, V. (2021)
Development and characterization of colloidal pNIPAM-based microgels for delivery of growth factors in dentoalveolar tissue engineering strategies.
8th Belgian Symposium on Tissue Engineering, 12-13 Nov 2021, Louvain La Neuve, Belgium

Development and characterization of colloidal pNIPAM-based microgels for delivery of growth factors in dentoalveolar tissue engineering strategies

Mehdi Salar Amoli[1,2], Huimin Yang[1], Resmi Anand[1,3], Mostafa EzEldeen[2], Reinhilde Jacobs[2], Veerle Bloemen[1,3]
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Introduction

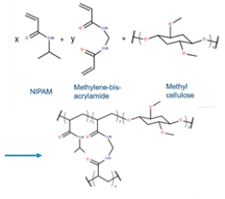
Maintaining the optimum concentration of growth factors and signaling molecules has an important impact on the outcome of tissue engineering strategies. Consequently, various release systems, either sustained, or trigger-based, have been designed to be incorporated in tissue engineering scaffolds. Microgels based on poly-n-isopropylacrylamide (pNIPAM) are widely used for this purpose considering their highly controllable properties. However, synthesis of such microgels involves a wide variety of parameters that can affect the outcome of the drug delivery strategies. This study therefore aims to synthesize pNIPAM based microgels for drug delivery in dentoalveolar tissue engineering, and systematically analyze the effect of different factors on the final properties of the microgels.

Materials and Methods

Methylcellulose was selected as a co-monomer to induce degradability, considering its limited functional groups preventing reactions with the drugs, and novel pNIPAM-methylcellulose microgels were synthesized through precipitation polymerization process at 40 °C. A 2^3 factorial set of experiments was designed to evaluate the effects of (i) material ratio, (ii) crosslinker concentration and (iii) presence of surfactants during synthesis, on final properties of the microgels. The microgels were characterized in terms of their chemical structure through Fourier-transform infrared spectroscopy (FTIR), their size through Dynamic light scattering (DLS), and their volume phase transition temperature (VPTT) through spectrophotometry. Genipin, a natural compound known to promote odontoblastic differentiation of dental pulp stem cells, was used as a model drug and the loading capacity of the microgels was evaluated through a "breathing-in" method followed by centrifugation and spectrophotometry. Factorial statistics were applied to determine the most important parameters affecting the microgel properties.

Results

Material Development
Chemical reaction



pNIPAM-methylcellulose copolymer

Figure 1. The reaction of Poly(N-isopropylacrylamide)/methyl cellulose microgel

FTIR

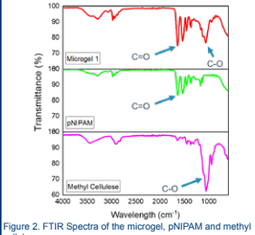


Figure 2. FTIR Spectra of the microgel, pNIPAM and methyl cellulose
Presence of C-O, characteristic of methylcellulose, and C=O, characteristic of pNIPAM confirms successful synthesis of pNIPAM-methylcellulose microgels.

Table 1. the factorial design of synthesized microgel classes

Label	PNIPAM : Methyl cellulose	Methylene-bisacrylamide	SDS
MG1	2:1	2.5mol%	0
MG2	5:1	2.5mol%	0
MG3	2:1	10mol%	0
MG4	5:1	10mol%	0
MG5	2:1	2.5mol%	2mM
MG6	5:1	2.5mol%	2mM
MG7	2:1	10mol%	2mM
MG8	5:1	10mol%	2mM

Measurement of volume phase transition temperature

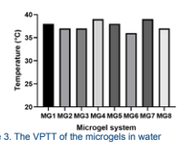


Figure 3. The VPTT of the microgels in water

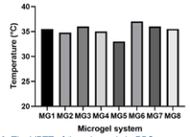


Figure 3. The VPTT of the microgels in PBS

As expected, presence of the salts cancels the charges on microgel surface, leading to a VPTT that is 1-2 °C lower than microgels in water. Above this temperature, the hydrophobic groups on pNIPAM backbone will be exposed to the solution and the microgel will shrink.

Measurement of microgel size through DLS

Table 2. measurement of average microgel diameter

Microgel	DZ Mean (nm) at 40°C	Microgel	DZ Mean (nm) at 40°C
1	569.03	5	189.43
2	878.77	6	146.63
3	662.17	7	887.00
4	886.00	8	165.93

Table 3. statistical analysis and determination of most influential factors on microgel size

label	factors	effects	variance
A	NIPAM : methyl cellulose	57.575	± 26.42
B	Bisacrylamide	204.3083	± 26.42
C	SDS	-401.742	± 26.42
AB	NIPAM : methyl cellulose + bisacrylamide	191.0417	± 26.42
BC	Bisacrylamide + SDS	154.125	± 26.42
AC	NIPAM : methyl cellulose + SDS	324.3583	± 26.42
ABC	All 3 factors	148.0917	± 26.42

The analysis demonstrates presence of SDS during synthesis to be the most influential factor on microgel size. This can be attributed to reduced surface tension of water in synthesis chamber resulting in faster collapse of polymer chain at the synthesis temperature.

Measurement of drug loading efficiency

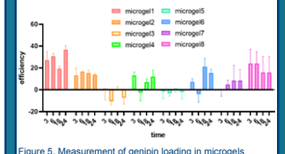


Figure 5. Measurement of genipin loading in microgels
Table 4. statistical analysis and determination of most influential factors on microgel loading efficiency

Information		L.E.	
Factors	Elements	effect	variance
A	NIPAM : methyl cellulose	5.37	± 0.43
B	Methylene-bisacrylamide (MBA)	-8.59	± 0.43
C	SDS	-4.44	± 0.43
AB	NIPAM : methyl cellulose + MBA	8.01	± 0.43
BC	MBA + SDS	14.27	± 0.43
AC	NIPAM : methyl cellulose + SDS	7.09	± 0.43
ABC	All 3 factors	-13.12	± 0.43

The analysis demonstrated a combination of MBA and SDS to have the greatest effect on the loading capacity of the microgels, where presence or absence of both factors together affects the loading more than other factors

Evaluation of cytotoxicity

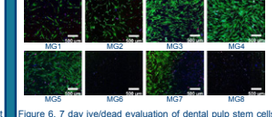


Figure 6. 7 day ive/dead evaluation of dental pulp stem cells exposed to microgels.
Based on the live/dead evaluation, MG6 and MG8 are toxic, while other microgels can be in contact to cells without much toxicity.

Evaluation of drug release from microgels

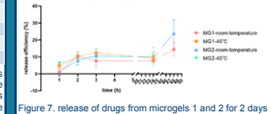


Figure 7. release of drugs from microgels 1 and 2 for 2 days

CONCLUSION

The results confirmed successful synthesis of the microgel systems. Moreover, the DLS results demonstrated a microgel diameter ranging from approximately 150 nm to 800 nm, and indicated that the presence of surfactant has the most influential impact on microgel size, with small amounts of surfactant during synthesis leading to significant reductions in microgel size. Furthermore, Genipin, as the model drug, was loaded with different efficiencies in the microgels. Statistical analysis determined an interaction among the effect of parameters, crosslinker concentration and presence of surfactants, on loading efficiency, with their combination being the most effective parameter on the outcome. Moreover, the volume phase transition temperature of the microgels ranged from 34 °C to 39 °C, both below and above the physiological temperature making them suitable for different applications. Taken together, the results of this study, obtained through a systematic analysis of parameter effects, can serve as a solid basis for development of drug delivering pNIPAM-methylcellulose microgels for dentoalveolar tissue regeneration.

This work is part of KU Leuven
Contact: mehdi.salaramoli@kuleuven.be

Song, D., Shujaat, S., De Faria Vasconcelos, K., Huang, Y., Politis, C., Lambrichts, I., Jacobs, R. (2021)
Diagnostic accuracy of CBCT versus intraoral imaging for the assessment of peri-implant bone defects
23rd International Congress of DentoMaxilloFacial Radiology, 28 April – 1 May 2021, Gwangju, South Korea, online

ICDMFR 2021

Diagnostic accuracy of CBCT versus intraoral imaging for assessment of peri-implant bone defect

Song DD [1]*, Shujaat S[1], de Faria Vasconcelos K[2], Huang Y[1], Politis C[1], Lambrichts I[2], Jacobs R[1]
[1]Department of Imaging & Pathology, KU Leuven, Belgium
[2] Department of Morphology, Hasselt University, Belgium

Introduction

Early detection of marginal bone loss is vital for treatment planning and prognosis of teeth and implant. This study was conducted to assess diagnostic accuracy of CBCT compared to intra-oral (IO) radiography for detection, classification, and measurement of peri-implant bone defects in an animal model.

Method & Material

Fifty-four mandible blocks with implants were harvested from nine male health adult beagle dogs with acquisition of IO, CBCT and micro-CT images from all samples. Peri-implant bone defects from 16 samples were diagnosed using micro-CT and classified into 3 defect categories: dehiscence (n = 5), infrabony defect (n = 3) and crater-like defect (n = 8) (Fig.1) The dimension of bone defect was measured as showed in Fig.2.

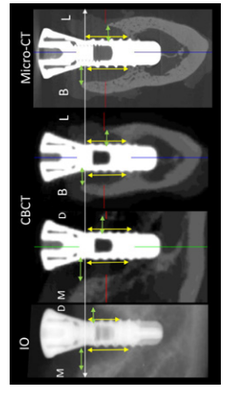


Fig.2: Method of depth and width measurement in intra-oral radiography (IO), cone-beam CT (CBCT) and micro-CT imaging. White arrow: implant shoulder as reference; Yellow arrow: depth of bone defect (from implant shoulder to the most apical of bone defect); Green arrow: width of bone defect (from implant shoulder to bone crest).

Results

There was a high diagnostic accuracy for detection of bone defects with CBCT images (sensitivity: 100%/100%), while IO images showed a reduction in accuracy (sensitivity: 69%/63%). For accuracy of measuring defect depth and width, a higher correlation was observed between CBCT and gold standard micro-CT ($r = 0.91$, 95% CI: 0.86-0.94), whereas a lower correlation was seen for IO images ($r = 0.82$, 95%CI: 0.67-0.91).

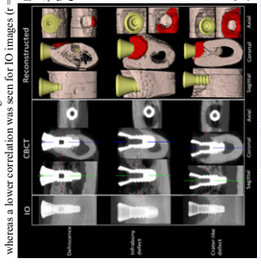


Fig.1 *Shapes of peri-implant bone defects which were demonstrated in IO, CBCT and reconstructed imaging.*

Table 1: *Reliability and agreement in detection of bone lesion and morphology classification.*

Detection parameters	Methods	Observer effect	Reliability		Agreement	
			ICC	95% CI	Weighted Kappa	95% CI
Bone defect presence	IO	0	0.96	0.94-0.97	0.84	0.72-0.96
	CBCT	0	0.97	0.96-0.98	0.87	0.74-0.99
	Total	0	0.90	0.86-0.92	0.78	0.68-0.88
Shape classification	IO	0	0.96	0.94-0.97	0.84	0.72-0.94
	CBCT	1	-	-	0.94	0.97-1
	Total		0.92	0.90-0.94	0.82	0.74-0.90

Table 2: *Sensitivity of diagnosis of bone defect presence and shape.*

Observers	Methods	Bone defect presence	Bone defect shape		
			Dehiscence	Infrabony defect	Crater-like defect
1	IO	69%	0	50%	78%
	CBCT	100%	100%	100%	90%
2	IO	63%	0	50%	78%
	CBCT	100%	100%	100%	89%

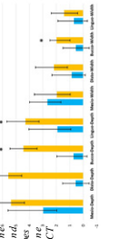
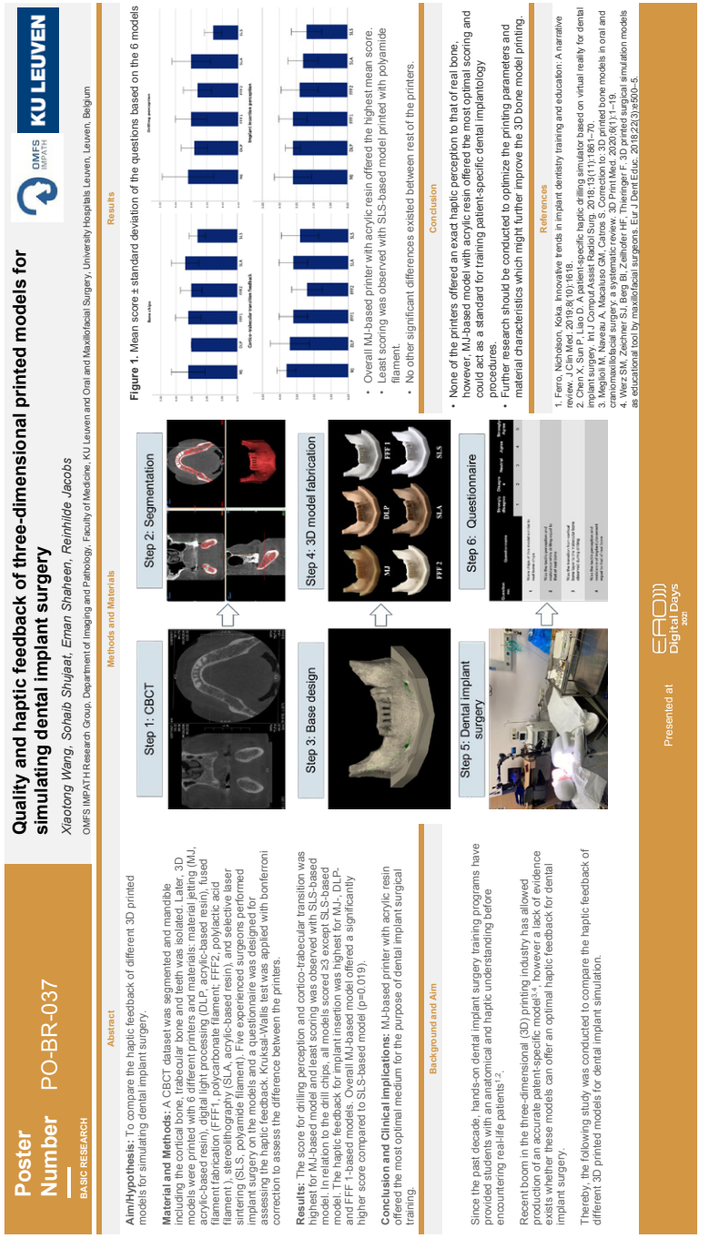


Fig.3: *Graph of bone defect size (depth and width) for different shapes of peri-implant bone lesion in IO and CBCT imaging. *p < 0.05.*

Conclusion

Diagnostic accuracy and reliability of CBCT was found to be superior to IO imaging for detection, classification, and measurement of peri-implant bone defects.

Wang, X., Shujaat, S., Shaheen, E., & Jacobs, R. (2021)
Quality and haptic feedback of 3D printed models for simulating dental implant surgery
EAO Digital Days, 12-14 October 2021, online.



B. INVITED LECTURES

C. Politis	23/01/21	Orthognathic surgery in systemic disease	30th National Congress of the Hellenic Association for Oral and Maxillofacial Surgery Online
R. Jacobs	26/1/21	On tooth bioprinting	Online 3D Bioprinting Conference, 8th edition Jakajima, Matchmaker for Innovators Online
S. Shujaat	28/1/21	Accuracy of cone beam computed tomography-derived casts	Online 3D Dental Printing Conference, 8th edition Jakajima, Matchmaker for Innovators Online
C. Noffke., E. Raubenheimer	21/02/21	Radiology and Pathology of Odontogenic Tumoursv	Educational Tract Training Program, IADMFR Online
R. Jacobs	8/3/21	Panel discussion 1: Radiation protection training in diagnostic radiology, including dental Panel discussion 3: Radiation protection training of referring physicians and dentists	Technical meeting on Developing Effective Methods for Radiation Protection Education and Training of Health Professionals IAEA Headquarters, Vienna, Austria Online
C. Politis	25/03/21	Odontogene Tumoren: masterclass	IOMFCOT Leuven, Belgium
C. Politis	27/03/21	Actualiteiten MKA	VBS-MKA Leuven, Belgium Online
R. Jacobs	13/4/21	Diplomkurs odontologisk radiologi: CBCT: from scanning to planning	Karolinska Institutet Online
R. Jacobs	28/4-1/5/21	The articifical wonders of planning and printing	23rd International Congress of DentoMaxilloFacial Radiology Gwangju, South Korea Online
K. de Faria Vasconcelos	17/05/21	Internationalization: an individual experience	Post-Graduation in Health Sciences University of Brasília, Brasília, Brazil Online
C. Noffke	26/05/21	Radiological interpretation of odontogenic tumours.	University of Campinas, Brazil Online
C. Politis	27/05/21	Een frisse wind door uw praktijk	IOMFCOT Leuven, Belgium Online
R. Jacobs, K. Bacher, T. Clarijs, R. Pauwels	27-28/5/21	Two-days interuniversity programme on the use of Cone Beam CT for dentomaxillofacial diagnostics	PAV Mondgezondheidswetenschappen KU Leuven Leuven, U Ghent, SCK Mol Belgium Online

R. Jacobs	31/5/21	1 day course radioprotection in dentistry for dental assistants and oral hygienists	PAV Mondgezondheidswetenschappen Leuven, Belgium Online
R. Jacobs, K. Bacher	31/5-1/6/21	Two day course for radio-protection certification in dentistry	PAV Mondgezondheidswetenschappen Leuven, Belgium Online
C. Politis	03/06/21	Orthognathic surgery in systemic disease	EACMFS Online
C. Politis	10/06/21	Ulceraties en erosies in de algemene praktijk	IOMFCOT Leuven, Belgium Online
K. Nagy	10 - 12/06/21	Early complex care of Cleft Lip and Palate	Hungarian Neonatological Society Congress II and Young Neonatologians Meeting VI
F. Van der Cruyssen	21/06/21	Trigeminal neuropathy: trouble, trauma, tension and treatment	World Congress on Pain Amsterdam, The Netherlands
N. Morgan	28/6/21	Automated CBCT Image Segmentation of the Maxillary Sinus	Monthly Scientific Activity of the Oral Radiology Division of Department of Oral Medicine and Diagnostic Sciences King Saud University, Riyadh, Saudi Arabia Online
C. Politis	29/06/21	Iatrogene problemen in de mond	NIVVT De Montil, Essene, Belgium
R. Jacobs	1/7/21	Workshop Cone Beam CT in de praktijk: basis	PAV Mondgezondheidswetenschappen De Jacht, Heverlee, Leuven, Belgium
R. Jacobs	2/7/21	Workshop Cone Beam CT in de praktijk: diagnostiek	PAV Mondgezondheidswetenschappen De Jacht, Heverlee, Leuven, Belgium
R. Jacobs	6/7/21	CBCT, hoe kijken we ernaar, interpretatie van CBCT beelden	PAV Mondgezondheidswetenschappen Leuven, Belgium Online
R. Jacobs	8/7/21	CBCT, hoe kijken we ernaar. Radiodiagnostiek	PAV Mondgezondheidswetenschappen Leuven, Belgium Online
C. Politis	14/07/21	Keratocyst: ablative or conservative approach	25th Congress of the European Association for Cranio Maxillo Facial Surgery virtual congress Online
K. de Faria Vasconcelos	14-15/07/21	Artifacts in CBCT part 1 and part 2 MicroCT and CBCT application in research field	Two days course - Specialization in Radiology - CIRO Goiâna, Goiás, Brazil Online
R. Jacobs	3/9/21	Workshop cone beam CT in de praktijk: presentatie van eigen casus	PAV Mondgezondheidswetenschappen De Jacht, Heverlee, Leuven, Belgium

R. Jacobs, K. Bacher	6-7/9/21	Two day course for radio-protection certification in dentistry	PAV Mondgezondheidswetenschappen De Jacht, Heverlee, Leuven, Belgium
C. Noffke., E. Raubenheimer	10/09/21	Radiological Interpretation of Anomalies of the Maxillofacial Bones	Educational Tract Training Program, IADMFR Online
R. Jacobs	11/9/21	The artificial wonders of CBCT	NewTom FORUM San Raffaele Hospital, Milan, Italy
C. Politis	13/09/21	Zwellingen in MKA	NIVVT Stiemerheide, Genk, Belgium
R. Jacobs	16/9/21	Beeldende stralen	VVT Studieclub West-Brabant Cultureel Centrum Westrand, Dilbeek, Belgium
C. Politis	17/09/21	SARPE Complications IBRA Advanced/Fellow Course on Orthognathic Surgery	IBRA Headquarters, Basel, Switzerland
C. Politis	18/09/21	Facial Asymmetry IBRA Advanced/Fellow Course on Orthognathic Surgery	IBRA Headquarters, Basel, Switzerland
A. Ockerman	21/9/21	Bloedverdunners bij tandextracties en orale chirurgie	PAV Mondgezondheidswetenschappen Leuven, Belgium Online
K. Nagy	7/10/21	Principles of care for patients with cleft lip and palate and an overview of modern surgical procedures	Electronic Index of Continuing Education of Physicians Online
K. Nagy	7/10/21	Surgical treatment of cleft lip	Electronic Index of Continuing Education of Physicians Online
C. Politis	16/10/21	Grensverleggende inzichten in MKA: Pijn in MKA	Congres oud-assistenten Arnhem-Leuven De Jacht Leuven, Belgium
R. Jacobs	3/11/21	AI-assisted treatment planning (overall story)	I UFG International Meeting on Dental Research Goiânia, Brazil Online
P. Lahoud	3/11/21	AI tools for tooth and nerve segmentation (serving autotransplantation and implant placement)	I UFG International Meeting on Dental Research Goiânia, Brazil Online
R. Jacobs	5/11/21	Lectio Magistralis: Empowering Artificial Intelligence for oral healthcare	2nd Digital Dentistry Society Global Congress Digital Dentistry Society Villa Erba Congress Center, Cernobbio, Lake Como, Italy

I. Savoye, F. Preda, P. Verhelst	6/11/21	A new era of facial planning: fully digital and foolproof? Part I + II	The 2nd Digital Dentistry Society Global Congress Digital Dentistry Society Villa Erba Congress Center, Cernobbio, Lake Como, Italy
C. Politis	18/11/21	Seminarie Kaakbotpathologie: Chirurgische uitdagingen in kaakbotpathologie	PAV Mondgezondheidswetenschappen Huis Bethlehem, Leuven, Belgium
C. Noffke, E. Raubenheimer	18/11/21	Radiodiagnostics of Jaw Bone Pathology	PAV Mondgezondheidswetenschappen South-Africa Online
R. Jacobs	18/11/21	Seminarie kaakbotpathologie: Pathologie in de orofaciale regio	PAV Mondgezondheidswetenschappen Huis Bethlehem, Leuven
E. Tijskens	18/11/21	Endodontie in het melkgebit	VVT studieclub West-Brabant Dil'arte, Dilbeek, Belgium
K. de Faria Vasconcelos	20/11/21	The role of CBCT in endodontics: from basic research to the clinical impact	Flemish Society for Endodontology De Hoorn, Leuven, Belgium
C. Politis	23/11/21	Odontogene en niet-odontogene tumoren	NIVVT Stiemerheide, Genk, Belgium
R. Jacobs	25/11/21	Kind in beeld: Specifieke aspecten op vlak van beeldvorming bij kinderen, incl radioprotectie	PAV Mondgezondheidswetenschappen 3Hoog, Heverlee, Belgium
C. Politis	26/11/21	Symposium Worden we wijzer met Wijsheidstanden?: Klinische wijsheden over wijsheidstanden	PAV Mondgezondheidswetenschappen Museum M, Leuven, Belgium
M. Vranckx	26/11/21	Symposium Worden we wijzer met Wijsheidstanden?: 15.000 wijsheidstanden en bevindingen	PAV Mondgezondheidswetenschappen Museum M, Leuven, Belgium
F. Van der Cruyssen	26/11/21	Symposium Worden we wijzer met Wijsheidstanden?: Wijsheidstanden en zenuwen gelinkt	PAV Mondgezondheidswetenschappen Museum M, Leuven, Belgium
R. Jacobs	26/11/21	Paediatric OMFS in a new Millenium: Radio protection in children	KBVSMFH najaarsvergadering, Genval, Belgium
C. Politis	26/11/21	Paediatric OMFS in a new Millenium: Perspectives of reimbursement of omfs procedures in paediatric vs adult population	KBVSMFH najaarsvergadering, Genval, Belgium

C. Politis	2/12/21	Niet-odontogene tumoren	IOMFCOT Leuven, Belgium Online
M. EzEldeen	2/12/21	Tandautotransplantatie in het digitale tijdperk: Tandautotransplantatie als behandeloptie in de pedodontie	PAV Mondgezondheidswetenschappen De Hoorn, Leuven, Belgium
C. Politis	4/12/21	Vermijdbare mishaps in de tandheelkunde; een mka-invalshoek	NIVVT Thor park, Genk, Belgium
R. Jacobs	9/12/21	CBCT waar beginnen we: een update	PAV Mondgezondheidswetenschappen Irish College, Leuven, Belgium
R. Jacobs	13/12/21	Current evidence and guidelines on contact shielding in dental radiology	IAEA Consultancy Meeting on Patient Shielding in X-ray Imaging The International Atomic Energy Agency Online
I. Savoye, F. Preda, P. Verhelst	16/12/21	Digitalisatie in Orthodontie	First Congress Digital Dentistry Belgium Ghelamco Arena, Ghent, Belgium
A. Torres	16/12/21	De Digitale Tandarts	First Congress Digital Dentistry Belgium Ghelamco Arena, Ghent, Belgium
M. Bornstein	23/12/21	Diagnostic and therapeutic challenges in dental practice	PAV Mondgezondheidswetenschappen Irish College, Leuven, Belgium

5

3D lab

The 3D lab facility was officially introduced in autumn 2014, as an integrated part of the Department of Oral and Maxillofacial surgery at UZ Leuven. Together with the maxillofacial imaging center, the 3D-lab facility is fully integrated in the workflow of the daily clinic. The work started from simple segmentation and 3D printing of anatomical structures to 3D planning of complex surgeries. Currently, the 3D lab works in a multidisciplinary team that brings together the expertise of doctors, scientists, engineers to improve care for each individual patient. This closed cooperation enabled the surgeon and patient to maximize the benefits from 3D technology. The focus of our 3D lab is how to integrate 3D technologies in the clinical workflow to develop new medical treatment methods and to carry out clinical research in the field of oral and maxillofacial surgery. This involves computer assisted surgical planning, 3D printing of anatomic models and surgical templates, 3D metal printing of patient specific implant and image-guided surgery. Besides Oral and Maxillofacial surgery, the 3D lab is collaborating internally within UZ Leuven departments, and externally with 9th People Hospital Shanghai, 4th Military Medical University Xi'an China, Department of Mechanical Engineering Jiao Tong University, Karolinska University Hospital Stockholm, etc.

In 2021 the Medical Device Regulatory came into effect as a European directive. This still has to be implemented in European Hospitals. In contrast to the industrial environment no official agency exists to help Hospitals implement these new regulations. These regulatory requirements will deeply affect patient care and will inflict collateral damage, where companies will retract existing patient solutions from the market. It also slows down the efforts to establish point-of-care metal printing facilities in the hospitals. It is the next logical step in 3D-printing in hospitals, but MDR will act as a cost-multiplicator far more than its positive effect on patient quality. Only patients who can afford the increased cost of 3D-constructs will benefit from MDR. Society, at large, can impossibly carry the cost burden of regulatory overload. For a 3D-lab facility as ours the research focus will need to change from materials and applications research towards cost-benefit studies and medical technology assessments.

A. TEAM

Constantinus POLITIS

Constantinus Politis is Oral and Maxillofacial Surgeon. He is currently Full Professor and Chairperson of the Department of Oral and Maxillofacial Surgery at Leuven University Hospitals, KULeuven, Belgium. He is an invited Lecturer at the EHSAL in Brussels. He graduated at the Catholic University of Leuven in medicine (MD, summa cum laude), in dentistry (DDS, magna cum laude). He specialized in oral and maxillofacial surgery at the Catholic University of Leuven. Postgraduate training was additionally followed in Arnhem (Stoelinga), Aachen (Koberg), Copenhagen (Pindborg), Göteborg (Bränemark) and San Francisco (Marx). He holds an honorary professorship at the Fourth Medical Military University of Xi'an, China. He also holds a master degree in management (MM) from the Applied Economic Scienes at the University of Hasselt and a master degree in Hospital Management (MHM) from the Catholic University of Leuven. He became a recognition as medical specialist in management of health care data and is now member of the National Council of Hospital Facilities. He is Vice-President of the Professional Union of Belgian Oral and Maxillofacial Surgeons. He is President of the Belgian Royal Scientific Society of Oral and Maxillofacial Surgery. He is acknowledged trainer of OMFS trainees. He defended his doctor's thesis on the subject of complications of orthognathic surgery (PhD). His professional field of intrest is in orthognathic and orthodontic surgery and trigeminal nerve dysfunction. Clinical research projects include prevention and repair of iatrogenic trigeminal nerve injury, transplantation of teeth and orthognathic surgery. He has been granted membership of the Belgian Royal Academy of Medicine.
Researchgate: https://www.researchgate.net/profile/Constantinus_Politis2

Reinhilde JACOBS

Reinhilde Jacobs is dentist, Doctor in Dental Sciences (PhD University of Leuven), periodontologist (KU Leuven) and Master in Dental Radiology (University of London). She is full professor at the University of Leuven and visiting professor at Karolinksa Institutet, Stockholm, Sweden and the Dalian Medical University in China. R. Jacobs is heading the omfs impath research group of the KU Leuven (omfsimpath.be) and the clinical center of dentomaxillofacial radiology (UZleuven). She is Secretary General of the International Association of DentoMaxilloFacial Radiology. She is section editor of 5 journals (Journal of Dentistry, Clinical Oral Investigations, International Journal of Oral Implantology, European Journal of Radiology and Oral Radiology). She has received the D Collen Research Travel Award (1994), a postdoctoral fellowship of the European Commission (1994-95), the IADR Young Investigators Award (1998) and the Belgian Joachim Award in Odontostomatology (1999). In 2013, she received a Dr Honoris Causa at the "Iuliu Hatieganu" University of Medicine and Pharmacy in Cluj-Napoca. She is involved in many multidisciplinary and interuniversity research collaborations, with a specific focus on imaging research, artificial intelligence and bioprinting. She has been actively participating in 5 European projects and is (co-)author of 5 books and more than 500 publications in peer-reviewed journals besides multiple invited lectures and publications in other journals or books. Scopus (2022): h:70

Eman SHAHEEN

Eman (Emmy) Shaheen was born on July 12th, 1982 in Giza, Egypt. She graduated with honor from the faculty of Computer Sciences and Information Technology (2003), Cairo University, Egypt where she also worked as a teaching assistant from 2003 till 2007 with major in Image Processing. Meanwhile, she obtained her Master's Degree in Video Processing (2007) from Cairo University. In 2008, she joined the team of Medical Physics where she finished with distinction her pre-doctoral studies about mammography and breast cancer (2009) in Biomedical Sciences at the KU Leuven, Belgium. She was granted a PhD scholarship from the OPTIMAM project (UK) in 2010 to develop, simulate and validate 3D models of breast lesions and tools to optimize the performance of breast tomosynthesis. She obtained her doctoral degree in 2014, KU Leuven, Belgium. In the same year, she started working in the department of Maxillofacial surgery, University hospitals Leuven (Belgium) with Prof. dr. Constantinus Politis as clinical engineer with focus on 3D planning of orthognathic surgeries. Next to the patient related work, she is part of the research group of the OMFS-IMPATH research group (KU Leuven, Belgium) where she supervises students, supports different research projects related to 3D printing and 3D simulations. She is also collaborating with Materialise (Leuven, Belgium) as consultant to improve the CMF software for orthognathic surgeries next to other research related projects.

Sohaib SHUJAAT

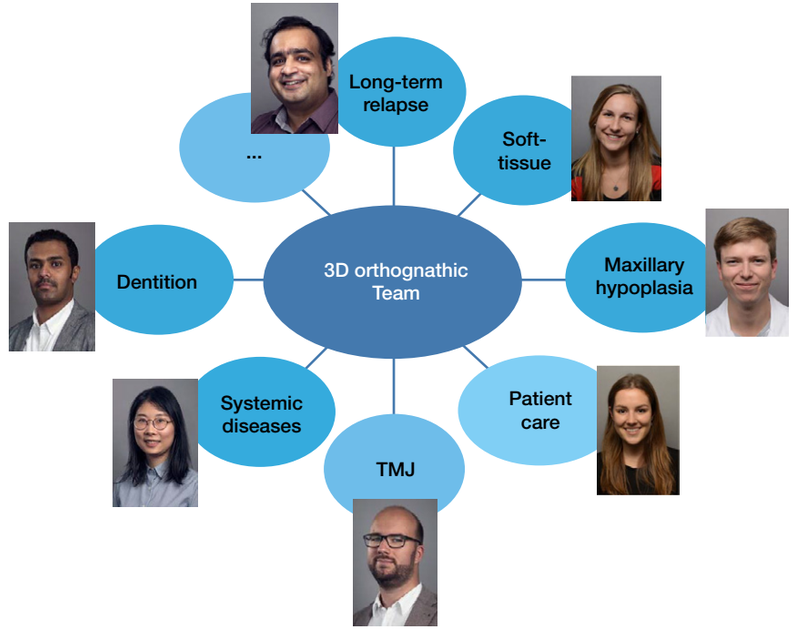
Sohaib Shujaat was born on November 29th, 1985. He achieved his degree in Bachelor of Dental Surgery (B.D.S) from Lahore Medical and Dental College, Lahore, Pakistan (2004 - 2008). After his graduation, he worked as an Internee in all clinical departments of dentistry at Lahore Medical and Dental College, Lahore, Pakistan (2009-2010). He obtained his Master of Science (MSc. Dent Sci) degree in Oral and Maxillofacial Surgery (360 credits) with merit from Glasgow Dental School and Hospital, University of Glasgow, Glasgow, United Kingdom, under the guidance of Professor Ashraf Ayoub (2010-2012). During his Masters, he worked on 4-Dimensional facial soft tissue changes in oncology patients. From March 2013 till September 2017, he worked as a Lecturer in the Department of Oral and Maxillofacial Surgery and Course Director of Internal Medicine and Comprehensive Patient Management (CPM) for dental students at Imam AbdulRahman Bin Faisal University (Formerly University of Dammam), Dammam, Kingdom of Saudi Arabia. At the same instance, he served as a Specialist (Registrar) in the Department of Oral and Maxillofacial Surgery, King Fahd Hospital of the University. Currently he is a PhD candidate (OMFS-IMPATH research group, KU Leuven) with Professor Reinhilde Jacobs as his promotor. His research topic for PhD is related to three-dimensional analysis of hard and soft tissue changes in orthognathic surgery patients and to develop a start of art predictive model for treatment planning.

Yi SUN

Yi Sun obtained his PhD in Biomedical Sciences, Master of Medical imaging and Bachelor in Electronic Engineering. Since 2007, he worked in the field of computer assistant surgery planning, with focus on oral and maxillofacial surgery. His main professional interest is template-based and image-guided solution for dental implant placement, design of digital splint for orthognathic surgery, orofacial reconstruction using fibular or DCIA flap. Currently he is responsible for the 3D surgical simulation team in the department of oral and maxillofacial surgery (UZ Leuven). His current research interest are: design of patient specific implant, tissue engineering by using 3D printed titanium scaffold and development of image-guided surgical simulation system (navigation system).

B. PROJECTS

- Long-term bone relapse: maxillary relapse and mandibular remodeling
- Soft tissue changes after orthognathic surgery
- Transverse maxillary hypoplasia for orthognathic patients
- Continuous Quality Improvement in orthognathic surgery
- Condylar changes after orthognathic surgery
- Systemic diseases related to orthognathic surgery
- Dental changes evaluation in 3D after orthognathic surgery
- 3D evaluation of airway changes after orthognathic surgery
- Maxillofacial trauma management
- Cost-benefit of in-house designed 3Dprinted reconstruction plates



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