

**KU LEUVEN**



**OMFS**  
IMPATH

Yearbook 2016



**OMFS**  
IMPATH

Yearbook 2016



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# 1

## Preface



Clinical progress can only be made when treatment results and patient outcome are carefully evaluated and when new ideas emerge from basic science. As such, an University provides a unique setting where clinical departments are strengthened and heavily influenced by their research counterparts. The same applies to the Department of Oral and Maxillofacial Surgery at Leuven University Hospitals. At least 3 complementary units are feeding the clinic with essential input: the department of oral and maxillofacial imaging, the 3D-lab facility and the OMFS-IMPACT research unit. Whereas the imaging department and the 3D-lab facility are fully integrated in the workflow of the daily clinic, the research department remains a separate unit, albeit both functionally and architectonically closely related to the clinical department. While many countries are building walls and protective measures against the inflow of foreign instream, research units remain meeting places for scientific young capital from all over the world. OMFS-IMPACT houses no less than 17 different nationalities, who all share a common goal. The society should cherish the research facilities at Universities as these are the beacons of hope in dark times. The OMFS-IMPACT Yearbook 2016 illustrates what can be achieved in a limited time frame when young scientific talents integrate and communicate with clinicians in a multicultural environment.







**2**

**Team**



The OMFS-IMPACT research group relates to development and validation of surgical tools and image-based solutions to advance in oromaxillofacial surgery, with an ultimate aim to obtain an optimized treatment outcome while minimizing the peri- and postsurgical risks, such as neurovascular trauma. In order to achieve this, a global integration of digital datasets will enable the creation of a virtual replica of the patient. This may allow full simulation of the surgery as well as of its expected outcome. While the latter may help to further modify and fine-tune the planned surgery, the former integrated virtual data may allow presurgical simulations, development of image-based surgical tools and navigation. Research will be focused on image-based development of surgical aids with a validation of their clinical applicability. Research lines will include: optimized image acquisition with the least radiation dose, especially when children are concerned; image-based development of individualized surgical tools, while striving for advanced applications of e.g. 3D printing; maximized visualization of the trigeminal nerve pathway to minimize the surgical risks for trigeminal nerve damage. Such visualization may also assist in creating new access routes and surgical strategies to modulate trigeminal neuropathic pain.



## A. STAFF

*Constantinus POLITIS*

Constantinus Politis is Oral and Maxillo-Facial Surgeon. He is currently Professor and Chairperson of the Department of Oral and Maxillofacial Surgery at Leuven University, 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 also holds a master degree in management (MM) from the Applied Economic Sciences 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 Secretary General of the Professional Union of Belgian Oral and Maxillofacial Surgeons. 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 interest 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.

*Joseph SCHOENAERS*

Joseph Schoenaers obtained his medical and dental degrees at the University of Leuven in 1977 and 1980 respectively. Subsequently he specialised in Stomatology (1982 in Arnhem, Nederland - KU Leuven Belgium) and Maxillo-Facial Surgery (1989 University of Texas, Health Science Center at Dallas USA) with an additional specialisation in plastic and reconstructive surgery (Erasmus University Rotterdam).

He was appointed professor in Stomatology and Maxillo-Facial Surgery at KU Leuven (University Hospital 1994). From 1997 to 2012, he was also Departmental Head of the Clinical Department of Maxillo-Facial Surgery at University Hospital Leuven. Up till today his main focus lays with plastic and reconstructive surgery (oncology, congenital deformities).

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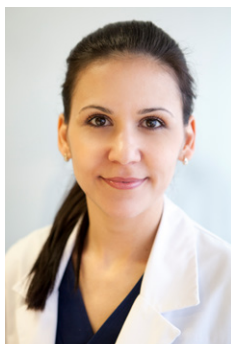
*Reinhilde JACOBS*



Reinhilde Jacobs is dentist (1990), Doctor in Dental Sciences (1993; PhD University of Leuven), periodontologist (1996; KU Leuven) and Master in Dental Radiology (2002; University of London). With a European fellowship (1994-1995), she performed postdoctoral research at the Dept Orthopaedics (prof B Rydevik, Salghrenska Sjukhuset, Göteborg) and at the Institute of Applied Biotechnology (prof P-I Brånemark), University of Gothenburg, Sweden. She is full professor at the University of Leuven, visiting professor at Karolinska Institutet Stockholm (Sweden) and Dalian Medical University in China. R. Jacobs is coordinating the OMFS-IMPACT Research Group ([www.omfsimpact.be](http://www.omfsimpact.be)) of the Department of Imaging & Pathology, meanwhile being responsible for research, education and clinical activities in dentomaxillofacial radiology (heading the dentomaxillofacial radiology center). She is Secretary General of the International Association of DentoMaxilloFacial Radiology and past president of the European Academy of DentoMaxilloFacial Radiology. She is section editor imaging of Clinical Oral Investigations and associate editor of European Journal of Oral Implantology, and Oral Radiology. She has received the D Collen Research Travel Award (1994), the IADR Young Investigators Award (1998) and the Belgian Joachim Award in the 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 oral implant physiology and imaging research. She has been actively participating in European projects (ref. Pisa, Minosquare, Osteodent, SedentexCT and Dimitra). She is (co) author of 5 books and more than 240 publications in peer-reviewed journals besides multiple invited lectures and publications in other journals or books.

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*Ruxandra Gabriela COROPCIUC*



Ruxandra Gabriela Coropciuc is a Romanian Maxillofacial Surgeon, graduated from the university of Medical and Pharmacy Carol Davila, Bucharest as a Dentist in 2007 and as a Medical Doctor in 2012. In 2013 she obtained her specialization in Oral and Maxillo-Facial Surgery (Clinical Hospital of Oral and Maxillo-Facial Surgery, Bucharest). She joined the Department of Maxillo – Facial Surgery at the UZ Leuven, Belgium in 2013. Her clinical research is focussed on bisphosphonate-related osteonecrosis of the jaw bone. She has been appointed in 2016 as Clinical Staff Member in Oral and Maxillofacial Radiology at UZ Leuven.

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*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.





## B. RESEARCHERS

### *Michael M. 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. 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 Associate Professor in the field of „Oral Surgery and Stomatology“. His fields of research include cone beam computed tomography (CBCT) in clinical dental practice, stomatology/oral medicine, GBR procedures with bioresorbable membranes and dental implants.

### *Annelore DE GRAUWE*



Annelore De Grauwe was born on May 9th, 1977. She graduated as a dentist in 2001 at the University of Ghent, Belgium. After one year in private practice, she decided to obtain a Master degree in Paediatric Dentistry and Special Care at the University of Ghent, which she obtained in 2005, summa cum laude. She works as a paediatric dentist in her own private practice, and performs narcodontics in the hospitals of Bruges and Dendermonde. She is an active board member of the Belgian Academy of Paediatric Dentistry since 2005. She is also active member of the EAPF, IAPD, EADMFR, IADMFR, IADR and NVDMFR. From 2016 on, she works as a researcher at OMFS-IMPACT, with special interest in paediatric dentistry and imaging.

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*Mostafa EZELDEEN*

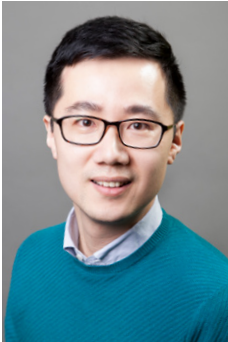


Mostafa EzEldeen was born on July 19th , 1984 in Mansoura, Egypt. He obtained his Bachelor of Dental Medicine and Surgery (2007) from Mansoura University, Egypt and Master in Dentistry (2013), Summa cum laude, at the KU Leuven, Belgium. Further, he obtained a specialization in Paediatric Dentistry and 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-IMPACT, KU Leuven, Belgium) with Prof.

Dr. Reinhilde Jacobs as his promotor. 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.

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*Yan HUANG*



Yan Huang is a dentist, graduated from Postgraduate Study of Advanced Medical Imaging and defended his PhD thesis of Biomedical Sciences in May 2014, at the Catholic University of Leuven, Belgium. He has been working at the OMFS-IMPACT research group for over 5 years, focusing on the use of Cone Beam CT for bone structural measurements. He is one of the principal researchers in the collaborative project from National Natural Science Foundation of China. At the moment he is Post-doc researcher in a FWO-funded research project.

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*Alessandro LAMIRA*



Alessandro Lamira has qualified in Sao Paulo, Brazil 1998, awarded best student in Endodontics. He has trained in the Brazil, UK and Portugal. He is a Peridontist granted by University of Sao Paulo - Bauru. He was a clinical teacher at UNAERP University and King s College at Guys Hospital. he is currently a PhD student in endodontics at University of Sao Paulo - Ribeirao Preto doing part of his studies at Leuven University - Belgium.

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*Laura NICOLIELO*



Laura Nicolielo is a Dental Surgeon (University of São Paulo, Brazil) (2009), Postgraduate in Oral Surgery (University of São Paulo, Brazil) (2010), Master in Applied Dental Sciences with focus in Stomatology and Radiology (University of São Paulo, Brazil) (2013), Implantologist (Opem Institute, Bauru, Brazil) (2013) and Postgraduate in Advanced Medical Imaging (KU Leuven, Belgium) (2014). In October 2013, she was granted by the Brazilian Government to start the PhD in the OMFS-IMPATh Research Group under supervision of Prof. Dr. Reinhilde Jacobs. Her main research topic is validation of 3D imaging modalities in the assessment of 1) Neurovascular structures of the jaw bones 2) Bone quality and quantity and 3) Condylar resorption after orthognathic surgery.

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*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 Maxillo-facial surgery, University hospitals Leuven (Belgium) with Prof. 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 OMFSIMPATH (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.

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*Deepti SINHA*



Deepti Sinha is an oral and maxillofacial trainee at the University Hospital Leuven. She is a Guy's, King's and St Thomas' graduate and obtained her medical degree from the University of London. During her time as a dental student she illustrated 2 textbooks: 'Essentials of clinical periodontology and periodontics' by Prof. Shantipriya Reddy and 'Clinical operative dentistry principles and practice' by Prof. Ramya Raghu. She was awarded the 'best outgoing student' of her year in dental school and was recipient of the Joseph Lister surgical prize, London, during her medical studies. She has had several poster presentations both nationally (UK) and internationally on topics related to oral and maxillofacial surgery.

Her current research topics include: Stricture formation in salivary glands, autotransplantation in cleft patients, difficult airway management a multi-disciplinary approach and peri-implantitis in ultra short implants. She is a young fellow of the Royal Society of Medicine, London, UK and the Royal Society of Surgeons, Edinburgh, Scotland.

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*Bennaree AWARUN*



Bennaree Awarun is a graduated dentist from Chulalongkorn University, Thailand with the second class honor (2014). She was working as a general dentist in a private practice for two years in Bangkok (2015-2016). In 2017, she obtained her postgraduate diploma in Advanced Medical Imaging from KU Leuven, Belgium with great distinction. Her research focuses on CBCT exposure protocols in cleft lip and/or palate patients for diagnosis and treatment planning.

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*Andreas STRATIS*



Andreas Stratis was born in February 1981 in Larissa, Greece. He obtained his BSc in Physics at the Aristotle University of Thessaloniki, Greece in 2004 and his MSc in Medical Physics at the University of Surrey, UK. Since 2008 he is officially licensed to practice Medical Physics in Radiology, nuclear medicine and radiotherapy by the Hellenic Health Ministry. From 2008 to 2013 he was offering medical physics services in several radiology and nuclear departments in national and private hospitals in Greece. On January 2013 he moved to Belgium working for the Medical Physics Quality Assurance team of the UZ Leuven. He has served the Hellenic Association of Medical physicist as a Public Relations director (2010-2012) and Secretary Assistant (2012-2014). Since January 2014 he is a PhD student at the KU Leuven with his research focused on patient specific dosimetry via Monte Carlo simulations in dental Cone Beam CT.

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Yi SUN



Yi Sun obtained his PhD in Biomedical Science, Master of Medical imaging and Bachelor in electronic engineering. Since 2007, he worked in the field of computer assisted 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, mandible reconstruction using fibular bone. Currently he is responsible for the 3D surgical simulation team in the department of oral and maxillofacial surgery (UZ Leuven) and involved in development of image-guided surgical system (navigation system).

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Kostas SYRIOPOULOS



Kostas Syriopoulos graduated as dentist from Athens Dental School (Greece) and he specialised in Dentomaxillofacial radiology. 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. He had been a staff- member in the department of Dentomaxillofacial Radiology, ACTA, Amsterdam. Since February 2015 he has been a staff member in the Oral Imaging Centre of the KU Leuven. His main professional interests are Diagnostic Radiology, Radiography Education and Radiation Protection.

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*Giulia GALLO*



Giulia Gallo was born on 5 August 1990 in Italy. She graduated as a dentist in July 2016 from the University of Siena-Firenze, Italy. She was postgraduate research trainee at the OMFS-IMPATh Research Group (Department of Imaging and Pathology, Faculty of Medicine, KU Leuven) from September 2016 to March 2017. Her research topics was: Comparison Between 2D and 3D Facial Images for Clinical Assessment During Treatment Planning and Follow-up in Orthognathic Surgery. She is actually a resident student of Master Program in Prosthodontics Sciences at University of Siena and she works at her dental office.

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*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.



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*Martine VAN VLIERBERGHE*



Martine Van Vlierberghe finished her dental studies in 1979 at the University of Ghent, Belgium. At the same university she received the Certificate of postgraduate training in Orthodontics in 1983. She specialized further in cranio-facial deformities at the University of Nijmegen and at the New York Medical University Center. She was founder of the cranio-facial deformity team at the University of Ghent in Belgium and was active there during 24 years. She was also actively involved in orthodontic training at undergraduate and postgraduate level at the University of Ghent. Meanwhile she started a private orthodontic practice from 1984 until now. In 2004 she finished with summa cum laude one year postgraduate training in civil and criminal law at the faculty of Law at the University of Ghent, Belgium. Afterwards she followed one year postgraduate education on multidisciplinary forensic research: the legal and scientific aspects at the Catholic University of Leuven, Belgium. Subsequently she obtained with summa cum laude her master after master in Forensic Odontology at the Catholic University of Leuven, Belgium. Since 2014 she works as researcher at OMFS-IMPATh Research Group focusing on the iatrogenic damage of the trigeminal nerve.

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*Catalina Moreno RABIE*



Catalina Moreno Rabie, was born in Concepción, Chile in 1992. She studied her bachelor and master degree in Dentistry at University of los Andes in Chile, between 2011 and 2016. Before graduation, during her last year of Dentistry she did an internship in Clinical and Research training in KU Leuven, where she studied the mandibular bone on Cone Beam CT.

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*Ruben PAUWELS*

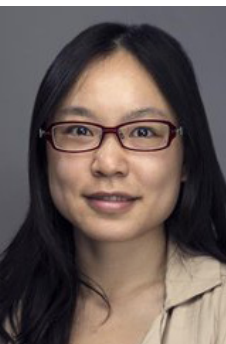


Ruben Pauwels is a Master in Biomedical Sciences (2007), Master of Medical Imaging (2008) and PhD in Biomedical Sciences (2012). His research has focused on the use of CBCT in dentistry. His research topics include: 1. Radiation dosimetry 2. Technical image quality analysis 3. Optimization of exposures in CBCT 4. Applicability of Hounsfield Units in CBCT 5. Bone structure analysis in CBCT. As a Consortium member of the SEDENTEXCT project, he was a contributor to the European Guidelines on dental CBCT. He was a corresponding member of International Commission on Radiological Protection (ICRP) Task Group 88, and a co-author of ICRP Publication 129. He is currently acting as a consultant for the

International Organization of Medical Physics (IOMP), the Thailand National Electronics and Computer Technology Center (NECTEC) and the International Atomic Energy Agency (IAEA). He received the European Academy of Dentomaxillofacial Radiology (EADMFR) Research Award and Fellowship Grant in 2012. He is Associate Editor of the British Journal of Radiology.

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*Ruiting ZHAO*



Ruiting Zhao is a specialisation student at the OMFS-IMPATh research group under supervision of Prof. dr. Reinhilde Jacobs. she studies the effect of bisphosphonates on the bone microstructure. She graduated in 2013 as dentist from the West China School of Stomatology in Sichuan, China. In 2016 she graduated as Master in Oral Sciences from the University of Bergen, Norway with a thesis investigating mechanisms leading to early aseptic loosening of implants.

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*Camilla DEAMBROSI*



Camilla Deambrosi was born on October, the 4th, 1990 in Italy. She graduated at the dentistry faculty of the Florence University in 2016. During the University years she participated in an Exchange program at the Universidad Europea de Madrid. After getting her degree she took part in the Omfs-Impath group contributing to the gubernaculum dentis and retromolar canal research. She is now collaborating with few dental offices in Florence and neighbouring cities. Meanwhile she is attending a endodontic and surgery advanced training.

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*Marina CODARI*



Marina Codari obtained her Master and Bachelor of Science in Biomedical Engineering (Politecnico di Milano, Milano, Italy). Currently she is a PhD student in Integrated Biomedical Research (department of Biomedical Science for Health, faculty of Medicine and Surgery, Università degli studi di Milano). Since 2011, she worked in the field of medical imaging, with focus on oral and maxillofacial imaging using CBCT data. Her main professional interest are image segmentation and registration for automatic feature extraction in the maxillofacial region and metal artefact reduction in CBCT data. From October 2015 she will be part of the OMFS-IMPATh research group as visiting PhD student.

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*Karla DE FARIA VASCONCELOS*



Karla de Faria Vasconcelos is dentist, Doctor in Dental Radiology (PhD at State University of Campinas– Brazil, with a period of external internship at KULeuven - Belgium), Master in Dentistry (Federal University of Goiás - Brazil) and Specialist in Oral Radiology (University of Campinas). She has worked, as Radiologist, in a private radiology clinic. She is a collaborator professor of graduate program at Federal University of Goiás, teaching in the diagnostic imaging discipline. She has been involved in interuniversity research collaborations, with a specific focus on imaging research (digital radiography, cone beam computed tomography and microcomputed tomography). At present, she is a Post-doc researcher in an FAPESP - founded research project.

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*Ruth DEJAEGHERE*



Ruth Dejaeghere was born on February 18th, 1993 in Kortrijk. She obtained her Bachelor in Biomedical Sciences (2014) from KU Leuven University department Kortrijk. In her first master year (KU Leuven University), she did internships in the laboratory of experimental urology, general medical oncology and oral and maxillofacial surgery. Currently, she is a thesis student under promotorship of Professor Reinhilde Jacobs and Professor Constantinus Politis. Her research topic is the multicentric assessment of postoperative complications of wisdom tooth removal.

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*Anna OCKERMANN*



Anna Ockerman performed a one year internship (2016-2017) at the OMFS-IMPATh research group under promotorship of Prof. dr Reibhilde Jacobs and Prof. dr. Constantinus Politis. During this year, she worked as a full-time researcher on a project investigating third molar eruption patterns, third molar pathology and postoperative complications with third molar surgery.

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*Eveline LAMBRECHTS*



Evelien Embrechts is a MSc in Biomedical Sciences, graduated in June 2017. She studied the age-related indications and complications of third molar removal during a one-year internship in our research group. Her promotor was Prof. dr. Reinhilde Jacobs.

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*Bieke GROMMEN*



Bieke Grommen is born on September 17th, 1993 in Belgium. She obtained her bachelor of Biomedical Science (2014) at the Catholic University of Leuven, Belgium. She is doing her master Clinical Biomedical Science and writing her thesis at the OMFS-IMPATh Research Group (Department Imaging and Pathology, Faculty Medicine, Catholic University Leuven) with Prof. Dr. Reinhilde Jacobs as her promotor. She did internships at different departments in the hospital of Gasthuisberg, Belgium, like dermatology, nuclear medicine and otorhinolaryngology (2014).

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*Mariana Quirino SILVEIRA SOARES*



Mariana Silveira is a dentist, Master in Dentistry, area of Dental Clinic (Federal University of Goiás, Goiânia, Brazil; 2013). Currently, she is Stomatology and Oral Biology PhD student at the University of São Paulo, Bauru, Brazil, doing parts of her studies at KU Leuven, Belgium. Her research topics are analysis of the influence of bisphosphonates in bone microarchitecture using Micro-CT and investigation of jaw bone grafts using Micro-CT.

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*Natalia SALVO VILLEGAS*



Natalia Salvo Villegas was born in Houston, Texas, USA, 1988. She is a Chilean Doctor of Dental Surgery specialized in Oral and Maxillofacial Radiology at Universidad de Los Andes, Santiago, Chile in January 2015. She obtained the 3rd place in the “Original Research” category at the Latin American Congress of Maxillofacial Radiology held in Medellin, Colombia 2014. Besides her clinical work she is currently working on the assessment of the mandibular incisive canal by Cone Beam Computed Tomography. At the moment she is coursing an internship at the Oral and Maxillofacial Radiology Departament at the Katholiek Universiteit Leuven, Belgium.

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*Berkan CELIKTEN*



Berkan Celikten, DDS MSc PhD, is an Associate Professor of Endodontics at the Ankara University, Faculty of Dentistry, where he serves as a faculty in Endodontics Department, Ankara University, Ankara, Turkey. Dr. Celikten was born in Ankara, Turkey, 1981. He received his dental degree in 2012 and completed his residency studies at the Ankara University, Turkey. In 2012, he started his academic career in Ankara University as a consultant at the Faculty of Endodontics. Between 2012-2017, he worked as a consultant and lecturer in the same University. He became an associate professor in 2017.

He has over 30 international publications on peer-reviewed journals (many of them ISI indexed journals), He has 2 National book

Chapter. He particularly made significant contributions in Endodontics. He has been invited to give lectures in national scientific meetings. He is a member of Turkish Endodontics society and also European Endodontci Society (ESE). he is serving as reviewer more than 10 different journals on his field including His research Interests are including: CBCT, Micro-CT, Endodontics,

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*Myrthel VRANCKX*



Myrthel Vranckx is a PhD candidate at the OMFS-IMPATh research group under promotorship of Prof. dr. Reinhilde Jacobs and Prof. dr. Constantinus Politis (Department Imaging and Pathology, KU Leuven). She graduated in June 2016 as MSc in Biomedical Sciences with a Master's Thesis in the use of CT imaging in Forensic Medicine (Faculty of Medicine, KU Leuven).

She currently studies third molar pathology and postoperative complications associated with third molar surgery. Her multicentric research project is ongoing in 5 different hospitals in Belgium.

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*Irem AYAZ*



Irem Ayaz was born on 27 February 1993 in Ankara, Turkey. She graduated as a dentist in July 2016 from the University of Ankara, Turkey. She is a specialization student at the OMFS-IMPATh Research Group (Department of Imaging and Pathology, Faculty of Medicine, KU Leuven) since September 2016. Her research topics are: Use of CBCT in Pediatric Orthodontics, and, Comparison Between 2D and 3D Facial Images for Clinical Assessment During Treatment Planning and Follow-up in Orthognathic Surgery.



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*Emad ALI ALBDOUR*



Emad Ali Alb दौर born in 1979 (Amman, Jordan) . Obtained his Bachelor degree in Dental Surgery and medicine from University of Jordan in 2002, then joined The Royal Medical Services (Jordanian Armed Forces) where he got the specialization in prosthodontics (Jordanian National Board) in 2010, he is a visiting researcher in OMFS impath with a focus on the fields of Maxillofacial Implantology and Digital Dentistry.

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*Ramy GABER*



Ramy Gaber, graduated from the Faculty of Dentistry; Ainshams University, Egypt 2005. Since 2007 he has been working at the Oral and Maxillofacial Surgery Department at the faculty where he received his surgical training and pursued his postgraduate studies. He completed his Master's degree in 2013 and the Doctorate Degree in 2017. In 2016, Ramy obtained a short term scholarship funded by the Egyptian ministry of Higher Education, to visit the OMFS-RESEARCH group for 6 months. His research interest is virtual planning and assesement in orthognathic surgery)

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*Abdulhadi ALHELWANI*



Abdulhadi ALhelwani was born in 1990 (Damascus, Syria). He obtained his Bachelor degree in Dentistry from the International University of Science and Technology in 2013 with a full scholarship from the Syrian Ministry of Higher Education. He specialized in endodontics and practiced general dentistry in Damascus and Erbil for three years before he started in 2016 studying and researching in the field of advanced medical imaging as a postgraduate student in KU Leuven university (OMFS-IMPATh Research Group). His research focus is in the fields of dental 3D printing and 3D facial simulation in computer-aided maxillofacial planning systems.

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*Daniel VASCONCELOS*



Daniel Vasconcelos was born on 16 May of 1993 in Viseu, Portugal. He graduated as a dentist in July 2016 from the University of Coimbra, Portugal. In September of 2016 started an exchange program at KU Leuven supported by the program Erasmus Plus, where he collaborated in the OMFS-IMPATh group under the supervision of Prof. Dr. Reinhilde Jacobs. In January of 2017, he started working in the hospital clinic until June of 2017.

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*Els TIJSKENS*



Els Tijskens graduated as a dentist in 1984 at KULeuven. 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 Past Secretary 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 is teaching Medical Imaging at UCLL Opleiding Mondzorgkunde.

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*Elke CLAERHOUT*



Elke Claerhout did a one-year internship in our research group, conducting a multicentric research project about third molar pathology and surgery. She graduated as MSc in Biomedical Sciences (KU Leuven) in June 2017. Her Master's Thesis was titled 'Epidemiological study of indications and complications of symptomatic versus prophylactic third molar extractions', and was written under promotorship of Prof. dr. Reinhilde Jacobs.

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*Jimoh AGBAJE*



Jimoh Olumide AGBAJE is a dentist with a specialization in Oral medicine and pathology from University College Hospital Ibadan Nigeria. He was awarded the DAAD (Deutscher Akademischer Austauschdienst) scholarship to study in Germany from where he obtained Doctor of Medical Dentistry (Magna cum Laude) from Christian-Albrecht-University, Kiel, Germany. He graduated from Postgraduate Study of Advanced Medical Imaging and defended a PhD thesis of Biomedical Sciences in March 2012, at the Catholic University of Leuven, Belgium. He worked at the department of Oral and Maxillofacial Surgery Ziekenhuis Oost Limburg Schiepse Bos 6 Genk, Belgium where he coordinated research works in Orthognatic surgery and implant surgery between March 2011 and September

2012. He started working in the OMFS-IMPATh research group from June 2012. His research is focused on Reduction of Inferior alveolar nerve injury in bilateral sagittal split osteotomy BSSO). At present, he is a Post-doc researcher in an FWO-funded research project.

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*Carolina LETELIER*



Carolina Letelier is dentist, Especialist in Dentomaxillofacial Radiology (University of los Andes, Chile). She is instructor in the postgraduate of dentomaxillofacial radiology at the University of los Andes. C.Letelier is foundress of Report360 SPA ([www.report360.cl](http://www.report360.cl)) for online diagnostic reports in 2D and 3D dentomaxillofacial images requiered from different hospitals from Chile. She also does private practice as radiologist in different radiological centers in Santiago, Chile. She is co-author in one publication of the International Journal of Oral Science (2017) and actually is involved in different research collaborations in University of los Andes and KU Leuven (Belgium).



## C. ADMINISTRATIVE COORDINATOR

### *Gabriela CASTEELS*



Gabriela Casteels is currently working as administrative research coordinator for the OMFS-IMPATh research group at the Department of Imaging and Pathology, KU Leuven. Her work experience is essentially situated within the organizational, coordinating and administrative support of organizations and professional societies.



**3**

**Research**



A. PROJECTS

B. AWARDS

C. PUBLICATIONS

- International peer-reviewed publications
- Book (chapter) publications
- Abstracts of congress presentations

D. CHAIRS

## A. PROJECTS

### National funding

#### M3-Observatorium



Epidemiological study on the surgical removal of third molars.

- Verbond der Belgische Beroepsverenigingen van Geneesheren-Specialisten MKA
- Koninklijke Belgische Vereniging Voor Stomatologie en Maxillo-Faciale Heelkunde (KBVSMFH).

*In samenwerking met VlaamsZiekenhuisNetwerk KU Leuven*



#### Innervation around implants

Regeneration and remodeling of sensory innervation around dental implants treated with platelet-rich plasma.

- FWO



#### Radiation dose simulations

Patient-specific approach of CBCT imaging: custom made Monte Carlo simulations.

- OT



#### Tooth autotransplantation

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

- FWO



#### Trigeminal nerve injuries

Reduction of Inferior alveolar nerve injury in bilateral sagittal split osteotomy (BSSO).

- FWO



#### Computer-assisted maxillofacial surgery

The development and clinical application of a computer assisted oral and maxillofacial surgery system.

- in collaboration with Materialise



### European funding

#### Dimitra

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





## B. AWARDS

### EADMFR RESEARCH FELLOWSHIP 2016

Jeroen Van Dessel



### OUTSTANDING RESEARCH AWARD - 2ND PRICE 2016

Ruben Pauwels



### SECOND PRICE ORAL PRESENTATION EADMFR RESEARCH AWARD 2016

Marina Codari



### JOURNAL OF ENDODONTICS AWARDS 2016 - BEST ARTICLE IN THE CATEGORY OF CLINICAL RESEARCH FOR THE YEAR 2015

*3-dimensional analysis of regenerative Endodontic treatment outcome  
(San Francisco)*

Mostafa EzEldeen, Geertje Van Gorp, Jeroen Van Dessel,  
Dirk Vandermeulen, Reinhilde Jacobs



### EADMFR RESEARCH FELLOWSHIP 2016

Ruben Pauwels





## C. PUBLICATIONS

### INTERNATIONAL PEER-REVIEWED PUBLICATIONS

- Politis Constantinus, Schoenaers Joseph, Jacobs Reinhilde, Agbaje Jimoh (2016). Wound Healing Problems in the Mouth. *Frontiers in Physiology*, 7 (507), 1-13.
- Weckx Annelies, Agbaje Jimoh, Sun Yi, Jacobs Reinhilde, Politis Constantinus (2016). Visualization techniques of the inferior alveolar nerve (IAN): a narrative review. *Surgical and Radiologic Anatomy*, 38 (1), 55-63.
- Khalil Wael, Ezeldeen Mostafa, Van de Castele Elke, Shaheen Emmy, Sun Yiting, Shahbazian Maryam, Olszewski Raphael, Politis Constantinus, Jacobs Reinhilde (2016). Validation of cone beam computed tomography-based tooth printing using different three-dimensional printing technologies. *Oral Surgery, Oral Medicine, Oral Pathology and Oral Radiology*, 121 (3), art.nr. 10.1016/j.oooo.2015.10.028, 307-15.
- Widmann Gerlig, Bischel Alexander, Stratis Andreas, Kakar Apoorv, Bosmans Hilde, Jacobs Reinhilde, Gassner Eva-Maria, Puelacher Wolfgang, Pauwels Ruben (2016). Ultralow dose dentomaxillofacial CT imaging and iterative reconstruction techniques: variability of Hounsfield units and contrast-to-noise ratio. *The British Journal of Radiology*, 89 (1060), 20151055.
- Temmerman Andy, Vandessel Jeroen, Castro Ana, Jacobs Reinhilde, Teughels Wim, Pinto Nelson, Quirynen Marc (2016). The use of leucocyte and platelet-rich fibrin in socket management and ridge preservation: a split-mouth, randomized, controlled clinical trial. *Journal of Clinical Periodontology*, 43 (11), art.nr. 10.1111/jcpe.12612.
- Sinha Deepti, Dormaar Jakob Titiaan, Salvo Natalia, Politis Constantinus, Michael M. Bornstein Michael, Jacobs Reinhilde (2016). Solid ameloblastoma mimicking a periodontal defect: A diagnostic dilemma. *European Journal of Oral Implantology*, 9 (2), 189-193.
- Capitaneanu Cezar, Willems Guy, Jacobs Reinhilde, Fieuws Steffen, Thevissen Patrick (2016). Sex estimation based on tooth measurements using panoramic radiographs. *International Journal of Legal Medicine*, 131:813-821, art.nr. DOI 10.1007/s00414-016-1434-0.
- Kaur Jasdeep, Jacobs Reinhilde (2016). Salivary and serum leptin levels in patients with squamous cell carcinoma of the buccal mucosa. *Clinical Oral Investigations*, 20 (1), art.nr. 10.1007/s00784-015-1472-x, 39-42.
- Stratis Andreas, Gufei Zhang Gufei, Jacobs Reinhilde, Bogaerts Ria, Bosmans Hilde (2016). Rotating and translating anthropomorphic head voxel models to establish an horizontal Frankfort plane for dental CBCT Monte Carlo simulations: a dose comparison study. *Physics in Medicine and Biology*, 61 (24), N681-N696.
- Ruiters Sébastien, Sun Yi, De Jong Stephan, Politis Constantinus, Mombaerts Ilse (2016). Response to: Computer-aided design and three-dimensional printing in the manufacturing of an ocular prosthesis. *British Journal of Ophthalmology* (accepted), art.nr. bjophthalmol\_el;17236.
- Kaur Jasdeep, Politis Constantinus, Jacobs Reinhilde (2016). Response on: Comments on "Salivary 8-hydroxy-2-deoxyguanosine, malondialdehyde, vitamin C, and vitamin E in oral pre-cancer and cancer: diagnostic value and free radical mechanism of action". *Clinical Oral Investigations*, 20 (2), 397.

## INTERNATIONAL PEER-REVIEWED PUBLICATIONS

- Pauwels Ruben, Jacobs Reinhilde, Bogaerts Ria, Bosmans Hilde, Panmekiate Soontra (2016). Reduction of scatter-induced image noise in cone beam computed tomography: effect of field of view size and position. *Oral Surgery, Oral Medicine, Oral Pathology and Oral Radiology*, 121 (2), art.nr. 10.1016/j.oooo.2015.10.017, 188-95.
- Van Dessel Jeroen, Nicolielo Laura, Huang Yan, Slagmolen Pieter, Politis Constantinus, Lambrichts Ivo, Jacobs Reinhilde (2016). Quantification of bone quality using different cone beam computed tomography devices: Accuracy assessment for edentulous human mandibles. *European Journal of Oral Implantology*, 9 (4), 411-424.
- Grisar Koenraad, Schol Matthias, Hauben Esther, Schoenaers Joseph, Politis Constantinus (2016). Primary intraosseous squamous cell carcinoma of the mandible arising from an infected odontogenic cyst: A case report and review of the literature. *Oncology Letters*, 12 (6), 5327-5331.
- Alqerban Ali, Jacobs Reinhilde, Fieuws Steffen, Willems Guy (2016). Predictors of root resorption associated with maxillary canine impaction in panoramic images. *European Journal of Orthodontics*, 38 (3), 292-299.
- Agbaje Jimoh, Salem Ahmed S, Lambrichts Ivo, Braem Marc, Politis Constantinus (2016). Possible association between mandibular repositioning device for sleep apnea and osseous lytic lesion with fracture of the coronoid process of the mandible: A case report. *Quintessence International*, 47 (2), art.nr. 10.3290/j.qi.a34805, 141-5.
- Grisar Koenraad, Schol Matthias, Schoenaers Joseph, Dormaar Titiaan, Coropciuc Ruxandra, Vander Poorten Vincent, Politis Constantinus (2016). Osteoradionecrosis and medication-related osteonecrosis of the jaw: similarities and differences. *International Journal of Oral & Maxillofacial Surgery*, 45 (12), art.nr. S0901-5027(16)30114-X.
- Esposito Marco, Jacobs Reinhilde, Nieri Michele (2016). On peri-implant bone level measures: To see or not to see, that is the question. *European Journal of Oral Implantology*, 9 (2), S2-S2.
- Jacobs Reinhilde, Esposito Marco (2016). On peri-implant bone level measures: To see or not to see, that is the question. *European Journal of Oral Implantology*, 9 (2), 119-121.
- Ockeloen Charlotte W, Khandelwal Kriti D, Dreesen Karoline, Ludwig Kerstin U, Sullivan Robert, van Rooij Iris A L M, Thonissen Michelle, Swinnen Steven, Phan Milien, Conte Federica, Ishorst Nina, Gilissen Christian, Roa Fuentes Laury, van de Vorst Maartje, Henkes Arjen, Steehouwer Marloes, van Beusekom Ellen, Bloemen Marjon, Vankeirsbilck Bruno, Bergé Stefaan, Hens Greet, Schoenaers Joseph, Vander Poorten Vincent, Roosenboom Jasmien, Verdonck Anna, Devriendt Koenraad, Roeleveldt Nel, Jhangiani Shalini N, Vissers Lisenka E L M, Lupski James R, de Ligt Joep, Von den Hoff Johannes W, Pfundt Rolph, Brunner Han G, Zhou Huiqing, Dixon Jill, Mangold Elisabeth, van Bokhoven Hans, Dixon Michael J, Kleefstra Tjitske, Hoischen Alexander, Carels Carine (2016). Novel mutations in LRP6 highlight the role of WNT signaling in tooth agenesis. *Genetics in Medicine*, 18 (11), art.nr. 10.1038/gim.2016.10, 1158-1162.
- Agbaje Jimoh, Van de Castele Elke, Hiel Marjolein, Verbaanderd Ciska, Lambrichts Ivo, Politis Constantinus (2016). Neuropathy of Trigeminal Nerve Branches After Oral and Maxillofacial Treatment. *Journal of Maxillofacial & Oral Surgery*, 15 (3), 321-327.

- Agbaje Jimoh, Gemels Bert, Salem Ahmed S, Anumendem Dickson, Vrielinck Luc, Politis Constantinus (2016). Modified Mandibular Inferior Border Sagittal Split Osteotomy Reduces Postoperative Risk for Developing Inferior Border Defects. *Journal of Oral and Maxillofacial Surgery*, 74 (5), art. nr. S0278-2391(16)00019-7.
- De Faria Vasconcelos Karla, dos Santos Corpas Livia, da Silveira Bernardo Mattos, Laperre Kjell, Padovan Eduardo Luis, Jacobs Reinhilde, Luiz de Freitas Paulo, Lambrichts Ivo, Boscolo Norberto Frab (2016). MicroCT assessment of bone microarchitecture in implant sites reconstructed with autogenous and xenogenous grafts: a pilot study. *Clinical Oral Implants Research*, 00 (doi: 10.1111/clr.12799), 1-6.
- Detailleur Valentine, Cadenas de Llano Perula Maria, Buyse Bertien, Van Dyck Julie, Fieuws Steffen, Verdonck Anna, Politis Constantinus, Willems Guy (2016). Is there a correlation between sleep disordered breathing and maxillary expansion? A retrospective study based on cephalometric assessment and questionnaires. *International Dental Journal*.
- Agbaje Jimoh, Salem Ahmed Sobhy, Lambrichts Ivo, Daems Luc, Legrand Paul, Politis Constantinus (2016). Intraoperative Computed Tomography in Bilateral Sagittal Split Osteotomy. *Journal of Maxillofacial & Oral Surgery*, 15 (4), 461-468.
- Laleman Isabelle, Bernard Lauren, Vercruyssen Marjolein, Jacobs Reinhilde, Michael M. Bornstein Michael, Quirynen Marc (2016). Guided Implant Surgery in the Edentulous Maxilla: A Systematic Review. *International Journal of Oral & Maxillofacial Implants*, 31, S103-S117.
- Vulsteke Christof, Lurquin Eveline, Debiec-Rychter Maria, Gheysens Olivier, Nuyts Sandra, Schoenaers Joseph, Politis Constantinus, Mebis Jeroen, Hauben Esther, Clement Paul (2016). First evidence of treatment efficacy in metastatic carcinoma of the parotid gland with BRD4/NUT translocation. *Journal of Chemotherapy*, 28 (3), 242-246.
- Suter Valerie G A, Jacobs Reinhilde, Brücker Marcia R, Furher Alberto, Frank Jim, von Arx Thomas, Michael M. Bornstein Michael (2016). Evaluation of a possible association between a history of dentoalveolar injury and the shape and size of the nasopalatine canal. *Clinical Oral Investigations*, 20 (3), 553-61.
- Esposito Marco, Jacobs Reinhilde, Nieri Michele (2016). Editorial. *European Journal of Oral Implantology*, 9 (1), 1-1.
- Grisar Koenraad, Dok Rüveyda, Schoenaers Joseph, Dormaar Titiaan, Hauben Esther, Jorissen Mark, Nuyts Sandra, Politis Constantinus (2016). Differences in human papillomavirus-positive and -negative head and neck cancers in Belgium: an 8-year retrospective, comparative study. *Oral Surgery, Oral Medicine, Oral Pathology and Oral Radiology*, 121 (5), art.nr. S2212-4403 (15) 01298-5.
- Chen Xiaojun, Cheng Jun, Gu Xin, Sun Yiting, Politis Constantinus (2016). Development of preoperative planning software for transforaminal endoscopic surgery and the guidance for clinical applications. *International Journal of Computer Assisted Radiology and Surgery*, 11 (4), 613-20.
- Chen Xiaojun, Li Xing, Xu Lu, Sun Yiting, Politis Constantinus, Egger Jan (2016). Development of a computer-aided design software for dental splint in orthognathic surgery. *Scientific Reports*, 6 (38867), art.nr. 38867.



## INTERNATIONAL PEER-REVIEWED PUBLICATIONS

- Stratis Andreas, Gufei Zhang Gufei, Lopez Rendon Xochitl, Jacobs Reinhilde, Bogaerts Ria, Bosmans Hilde (2016). CUSTOMISATION OF A MONTE CARLO DOSIMETRY TOOL FOR DENTAL CONE-BEAM CT SYSTEMS. *Radiation Protection Dosimetry*, 169 (1-4), art.nr. ncw024.
- Politis Constantinus, Sun Yi, Agbaje Jimoh, Lambrichts Ivo, Piagkou Maria, Jacobs Reinhilde (2016). Condylar Fracture in a Child with Entrapment of the Inferior Alveolar Nerve. *Craniomaxillofacial Trauma & Reconstruction*, 9 (2), art.nr. DOI: 10.1055/s-0035-1563391, 149-151.
- Ruiters Sébastien, Sun Yiting, de Jong Stéphan, Politis Constantinus, Mombaerts Ilse (2016). Computer-aided design and three-dimensional printing in the manufacturing of an ocular prosthesis. *British Journal of Ophthalmology*, 100 (7), art.nr. bjophthalmol-2016-308399, 879-881.
- Chen Xiaojun, Xu Lu, Wang Wei, Li Xing, Sun Yiting, Politis Constantinus (2016). Computer-aided design and manufacturing of surgical templates and their clinical applications: a review. *Expert Review of Medical Devices*, 13 (9), 853-864.
- Van Hevele Jeroen, Hauben Esther, Haspeslagh Mark, Agbaje Jimoh, Salem Ahmed, Schoenaers Joseph, Politis Constantinus (2016). Application of derm dotting in oral and maxillofacial surgery. *Oral Science International*, 13 (1), 20-23.
- Ezeldeen M., Stratis A., Coucke W., Codari M., Politis C., Jacobs R. (2016). As Low Dose as Sufficient Quality: Optimization of Cone-beam Computed Tomographic Scanning Protocol for Tooth Autotransplantation Planning and Follow-up in Children. *Journal of Endodontics*, 43 (2), art.nr. S0099-2399(16)30749-X, 210-217.
- Ratajczak Jessica, Hilken Petra, Gervois Pascal, Wolfs Esther, Jacobs Reinhilde, Lambrichts Ivo, Bronckaers Annelies (2016). Angiogenic Capacity of Periodontal Ligament Stem Cells Pretreated with Deferoxamine and/or Fibroblast Growth Factor-2. *PLoS One*, 11 (12), art.nr. 10.1371/journal.pone.0167807, e0167807.
- Michael M. Bornstein Michael, Seiffert Carol, Maestre-Ferrín Laura, Fodich Ivo, Jacobs Reinhilde, Buser Daniel, von Arx Thomas (2016). An Analysis of Frequency, Morphology, and Locations of Maxillary Sinus Septa Using Cone Beam Computed Tomography. *International Journal of Oral & Maxillofacial Implants*, 31 (2), art.nr. 10.11607/jomi.4188, 280-287.
- Vercruyssen Marjolein, Naert Ignace, Coucke Wim, Jacobs Reinhilde, Teughels Wim, Quirynen Marc (2016). Accuracy and patient-centered outcome variables in guided implant surgery. An RCT comparing immediate with delayed loading. *Clinical Oral Implants Research*, 27 (4), art.nr. doi: 10.1111/clr.12583, 427-432
- Pauwels R., Jacobs R., Bogaerts R., Bosmans H., Panmekiate S. (2016). Determination of size-specific exposure settings in dental cone-beam CT. *European Radiology*, 27 (1), 279-285.
- Chen Xiaojun, Xu Lu, Sun Yiting, Politis Constantinus (2016). A review of computer-aided oral and maxillofacial surgery: planning, simulation and navigation. *Expert Review of Medical Devices*, 13 (11), 1043-1051.
- Shaheen E., Sun Y., Jacobs R., Politis C. (2016). Three-dimensional printed final occlusal splint for orthognathic surgery: design and validation. *International Journal of Oral & Maxillofacial Surgery*, 46 (1), art.nr. S0901-5027(16)30275-2, 67-71.

- Pittayapat Pisha, Jacobs Reinhilde, Bornstein Michael M., Odri Guillaume A., Kwon Min Sung, Lambrichts Ivo, Willems Guy, Politis Constantinus, Olszewski Raphaël (2016). A new mandible-specific landmark reference system for three-dimensional cephalometry using cone-beam computed tomography. *European Journal of Orthodontics*, 38 (6), 563-8.
- De Mol Antoni, Sciote Raf, Politis Constantinus (2016). A Mass Involving the Buccal Branch of the Facial Nerve. *JAMA Otolaryngology. Head & Neck Surgery*, 142 (2), art.nr. 10.1001/jamaoto.2015.3077, 187-8.
- Politis, C., Daems, L., De Temmerman, G., Legrand, P., Willems, G. (2016). Orthognatische chirurgie. *Tijdschrift voor Geneeskunde*, 72 (5), 323-32.
- Shaheen E., Khalil W., Ezeldeen M., Van de Casteele E., Sun Y., Politis C., Jacobs R. (2016). Accuracy of segmentation of tooth structures using 3 different CBCT machines. *Oral Surgery, Oral Medicine, Oral Pathology and Oral Radiology*, 123 (1), 123-128.



## BOOK (CHAPTER) PUBLICATIONS

- Adriaenssens S., Jacobs R., Schoenaers J., Naert I., Politis C. (2016). Implantaten en hun succes na bestraling. In: *Het tandheelkundig jaar 2016*, Chapt. 14, (pp. 179-190) Bohn Stafleu van Loghum.  
**ISBN: 978-90-368-0888-0**
- Van de Casteele E., Shaheen E., Sun Y., Ezeldeen M., Shahbazian M., Daems L., Legrand P., Jacobs R., Politis C. (2016). Driedimensionaal printen voor orale en maxillofaciale toepassingen. In: *Het tandheelkundig jaar 2016*, (pp. 239-251) Bohn Stafleu van Loghum.  
**ISBN: 978-90-368-0888-0**
- Storms A., Zogheib T., Bral C., Jacobs R., Willems G. (2016). De driedimensionale aangezichtsscan in de orthodontie. In: *Het tandheelkundig jaar 2016*, Chapt. 20, (pp. 253-263) Bohn Stafleu van Loghum.  
**ISBN: 978-90-368-0888-0**



## ABSTRACT OF CONGRESS PRESENTATIONS

- Pittayapat P., Jacobs R., Guillaume A., Lambrichts I., Willems G., Michael M. Bornstein M., Politis C., Olszewski R. (2016). Three-dimensional Frankfort horizontal plan revisited and evaluation of new horizontal planes. European Congress of DentoMaxilloFacial Radiology. Cardiff, 15-18th June.
- De Faria Vasconcelos K., Nicolielo L., Codari M., Jacobs R., Neto Haiter F. (2016). The performance of artifact reduction algorithm in CBCT images: a quantitative study. European Congress of DentoMaxilloFacial Radiology. Cardiff, 15-18 June 2016.
- Marcu M., Hedesiu M., Baciut M., Jacobs R., Salmon B., Dimitra c. (2016). The cumulative dose on a pediatric population during radio diagnosis in dentistry. European Congress of DentoMaxilloFacial Radiology. Cardiff, 15-18th June.
- Hedesiu M., Virag P., Soritau O., Bogdan L., Lucaciu O., Baciut M., Baatout S., Belmans N., Salmon B., Jacobs R., Dimitra c. (2016). Low dose radiation induced effects in dental follicle stem cells. European Congress of DentoMaxilloFacial Radiology. Cardiff, 15-18th June.
- Kavadella A., Tsiklakis K., Jacobs R., Berkhout W., Suomalainen A., Schulze R. (2016). European postgraduate dental students' knowledge and attitudes concerning CBCT. European Congress of DentoMaxilloFacial Radiology. Cardiff, 15-18th June.
- Huang Y., Li Z., Van Dessel J., Salmon B., Huang B., Ye J., Lambrichts I., Politis C., Jacobs R. (2016). Effects of platelet-rich plasma on trabecular bone healing around dental implants: an experimental study in beagle dogs. Enhanced Nature Healing in Dentistry. Leuven, 14-16 Oct 2016.
- Pauwels R., Jacobs R., Bogaerts R., Bosmans H., Soontra P. (2016). Determination of size-specific exposure settings in dental cone-beam CT. European Congress of DentoMaxilloFacial Radiology. Cardiff, 15-18th June.
- Stratis A., Gufei Zhang G., Ezeldeen M., Jacobs R., Bogaerts R., Bosmans H., DIMITRA c. (2016). Age-dependent organ dose calculations in dental CBCT imaging for a cohort of cleft palate patients. European Congress of DentoMaxilloFacial Radiology. Cardiff, 15-18June, 2016.
- Nicolielo L., El Maharoui O., van Lenthe H., Jacobs R. (2016). Accuracy of three-dimensional finite element modelling of trabecular and cortical bone structure using cone-beam computed tomography. European Congress of DentoMaxilloFacial Radiology. Cardiff, 15-18 June 2016.
- Soares M., Van Dessel J., Jacobs R., Imada T., Cesaril T., Garlet G., Zen Filho E., da Silva Santos P., Ribira-Bullen I. (2016). Influence of Zolendric Acid in the jaw bone microstructure: agreement between histologic and micro-CT evaluation in a rat model. EADMFR's 3rd Junior Meeting. Lublin, Poland, 07-10 February 2016.
- Codari M., Nicolielo L., De Faria Vasconcelos K., Jacobs R., Haiter Neto F. (2016). In-vitro objective evaluation of the impact of metal artifact in metal segmentation and background image quality with different CBCT devices, materials and field of views. European Congress of DentoMaxilloFacial Radiology. Cardiff, 15-18 June 2016.
- Reis Durão A., Morosolli A., Pittayapat P., Bolstad N., Ferreira A., Jacobs R. (2016). Accuracy of 2D cephalometric landmark by orthodontists and dentomaxillofacial radiologists. European Congress of DentoMaxilloFacial Radiology. Cardiff, 15-18 June 2016.

- Nicolielo L., Van Dessel J., Codari M., Apoorv K., Shaheen E., Politis C., Jacobs R. (2016). A novel imaging approach to follow-up of condylar remodeling following bimaxillary surgery. European Congress of DentoMaxilloFacial Radiology. Cardiff, 15-18 June 2016.
- Van Dessel J, Nicolielo LFP, El Maharoui O, van Lenthe H, Jacobs R. (2016). ACCURACY OF THREE-DIMENSIONAL FINITE ELEMENT MODELLING OF TRABECULAR AND CORTICAL BONE STRUCTURES USING CONE-BEAM COMPUTED TOMOGRAPHY.  
15th European Congress of Dento Maxillo Facial Radiology, Cardiff, Wales, June 15-18, 2016 [POSTER PRESENTATION]
- Huang Y, Zhaokai L, Van Dessel J, Salmon B, Huang B, Ye J, Lambrichts I, Politis C, Jacobs R. (2016). EFFECTS OF PLATELET-RICH PLASMA ON TRABECULAR BONE HEALING AROUND DENTAL IMPLANTS: AN EXPERIMENTAL STUDY IN BEAGLE DOGS.  
1st European Meeting on Enhanced Natural Healing in Dentistry, Leuven, Belgium, 14-16 Oct 2016

D. CHAIRS



*ALEAMED  
KLS MARTIN CHAIR FOR OMFS*

Duration: 3 years (2013-2016)  
To support research in the field of trigeminal neuropathy in OMFS.



*NOBEL BIO CARE CHAIR FOR ORAL AND  
MAXILLOFACIAL SURGERY*

Duration: 3 years (2013-2016)  
To support the research concerning the damage of the inferior alveolar nerve during mandibular surgery.



*BICON CHAIR FOR ORAL AND MAXILLOFACIAL  
SURGERY*

Duration: 3 years (2013-2016)  
To help to cover the teaching and/or research expenses in oral rehabilitation after oncology therapy and treatment modalities after iatrogenic damage of the inferior alveolar nerve.



*ROYAL BELGIUM SOCIETY OF STOMATOLOGY  
AND MAXILLOFACIAL SURGERY CHAIR FOR  
M3-OBSERVATORY*

Duration: 3 years (2013-2016)  
Epidemiological study on the surgical removal of third molars.



*STRAUMANN CHAIR FOR ORAL AND  
MAXILLOFACIAL SURGERY*

Duration: 3 years (2016-2019)  
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.





# 4

## Lecturing

#### A. SCIENTIFIC CONTRIBUTIONS AT CONGRESSES

- Oral presentations
- Poster presentations

#### B. INVITED LECTURES

## A. SCIENTIFIC CONTRIBUTIONS AT CONGRESSES

### ORAL PRESENTATIONS

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E. Shaheen, Y. Sun, R. Coropciuc, J.T. Dormaar, J. Schoenars, R. Jacobs, C.Politis ACCURATE PRODUCTION AND VALIDATION OF DIGITAL INTERMEDIATE AND FINAL 3D-PRINTED WAEFERS FOR BIMAXILLARY ORTHOGNATHIC CASES. Royal Belgian Society for Stomatology and Maxillo Facial Surgery spring meeting, Brussels, Belgium, March 18-19, 2016 [ORAL PRESENTATION]

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Y. Sun, R. Jacobs, C. Politis (2016)  
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P. Van Camp, E. Shaheen, Y. Sun, J.T. Dormaar, R. Coropciuc, J. Schoenaers, C. Politis (2016) OCCLUSAL CANT CORRECTION IN ORTHOGNATHIC SURGERY. Royal Belgian Society for Stomatology and Maxillo Facial Surgery spring meeting, Brussels, Belgium, November 18-19, 2016



## POSTER PRESENTATIONS

European Congress of Radiology, ECR 2016 , Vienana March 2-6 Abstract NO. C-1145

**KU LEUVEN**

ECR 2016 / C-1145

Patient-specific organ dose assessment in a dental cone-beam CT scanner with tube current modulation



Congress: ECR 2016    Poster No.: C-1145    Type: Scientific Exhibit  
Keywords: Radioprotection / Radiation dose, Radiation physics, Head and neck, Cone beam CT, CT, Dosimetry, Physics, Radiation safety, Dosimetric comparison  
Authors: A. Stratis, G. Zhang, J. Awouters, R. Jacobs, R. Bogaerts, H. Bosmans; Leuven/BE  
DOI: 10.1594/ecr2016/C-1145  
DOI-Link: <http://dx.doi.org/10.1594/ecr2016/C-1145>

### AIMS AND OBJECTIVES

Dental Cone Beam CT (CBCT) is an imaging technique with a wide range of applications in dental and maxillofacial radiology, i.e. in endodontics, periodontics and implantology(1-5). Its increasing use and its higher radiation induced risk compared to panoramic radiology suggest that accuracy in organ dose calculation is significantly important(6,7). To calculate organ doses, TLD dosimeters loaded in anthropomorphic phantoms are traditionally used, yet steep dose gradients encountered in dental...

### METHODS AND MATERIALS

Five paediatric cases were scanned with the VGi-evo CBCT (Newtom, Verona, Italy) using current-modulated pulses : a 7 years old female with a FOV of 5x5cm<sup>2</sup> - High Resolution upper jaw protocol (fig.1), a 7 years old female with a FOV of 8x5cm<sup>2</sup>- regular sinus protocol (fig.2), an 8 years old male with a FOV of 5x5cm<sup>2</sup>-regular upper jaw protocol (fig.3), a 12 years old female with a FOV of 8x5cm<sup>2</sup>-High resolution lower jaw protocol (fig.4) and a 12 years old female with a FOV of 12x8...

### RESULTS

The IC measured HVL at 110 kV was found to be equal to 8.427 mmAl which corresponds to an energy spectrum resulting from an x-ray beam filtered by a total of 13.65 mmAl equivalent filtration. Figure 11 depicts the energy spectrum of our scanner. The MC framework was validated with the use of a 3D-printed water elliptical phantom (fig.9) by positioning the IC in different positions into the phantom and comparing the measured dose water values to the respective simulation-calculated...

### CONCLUSION

Patient-specific dose calculations were carried out for five patients undergoing dental CBCT examinations in a state of the art scanner employing Tube Current Modulation. The modulation curves were reproduced and were implemented to the MC framework via dose-integral weighting factors. Each patient-specific MC scheme was then applied to the corresponding voxel model to calculate organ doses and estimate the radiation induced risk in terms of effective dose.

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PERSONAL INFORMATION  
[andreas.stratis@uzleuven.be](mailto:andreas.stratis@uzleuven.be)



## The performance of artefact reduction algorithm in CBCT images: a quantitative study

Karla de Faria Vasconcelos<sup>1,2</sup>, Laura Ferreira Pinheiro Nicolielo<sup>1</sup>, Marina Codari<sup>1,3</sup>, Reinhilde Jacobs<sup>1</sup>, Francisco Haiter Neto<sup>3</sup>

<sup>1</sup> OMFS IMPATH research group, Dept. Imaging & Pathology, Faculty of Medicine, KU Leuven and Oral and Maxillofacial Surgery, Leuven, Belgium.

<sup>2</sup> Department of Oral Diagnosis, Division of Oral Radiology, Piracicaba Dental School, State University of Campinas, Piracicaba, São Paulo, Brazil.

<sup>3</sup> Department of Biomedical Sciences for Health, Faculty of Medicine and Surgery, University of Milan, Milan, Italy.

### INTRODUCTION

Several metal artefact reduction (MAR) algorithms have been tested in the last few years and notable controversy is observed between the results with and without MAR correction.

### OBJECTIVE

To evaluate objectively the performance of different levels of MAR algorithm considering different materials, metal object positions and field of views (FOVs).

### MATERIALS AND METHODS

Nine customized resin phantoms containing a combination of three metal cylinders: titanium, copper-aluminum alloy (CuAl) and amalgam (Fig. 1).

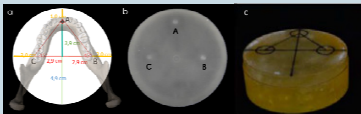
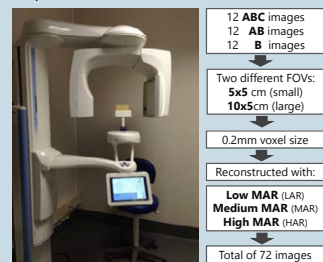


Fig. 1: (a) ABC position of metal cylinders, corresponding to the vertices of an isosceles triangle that represents the position of incisors and molars in a human mandible. (b) A phantom with metal cylinder in ABC position. (c) The phantom with the markings of the three possibilities.

1 The phantoms were scanned with: ProMax 3D (Planmeca Oy, Helsinki, Finland)



2 Images analysis were performed using MATLAB (Fig.2)

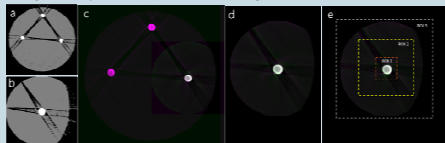


Figure 2: Automatic image segmentation for the large FOV (a), for the small FOV (b), translation (c), registration (d) and the three different ROIs around the metal cylinder (e).

3 The methodology allowed to assess the differences between segmented and real volume and the normalized standard deviation (nSD) of voxel values of three different ROIs. A three-way ANOVA test ( $p < 0.05$ ).

### RESULTS

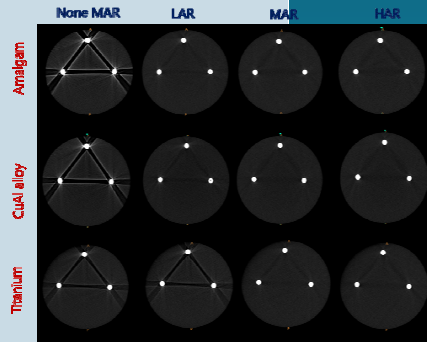
#### 1. Volume overestimation:

1.1 The strongest artefact suppression was observed using LAR with amalgam.

1.2 Significant difference between all material and positions with None MAR and LAR.

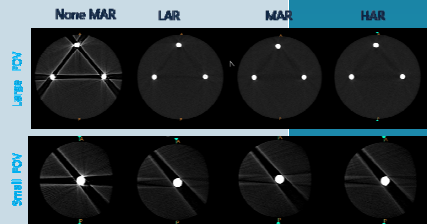
1.3 Significant difference was found only between ABC and B with amalgam with None MAR.

1.4 No significant difference in volume overestimation between the FOVs.



#### 2. Normalized standard deviation:

When there was object outside the FOV (AB and ABC positions) there was a significant difference between small FOV and large FOV for amalgam (Fig.4) and CuAl in ROI1.



### CONCLUSIONS

Different materials, object position and FOVs have an impact on the MAR performance of CBCT devices and should be considered when evaluating CBCT images with metal or highly dense objects included.

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# 15th European Congress of DentoMaxilloFacial Radiology (ECDMFR) 2016, Wales, Cardiff, Jun 15 - 18, 2016 . Abstract NO. PP085

## Age-dependent organ dose calculations in dental CBCT imaging for a cohort of cleft palate patients

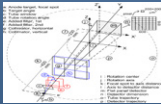
A. STRATIS<sup>1</sup>, G. ZHANG<sup>2</sup>, M. EZELEDEEN<sup>3</sup>, R. JACOBS<sup>1</sup>, R. BOGAERTS<sup>1</sup>, H. BOSMANS<sup>2</sup> and the DIMITRA consortium<sup>3</sup>

1. Katholieke Universiteit Leuven, Department of Imaging and Pathology, OMFS-IMPATh Research Group, Campus St. Raphael, Kapucijnenvoer 33, Leuven 3000, Belgium;
2. University Hospitals of Leuven, Department of Radiology, Herestraat 49, Leuven 3000, Belgium
3. Listing partners on [http://www.omfsimpath.be/php/research\\_projects/dimitra.php](http://www.omfsimpath.be/php/research_projects/dimitra.php)

**AIM:** Dental CBCT imaging is a recently introduced modality in dentomaxillofacial radiology with a wide range of clinical applications. CBCT scanners are reported to deliver higher organ doses compared to panoramic and intraoral radiography, yet they are associated with lower radiation induced risks compared to MSCT imaging. Cleft palate paediatric patients comprise a cohort of patients undergoing repeated dental CBCT exposures. The aim of this study was to calculate organ doses and quantify the radiation induced risk for cleft palate protocols in three different CBCT systems for 5, 8 and 12 years old patients via Monte Carlo (MC) simulations.

## Methods & Materials

We developed an EGSnrc MC framework which is capable of simulating the entire imaging chain from x-ray production to image formation



We customized the framework towards three dental CBCT scanners; Promax 3D Max (Planmeca), Accutomo 170 (Morita) and Vgi-evo (Newtom). Any geometry, x-ray tube and filter specification were taken into account.



Each scanner was individually customized, calibrated and validated for cleft palate protocols

Specifications	Promax 3D MAX (Planmeca)	Accutomo 170 (Morita)	Vgi-evo (Newtom)
FDV (mm x mm)	120 x 55	100 x 50	100 x 50
Voltage (kv)	96	90	110
WHL (mmkA)	9.05	4.2	8.43
Rotative filtration	No	Yes	No
SAD (cm)	33.3	54	47.5
Rotation	210°	360°	360°
Tube Current Modulation (TCM)/MC	No	No	Yes
Mode of operation	ULD/LD – ND/HD	Std. Res.	Normal/regular
mAs	6 - 105	87.5	TCM

We designed three head & neck voxel models; 5 and 8 years old (males) and 12 years old (female) based on the following procedure

1. Retrieve images from PACS (paediatric head & neck CT)
2. Segmentation with Image J
3. Comparison with ICRP reference mass values and voxel number adjustment for radioisotopic organs
4. Build voxel model
5. Process in Matlab to establish an horizontal Frankfort plane
6. Voxel.txt ready to be implemented into the code

Organ	Brain	Salivary gland	Thyroid	Esophagus	Stomach	Small intestine	Large intestine	Bladder	Uterus	Vagina	Rectum	Prostate	Testis	Ovary	Uterus	Vagina	Rectum	Prostate	Testis	Ovary
Brain	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Salivary gland	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Thyroid	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Esophagus	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Stomach	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Small intestine	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Large intestine	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Bladder	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uterus	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Vagina	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Rectum	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Prostate	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Testis	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ovary	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

All radioisotopic organs in the head-neck region are included in the phantoms

Scanner and protocol specific MC simulator



Application of voxel models

Organ dose calculations and radiation risk estimation for cleft palate paediatric patients

## Results & Discussion

Cleft palate protocols													Cleft palate protocols													Cleft palate protocols																																							
Organ	Tissue weighting factor	Planmeca Promax 3D Max					Accutomo 170					Newtom Vgi evo					Organ	Tissue weighting factor	Planmeca Promax 3D Max					Accutomo 170					Newtom Vgi evo					Organ	Tissue weighting factor	Planmeca Promax 3D Max					Accutomo 170					Newtom Vgi evo																			
		Standard	Normal/regular	Normal/regular	Normal/regular	Normal/regular	Standard	Normal/regular	Normal/regular	Normal/regular	Standard	Normal/regular	Normal/regular	Normal/regular	Standard	Normal/regular			Normal/regular	Normal/regular	Standard	Normal/regular	Normal/regular	Normal/regular	Standard	Normal/regular	Normal/regular	Normal/regular	Standard	Normal/regular	Normal/regular	Normal/regular	Standard			Normal/regular	Normal/regular	Normal/regular																											
		100 x 55 mm <sup>2</sup>										100 x 50 mm <sup>2</sup>												100 x 55 mm <sup>2</sup>										100 x 50 mm <sup>2</sup>												100 x 55 mm <sup>2</sup>										100 x 50 mm <sup>2</sup>									
		H*Net (Equivalent dose * wT) (µSv)										H*Net (Equivalent dose * wT) (µSv)												H*Net (Equivalent dose * wT) (µSv)										H*Net (Equivalent dose * wT) (µSv)												H*Net (Equivalent dose * wT) (µSv)										H*Net (Equivalent dose * wT) (µSv)									
Brain	0.01	0.17	0.45	0.70	0.81	1.08	2.04	1.01	0.31	0.26		Brain	0.01	0.20	0.54	0.84	0.73	2.27	3.55	1.26	0.82		Brain	0.01	0.15	0.40	0.63	0.74	1.08	2.05	0.88	0.62	0.27		Brain	0.01	0.15	0.40	0.63	0.74	1.08	2.05	0.88	0.62	0.27																				
Salivary gland	0.01	0.20	0.54	0.81	0.79	1.08	2.07	1.06	0.28	0.21		Salivary gland	0.01	0.20	0.52	0.79	0.71	1.43	2.78	0.76	0.76		Salivary gland	0.01	0.16	0.40	0.63	0.74	1.08	2.05	0.88	0.62	0.27		Salivary gland	0.01	0.16	0.40	0.63	0.74	1.08	2.05	0.88	0.62	0.27																				
Thyroid	0.008	1.37	3.67	5.72	4.05	15.40	24.06	5.68	0.70	0.62		Thyroid	0.008	1.00	2.81	4.32	3.82	11.80	18.73	4.05	2.70		Thyroid	0.008	0.95	1.81	3.05	1.00	5.07	7.83	2.18	1.32		Thyroid	0.008	0.95	1.81	3.05	1.00	5.07	7.83	2.18	1.32		Thyroid	0.008	0.95	1.81	3.05	1.00	5.07	7.83	2.18	1.32											
Esophagus	0.001	0.20	0.54	0.84	0.73	1.21	1.52	1.50	0.24	0.77		Esophagus	0.001	0.18	0.49	0.76	0.68	2.05	3.21	1.20	0.57		Esophagus	0.001	0.10	0.25	0.40	0.34	1.07	1.67	0.61	0.37		Esophagus	0.001	0.10	0.25	0.40	0.34	1.07	1.67	0.61	0.37		Esophagus	0.001	0.10	0.25	0.40	0.34	1.07	1.67	0.61	0.37											
Stomach	0.009	3.96	10.50	16.50	14.25	24.04	39.29	22.57	3.78	13.38		Stomach	0.009	3.51	9.36	14.63	12.68	39.33	61.45	23.58	10.47		Stomach	0.009	2.33	6.22	9.72	8.40	20.34	40.84	14.02	9.27		Stomach	0.009	2.33	6.22	9.72	8.40	20.34	40.84	14.02	9.27		Stomach	0.009	2.33	6.22	9.72	8.40	20.34	40.84	14.02	9.27											
Small intestine	0.004	2.47	6.80	10.31	8.30	27.70	43.29	12.42	1.71	6.79		Small intestine	0.004	1.31	3.00	4.78	4.31	12.84	20.07	5.77	3.31		Small intestine	0.004	0.86	2.20	3.50	3.10	9.64	15.45	4.07	2.57		Small intestine	0.004	0.86	2.20	3.50	3.10	9.64	15.45	4.07	2.57		Small intestine	0.004	0.86	2.20	3.50	3.10	9.64	15.45	4.07	2.57											
Large intestine	0.01	4.01	12.10	18.37	15.40	25.00	39.30	40.70	6.78	14.03		Large intestine	0.01	5.40	15.00	22.46	15.43	50.40	86.40	34.40	15.43		Large intestine	0.01	3.40	11.00	17.10	14.00	40.70	70.80	27.00	14.00		Large intestine	0.01	3.40	11.00	17.10	14.00	40.70	70.80	27.00	14.00		Large intestine	0.01	3.40	11.00	17.10	14.00	40.70	70.80	27.00	14.00											
Bladder	0.009	4.51	12.12	18.37	15.40	25.00	39.30	40.47	5.95	16.30		Bladder	0.009	3.57	9.52	14.87	12.85	20.08	42.41	59.73	19.54		Bladder	0.009	3.24	8.33	13.40	11.05	36.26	56.65	39.18	20.45		Bladder	0.009	3.24	8.33	13.40	11.05	36.26	56.65	39.18	20.45		Bladder	0.009	3.24	8.33	13.40	11.05	36.26	56.65	39.18	20.45											
Uterus	0.001	2.00	7.00	11.00	9.57	28.70	46.34	23.07	4.28	18.19		Uterus	0.001	1.00	3.00	4.00	3.00	10.00	16.00	11.00	5.00		Uterus	0.001	1.00	3.00	4.00	3.00	10.00	16.00	11.00	5.00		Uterus	0.001	1.00	3.00	4.00	3.00	10.00	16.00	11.00	5.00		Uterus	0.001	1.00	3.00	4.00	3.00	10.00	16.00	11.00	5.00											
Vagina	0.001	1.01	3.74	6.28	5.70	11.52	18.80	8.77	1.05	7.03		Vagina	0.001	0.50	1.50	2.00	1.50	5.00	8.00	5.00	2.50		Vagina	0.001	0.50	1.50	2.00	1.50	5.00	8.00	5.00	2.50		Vagina	0.001	0.50	1.50	2.00	1.50	5.00	8.00	5.00	2.50		Vagina	0.001	0.50	1.50	2.00	1.50	5.00	8.00	5.00	2.50											
Rectum	0.001	1.01	3.74	6.28	5.70	11.52	18.80	8.77	1.05	7.03		Rectum	0.001	1.01	3.74	6.28	5.70	11.52	18.80	8.77	7.03		Rectum	0.001	1.01	3.74	6.28	5.70	11.52	18.80	8.77	7.03		Rectum	0.001	1.01	3.74	6.28	5.70	11.52	18.80	8.77	7.03		Rectum	0.001	1.01	3.74	6.28	5.70	11.52	18.80	8.77	7.03											
Prostate	0.001	1.01	3.74	6.28	5.70	11.52	18.80	8.77	1.05	7.03		Prostate	0.001	1.01	3.74	6.28	5.70	11.52	18.80	8.77	7.03		Prostate	0.001	1.01	3.74	6.28	5.70	11.52	18.80	8.77	7.03		Prostate	0.001	1.01	3.74	6.28	5.70	11.52	18.80	8.77	7.03		Prostate	0.001	1.01	3.74	6.28	5.70	11.52	18.80	8.77	7.03											
Testis	0.001	1.01	3.74	6.28	5.70	11.52	18.80	8.77	1.05	7.03		Testis	0.001	1.01	3.74	6.28	5.70	11.52	18.80	8.77	7.03		Testis	0.001	1.01	3.74	6.28	5.70	11.52	18.80	8.77	7.03		Testis	0.001	1.01	3.74	6.28	5.70	11.52	18.80	8.77	7.03		Testis	0.001	1.01	3.74	6.28	5.70	11.52	18.80	8.77	7.03											
Ovary	0.001	1.01	3.74	6.28	5.70	11.52	18.80	8.77	1.05	7.03		Ovary	0.001	1.01	3.74	6.28	5.70	11.52	18.80	8.77	7.03		Ovary	0.001	1.01	3.74	6.28	5.70	11.52	18.80	8.77	7.03		Ovary	0.001	1.01	3.74	6.28	5.70	11.52	18.80	8.77	7.03		Ovary	0.001	1.01	3.74	6.28	5.70	11.52	18.80	8.77	7.03											
Effective dose (Sv)	22.64	64	94.3	81.0	82.8	208.2	175.7	27.5	77.4	39.4		Effective dose (Sv)	18.4	49.0	76.5	66.1	207.1	134.4	105.6	64.7		Effective dose (Sv)	16.3	38.0	58.9	57.7	189.7	209.5	113.0	64.7		Effective dose (Sv)	16.3	38.0	58.9	57.7	189.7	209.5	113.0	64.7		Effective dose (Sv)	16.3	38.0	58.9	57.7	189.7	209.5	113.0	64.7															
Organ doses and effective dose for 5 years old male patients													Organ doses and effective dose for 5 years old male patients													Organ doses and effective dose for 12 years old female patients																																							

Organ doses and effective dose for 5 years old male patients

Organ doses and effective dose for 8 years old male patients

Organ doses and effective dose for 12 years old female patients

- Acquisitions accepted for clinical use in our department for paediatric cleft patients lead to Effective Doses lower than 200µSv.
- Oral mucosa and salivary glands are the organs which contribute most to the total radiation induced risk.
- The effective dose increases with decreasing age at exposure in all cases, yet this pattern is more pronounced in systems with fixed x-ray tube current (mA) during rotation for same protocols (Planmeca Promax 3D Max and Morita Accutomo 170).
- Newtom Vgi evo uses an Automatic Exposure Control system which adjusts the mA of the scan according to the attenuation of patient's head resulting in lower mA scans for younger patients and higher mA scans for older patients. Therefore, the aforementioned pattern of increasing dose with decreasing age at exposure is not observed.

## Conclusion

We applied three paediatric head voxel models to our Monte Carlo framework which has been customized, calibrated and validated for three different scanner models to calculate organ doses for cleft palate paediatric patients. For regular / standard modes of operation the total risk in all cases was lower than 160 µSv.

1st European Meeting Enhanced Natural Healing in Dentistry,  
Belgium, Leuven, October 14-16, 2016, Abstract NO: 19

Effects of platelet-rich plasma on trabecular bone structures around dental implants: an experimental study in beagle dogs

Yan Huang<sup>1,2</sup>, Zhaokai Li<sup>3</sup>, Jeroen Van Dessel<sup>4</sup>, Benjamin Salmon<sup>4</sup>, Bo Huang<sup>5</sup>, Jun Ye<sup>6</sup>, Ivo Lambrechts<sup>7</sup>, Constantinos Politis<sup>8</sup>, Reinhilde Jacobs<sup>4</sup>

<sup>1</sup>OMFS IMPATH research group, Dept. Imaging & Pathology, Faculty of Medicine, KU Leuven and Oral and Maxillofacial Surgery, University Hospitals Leuven, Leuven, Belgium

<sup>2</sup>State Key Laboratory of Oral Diseases, West China College of Stomatology, Sichuan University, Chengdu, China

<sup>3</sup>Department of Clinical Medicine, Xiang Ya School of Medicine, Central South University, Changsha, Hunan, China

<sup>4</sup>Imaging & Oral Surgery, Paris Descartes Sorbonne University, Paris, France

<sup>5</sup>Implant Center, West China College of Stomatology, Sichuan University, Chengdu, China

<sup>6</sup>Department of Prosthodontics, College of Stomatology, Tongji University, Shanghai, China

<sup>7</sup>Group of Morphology, Biomedical Research Institute, Hasselt University, Diepenbeek, Belgium

Contact: yan.huang@kuleuven.be

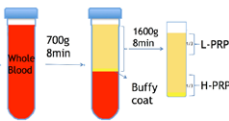
Aims

Whilst increasing evidence on the effectiveness of local platelet-rich plasma (PRP) application for soft and bone tissue healing in implant surgery, characterization of the healing and resulting bone structure with autologous PRP in physiological integration of oral implants remains poorly documented. Furthermore, the influence of such biological materials at different concentration on the assumed development of peri-implant bone structures has hardly been explored. The aim is to morphologically evaluate the peri-implant trabecular bone changes after the local application of a different concentration of PRP by using micro-CT.

Materials and methods

Animal experiment

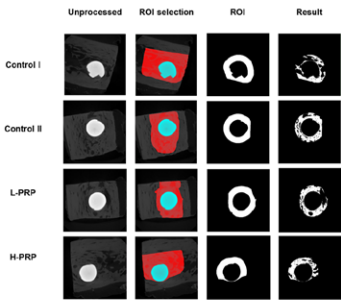
Ethical approval was obtained to carry out a split mouth study in 9 beagle dogs. Each dog randomly received 8 commercial threaded titanium implants (BLB system, Naton, China) (Grade V, 3.3mm Ø × 8 mm long, non-submerged healing) at both sides of mandibular premolar regions from one out of 4 groups: delayed implant placement without any loading (control I); delayed implant placement with delayed loading (control II); low concentration of PRP + delayed implant placement with delayed loading (L-PRP); high concentration of PRP + delayed implant placement with delayed loading (H-PRP). Animals were euthanized at 1, 3 and 5 months after implant placement and loading, respectively (3 dogs/time point).



**Figure 1: Platelet rich-plasma preparation.** According to a double-centrifugation protocol, fresh whole blood (5ml) was drawn from the dogs before the breakfast and then centrifuged at 700g for 8min, resulting in three basic components: blood cells (bottom), buffy coat (middle) and plasma (top). Next, the supernatant plasma and buffy coat were collected for further preparation. Both components were centrifuged separately for a second time at 1600g for 8min. The lower third were used as H-PRP and the upper third was collected as L-PRP.

Image analysis: bone structure morphometry

The block biopsies were removed and scanned under a resolution of 20 µm, 10 × 10 mm FOV, 90 KvP, 160 mA, exposure time of 3 min by micro-CT (Caliper, PerkinElmer, USA). The bone structural parameters were calculated in a circular-shaped region (1mm wide × 2mm height) around the middle level of implant. The bone structural parameters were calculated using a custom-made dedicated tool in CTAn software (Bruker, Kontich, Belgium).



**Figure 2: Image processing before calculation of morphometric parameters.** From left to right: original micro-CT images for different protocols; manually rough selection of the region of interest (ROI); binary ROI automatically generated by a custom processing algorithm based on adaptive thresholding segmentation for the implant protocols, excluding implant and cortical bone; binary segmentation of trabecular bone in this ROI, from which trabecular structures were automatically calculated in a three-dimensional way.

**Table 1: Trabecular parameters quantified from micro-CT images in selected volume of interest (VOI)**

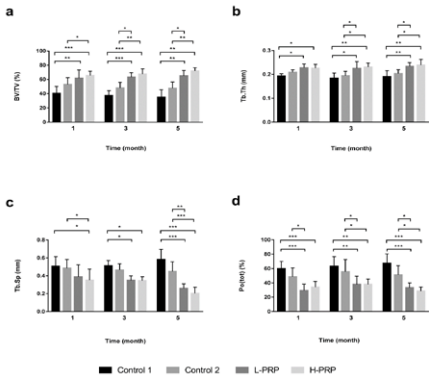
Abbreviation	Morphologic Parameters	Standard Unit	Description
BV/TV	Bone volume fraction	%	Ratio of the segmented bone volume to the total volume of the region of interest
Tb.Th	Trabecular thickness	mm	Mean thickness of trabeculae, assessed using direct 3D methods
Tb.Sp	Trabecular separation	mm	Mean distance between trabeculae, assessed using 3D methods
Po (tot)	Total porosity percentage	%	Ratio of the volume of all open plus closed pores to total volume of interest

Statistical analysis

The Tukey's HSD test was used to compare variables between groups and non-parametric multiple comparisons were applied when normality was not confirmed.

Results

Good osseointegration was obtained and no obvious bone resorption was observed. The differences between control I vs. control II, L-PRP and H-PRP were statistically significant regarding to bone volume density (BV/TV), trabecular thickness (Tb.Th), trabecular separation (Tb.Sp) and total porosity percentage [Po (tot)]. Both experimental groups (L-PRP and H-PRP) had significantly higher values for BV/TV, Tb.Th and Po(tot) than the controls (I and II), especially at month 3 and month 5. There were also a trend of decreasing in BV/TV and Tb.Th and a trend of increasing in Tb.Sp and Po(tot) for control I. However, no distinct difference were found at three time points neither between L-PRP and H-PRP groups, nor between control I and control II groups.



**Figure 3: Comparison of 3D morphologic parameters (mean ± sd) from micro-CT device (trabecular bone).** The micromorphology of the trabecular bone in L-PRP and H-PRP groups were characterized by relatively high values in BV/TV (a) and Tb.Th (b) but a lower value in Tb.Sp (c) and Po (tot) (d) in each observation time point. In contrast, dogs received Control 1 and Control 2 protocols showed no significant difference, but both with a decreased BV/TV and Tb.Th, increased Tb.Sp and Po(tot) at month 3. The micromorphology in the L-PRP group was similar to that of the H-PRP group at all observation time points.

\* significant difference ( $p < 0.05$ )

\*\* significant difference ( $p < 0.001$ )

\*\*\* significant difference ( $p < 0.0001$ )

Conclusions

H-PRP and L-PRP may have improved peri-implant bone structural integration compared to that obtained by delayed implant placement or delayed loading after 3 months of healing. The present findings do not seem to suggest a different bone remodeling pattern when using H-PRP or L-PRP.

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- Huang, Y., Van Dessel, J., Deygere, M., et al. (2014). Validating cone-beam computed tomography for peri-implant bone morphometric analysis. *Bone Research*, 2014 Jun 10:2:14010.
- Huang, Y., Van Dessel, J., Liang, X., et al. (2014). Effects of immediate and delayed loading on peri-implant trabecular structures: a cone-beam CT evaluation. *Clinical Implant Dentistry and Related Research*, 16 (6), 873-883.
- Van Dessel, J., Huang, Y., Deygere, M., et al. (2013). A comparative evaluation of cone beam CT and micro-CT on trabecular bone structures in the human mandible. *Dentomaxillofacial Radiology*, 42 (8), art.nr. 20130145, 20130145.

**International Association of Dental Research - Pulp Biology Regeneration Group  
symposium, Japan, Nagoya, June 26th-28th 2016.**

**P 55**

**KU LEUVEN**

**Oral Health  
RESEARCH**



**Seventy-two months of clinical and radiographic follow-up for revascularization of  
an infected immature permanent tooth followed by orthodontic treatment**

**Van Gorp G<sup>1</sup>, EzEideen M<sup>1,2</sup>, Jacobs R<sup>2</sup>, Declerck D<sup>1</sup>**

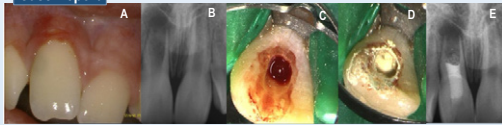
<sup>1</sup> Department of Oral Health Sciences, KU Leuven & Paediatric Dentistry and Special Dental Care, University Hospitals Leuven, Leuven, Belgium; <sup>2</sup> OMFS-IMPATh research group, Department of Imaging & Pathology, Faculty of Medicine, KU Leuven & Oral and Maxillofacial Surgery, University Hospitals Leuven, Leuven, Belgium

Author's e-mail: gertrude.vangorp@uzleuven.be

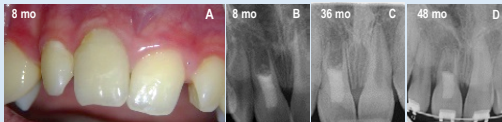
**Introduction**

There are no reports supporting the safe orthodontic movement for teeth treated with regenerative endodontic procedure (REP). The main aim of this case report is to evaluate the long-term clinical and radiographic outcome of REP in a necrotic immature permanent incisor with subsequent orthodontic treatment.

**Case Report**



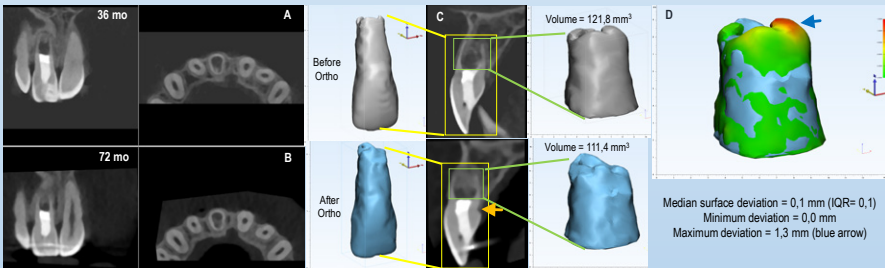
(A) A 10,5 years-old boy presented with swelling related to the maxillary right central incisor (no recorded history of trauma). Clinical examination showed tenderness to percussion and normal probing depth. (B) Intra-oral radiograph showed immature root & periapical lesion. (C, D, E) REP was performed; bi-mix antibiotics for disinfection, induction of blood clot, MTA (ProRoot MTA; Dentsply, Tulsa, OK) & composite resin for the coronal seal.



(A, B) Clinical and radiographic pictures 8 months after treatment show absence of signs & symptoms of inflammation and periapical healing. (C) 36 months after treatment, (D) 48 months after REP and 12 months after the start of the orthodontic treatment. Maxillary incisors were leveled and aligned using light intrusion forces.

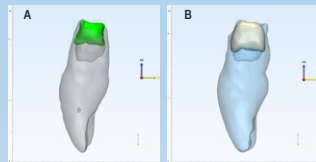


2D Radiographic examination was performed regularly every 6 months. (A) After removing the orthodontic braces, 67 months follow-up after REP. As the patient reported discomfort associated with the overnight retainer related to REP-treated tooth, a retention wire was used instead (B, C) 70 months follow-up showed a stable clinical and radiographic outcome.



(A) CBCT scan 36 months after REP showed periapical healing, continuity of the periodontal ligament and bony tissue ingrowth inside the root canal space. (B) Aligned CBCT scan 72 months after REP and after the completion of the orthodontic treatment demonstrating the stability of the treatment outcome. (C) 3D volumetric analysis showing insignificant resorption of the root above MTA level after orthodontic treatment (-8,5% volume), in addition to a stable localized cervical resorption defect (orange arrow) (D) Morphological comparison of the root surface above MTA level (pre-ortho vs. post-ortho), showing a median surface deviation of 0,1 mm. The maximum deviation was 1,3 mm and localized in the apical third on the buccal surface (blue arrow).

3D analysis of the bony ingrowth inside the root canal space (A) 36 months after REP: bone volume inside root canal space = 34,6 mm<sup>3</sup> (in green) (B) 72 months after REP: bone volume inside root canal space = 54,8 mm<sup>3</sup> (in yellow). Bony ingrowth rate 0,5 mm<sup>3</sup>/month (11,1% volume increase in 36 months).



**Conclusion**

This case report shows a positive clinical and radiographic outcome of REP with an insignificant apical root resorption after orthodontic tooth movement as demonstrated by the 3-dimensional analysis of the dental structures. An explorative study was launched to investigate the effect of orthodontic tooth regulation on immature teeth with a history of traumatic insult and treated with REP in comparison with other treatment options for immature teeth, such as MTA apexification and vital pulp therapy.

UZ  
Leuven

Hospital 49  
B - 3000 Leuven

www.kuleuven.be  
tel. 0652 (0)16 33 22 11

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## B. INVITED LECTURES

15-01-2016	R. Jacobs	CBCT: 'Routine of niet' om 3D te denken	AZ Sint-Jan, Brugge, Belgium
22-01-2016	C. Politis	Complicaties in maxillo-faciale heelkunde	Maria Ziekenhuis Overpelt, Lokale Tandartsenkring – MKA, Leuven, Belgium
22-01-2016	C. Politis	Tandtransplantaties, VVMKA-Upgrade	MKA-artsen, Antwerpen, Belgium
26-01-2016	M. Ezeldeen	3D planning for Tooth Autotransplantation and 3D printing of Surgical Templates	3D-printing in Maastricht
16-03-2016	R. Jacobs	Rol van de beeldvorming in riskmanagement en diagnostiek bij iatrogene trigeminus problematiek	VVTE meeting Antwerpen, Belgium
17-03-2016	R. Jacobs	Beeldvorming & röntgendiagnostiek anno 2015	VVT Zwijnaarde, Belgium
14-04-2016	C. Politis	3D planning bij orthognatische heelkunde, complexe implantaatpatiënten, trauma en congenitale problemen	Digitale workflow en 3D printing in MKA en Tandheelkunde, KU Leuven, Belgium
16-04-2016	C. Politis	Chronic complications in implantology	ITI Benelux congress, Maastricht, The Netherlands
23-04-2016	C. Politis	Korte implantaten: stand van zaken anno 2016	LUTV Oostende, Belgium
23-04-2016	C. Politis	Mucosaletsels en hun behandeling	LUTV Oostende, Belgium
23-04-2016	R. Jacobs	Imaging in dental practice anno 2016: What should we know?	Crowne Plaza Conference Center, Vilnius, Lithuania
26-05-2016	C. Politis	Extracties	KLTV « 80 jaar KLTV », St. Truiden, Belgium
26-05-2016	R. Jacobs	Two-day interuniversity programme on the use of CBCT for dentomaxillofacial diagnostics	KU Leuven, Belgium
27-05-2016	R. Jacobs	Two-day interuniversity programme on the use of CBCT for dentomaxillofacial diagnostics	KU Leuven, Belgium
25-06-2016	R. Jacobs	2D versus 3D radiology	Nobel Biocare Global Symposium, Waldorf Astoria New York, USA
01-07-2016	R. Jacobs	CBCT as an eye-opener for dentomaxillofacial diagnostics	NewTom Forum, Desenzano del Garda, Italy
05-09-2016	R. Jacobs	Two-day course for radioprotection certification in dentistry, KU Leuven, Belgium	KU Leuven, Belgium
06-09-2016	R. Jacobs	Two-day course for radioprotection certification in dentistry, KU Leuven, Belgium	KU Leuven, Belgium
08-10-2016	R. Jacobs	What to see beyond an image...?	Association Scientifique Dentaire, CHU St-Pierre, Brussel, Belgium

22-10-2016	R. Jacobs	Beyond CBCT	Lublin, Polen
10-11-2016	C. Politis, P. Legrand	Werken in privé versus universiteit: Trump versus Clinton ?	KU Leuven, Belgium
23-11-2016	R. Jacobs	Cone beam: que choisir et comment obtenir une bonne image diagnostique?	Congrès ADF, Paris, France
25-11-2016	C. Politis	Preclinical skills lab for OMFS surgery	KLS Martin Board, Tuttlingen, Germany
26-11-2016	R. Jacobs	Full digital workflow: digitale evolutie en mogelijkheden	NIVVT Wintersymposium VIVES, Brugge, Belgium
07-12-2016	C. Politis	Short implants in patients with Epidermolysis Bullosa	Bicon congress, Boston, USA
07-12-2016	C. Politis	Neuropathic pain after dental implants	Bicon congress, Boston, USA
08-12-2016	R. Jacobs	CBCT's bekijken om een diagnose te stellen: hoe beginnen we eraan?	KU Leuven, Belgium
09-12-2016	R. Pauwels, J.Vassileva	Mini-symposium on Radiation Protection in Dental Radiography	22nd International Conference on Medical Physics, Bangkok, Thailand
10-12-2016	E. Shaheen	Welk is de meerwaarde van 3D-voorbereiding?	LUTV, Leuven, Belgium
10-12-2016	C. Politis	Orthognatische heelkunde: de weg van de patiënt	KU Leuven, Belgium
10-12-2016	E. Shaheen	Welk is de meerwaarde van 3D voorbereiding?	LUTV Leuven
13-12-2016	R. Jacobs	Digitale beeldvorming bekeken in meerdere dimensies	VVT Eeklo, Belgium
15-12-2016	R. Jacobs	Diagnose van pathologie in de kaak: klinische gevalbespreking	KU Leuven, Belgium

**5**

**3D lab**



**A. TEAM**

**B. PROJECTS**

**C. PUBLICATIONS**

- International Peer Reviewed Publications
- Oral presentations
- Poster presentations

In October 2014, was the official opening of our 3D lab within the department of Oral and Maxillofacial surgery at UZ Leuven. 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 multi-disciplined 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 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 (ophthalmology, ENT, dentistry, traumatology, etc.), externally with Heilig Hart Hospital Leuven, Karolinska University Hospital Stockholm, etc.



## A. TEAM

*Constantinus POLITIS*

Constantinus Politis is Oral and Maxillo-Facial Surgeon. He is currently Professor and Chairperson of the Department of Oral and Maxillofacial Surgery at Leuven University, 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 also holds a master degree in management (MM) from the Applied Economic Sciences 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 Secretary General of the Professional Union of Belgian Oral and Maxillofacial Surgeons. 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 interest 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.

*Reinhilde JACOBS*



Reinhilde Jacobs is dentist (1990), Doctor in Dental Sciences (1993; PhD University of Leuven), periodontologist (1996; KU Leuven) and Master in Dental Radiology (2002; University of London). With a European fellowship (1994-1995), she performed postdoctoral research at the Dept Orthopaedics (prof B Rydevik, Salghrenska Sjukhuset, Göteborg) and at the Institute of Applied Biotechnology (prof P-I Brånemark), University of Gothenburg, Sweden. She is full professor at the University of Leuven, visiting professor at Karolinska Institutet Stockholm (Sweden) and Dalian Medical University in China. R. Jacobs is coordinating the OMFS-IMPATh Research Group ([www.omfsimpat.be](http://www.omfsimpat.be)) of the Department of Imaging & Pathology, meanwhile being responsible for research, education and clinical

activities in dentomaxillofacial radiology (heading the dentomaxillofacial radiology center). She is Secretary General of the International Association of DentoMaxilloFacial Radiology and past president of the European Academy of DentoMaxilloFacial Radiology. She is section editor imaging of Clinical Oral Investigations and associate editor of European Journal of Oral Implantology, and Oral Radiology. She has received the D Collen Research Travel Award (1994), the IADR Young Investigators Award (1998) and the Belgian Joachim Award in the 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 oral implant physiology and imaging research. She has been actively participating in European projects (ref. Pisa, Minosquare, Osteodent, SedentexCT and Dimitra). She is (co) author of 5 books and more than 240 publications in peer-reviewed journals besides multiple invited lectures and publications in other journals or books.

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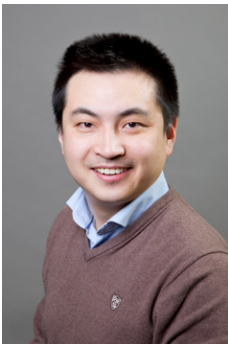
*Eman SHAHEEN*



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 Maxillo-facial surgery, University hospitals Leuven (Belgium) with Prof. 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 OMFSIMPATH (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.

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*Yi SUN*



Yi Sun obtained his PhD in Biomedical Science, 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, mandible reconstruction using fibular bone. Currently he is responsible for the 3D surgical simulation team in the department of oral and maxillofacial surgery (UZ Leuven) and involved in development of image-guided surgical system (navigation system).

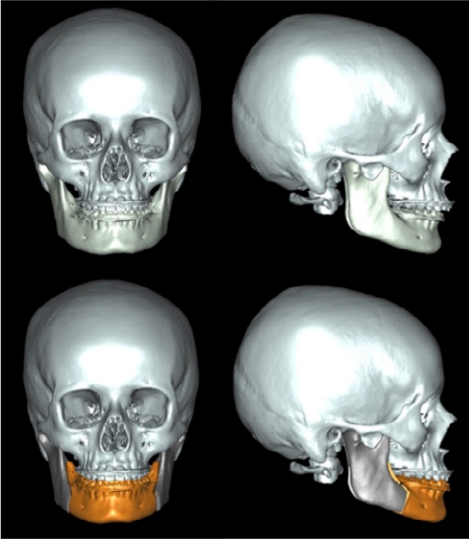


## B. PROJECTS

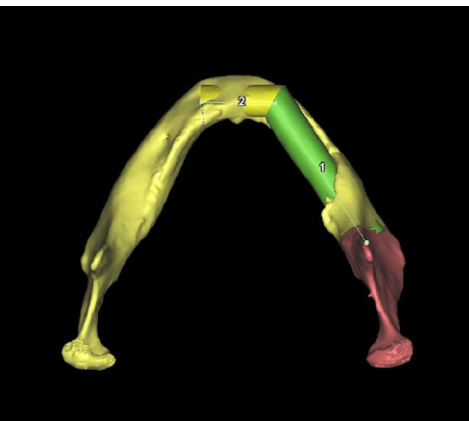
3D planning of orthognathic surgery

3D follow-up of hard and soft tissues of orthognathic patients (short and long term)

3D titanium printing of osteosynthesis plate for Le Fort I surgery



Computer assisted mandible / maxilla reconstruction with fi bular or DCIA flap







## C. PUBLICATIONS

### INTERNATIONAL PEER-REVIEWED PUBLICATIONS

- Khalil Wael, Ezeldeen Mostafa, Van de Castele Elke, Shaheen Eman, Sun Yi, Shahbazian Maryam, Olszewski Raphael, Politis Constantinus, Jacobs Reinhilde (2016). Validation of cone beam computed tomography-based tooth printing using different three-dimensional printing technologies. *Oral Surgery, Oral Medicine, Oral Pathology and Oral Radiology*, 121 (3), art.nr. 10.1016/j.oooo.2015.10.028, 307-15.
- Ruiters Sébastien, Sun Yi, De Jong Stephan, Politis Constantinus, Mombaerts Ilse (2016). Response to: Computer-aided design and three-dimensional printing in the manufacturing of an ocular prosthesis. *British Journal of Ophthalmology* (accepted), art.nr. bjophthalmol\_el;17236.
- Chen Xiaojun, Cheng Jun, Gu Xin, Sun Yi, Politis Constantinus (2016). Development of preoperative planning software for transforaminal endoscopic surgery and the guidance for clinical applications. *International Journal of Computer Assisted Radiology and Surgery*, 11 (4), 613-20.
- Chen Xiaojun, Li Xing, Xu Lu, Sun Yi, Politis Constantinus, Egger Jan (2016). Development of a computer-aided design software for dental splint in orthognathic surgery. *Scientific Reports*, 6 (38867), art. nr. 38867.
- Ruiters Sébastien, Sun Yi, de Jong Stéphan, Politis Constantinus, Mombaerts Ilse (2016). Computer-aided design and three-dimensional printing in the manufacturing of an ocular prosthesis. *British Journal of Ophthalmology*, 100 (7), art.nr. bjophthalmol-2016-308399, 879-881.
- Chen Xiaojun, Xu Lu, Wang Wei, Li Xing, Sun Yi, Politis Constantinus (2016). Computer-aided design and manufacturing of surgical templates and their clinical applications: a review. *Expert Review of Medical Devices*, 13 (9), 853-864.
- Chen Xiaojun, Xu Lu, Sun Yi, Politis Constantinus (2016). A review of computer-aided oral and maxillofacial surgery: planning, simulation and navigation. *Expert Review of Medical Devices*, 13 (11), 1043-1051
- Shaheen Eman, Sun Yi, Jacobs Reinhilde, Politis Constantinus (2016). Three-dimensional printed final occlusal splint for orthognathic surgery: design and validation. *International Journal of Oral & Maxillofacial Surgery*, 46 (1), art.nr. S0901-5027(16)30275-2, 67-71.
- Shaheen Eman, Khalil Wael, Ezeldeen Mostafa, Van de Castele Elke, Sun Yi, Politis Constantinus, Jacobs Reinhilde. (2016). Accuracy of segmentation of tooth structures using 3 different CBCT machines. *Oral Surgery, Oral Medicine, Oral Pathology and Oral Radiology*, 123 (1), 123-128.
- Politis Constantinus, Sun Yi, Shaheen Eman, Jacobs Reinhilde (2016). Einde van het gips in 't zicht. *A. Vesalius*, (2), 22-25.
- Shaheen Eman, Politis Constantinus (2016). The use of 3d virtual planning and 3d printing for the treatment of facial asymmetry: a case report. *Stoma Edu J* 3 (2), 156-161.



## ORAL PRESENTATIONS

E. Shaheen, Y. Sun, R. Coropciuc, J.T. Dormaar, J. Schoenars, R. Jacobs, C.Politis ACCURATE PRODUCTION AND VALIDATION OF DIGITAL INTERMEDIATE AND FINAL 3D-PRINTED WAEFERS FOR BIMAXILLARY ORTHOGNATIC CASES. Royal Belgian Society for Stomatology and Maxillo Facial Surgery spring meeting, Brussels, Belgium, March 18-19, 2016 [ORAL PRESENTATION]

Y. Sun, J. Schoenaers, Ph.Vuylsteke, J. Vranckx, L.Nanhekhan, R.Coropciuc, T. Dormaar, C. Politis (2016) DESIGN OF FIBULA-RECONSTRUCTION-PLATES IN ONCOLOGIC RECONSTRUCTION Royal Belgian Society for Stomatology and Maxillo Facial Surgery spring meeting, Brussels, Belgium, November 18-19, 2016 [ORAL PRESENTATION]

L. Groeneveldt , E. Shaheen , Y. Sun , R. Coropciuc , J. T. Dormaar, J. Schoenaers,R. Jacobs, C. Politis (2016) VOXEL BASED AMIRA 3D EVALUATION OF BIMAXILLARY ORTHOGNATHIC CASES. Royal Belgian Society for Stomatology and Maxillo Facial Surgery spring meeting, Brussels, Belgium, March 18-19, 2016 [ORAL PRESENTATION]

Y. Sun, R. Jacobs, C. Politis (2016)  
3D-PRINTING OF LOCKING RECONSTRUCTION PLATES: DESIGN AND PITFALLS  
Royal Belgian Society for Stomatology and Maxillo Facial Surgery spring meeting, Brussels, Belgium, November 18-19, 2016 [ORAL PRESENTATION]



## POSTER PRESENTATIONS

## UZ Leuven uses Amira software for postoperative evaluation of orthognathic patients

KU LEUVEN

Dr. Ir. Eman SHAHEEN, BSc, MSc, PhD,  
Department of Oral and Maxillo-facial Surgery -  
UZ Leuven

For the treatment of significant **skeletal malocclusion**<sup>1</sup> orthognathic surgery is indicated. Examples for skeletal malocclusion are diminished bite forces, restricted mandibular excursions, abnormal chewing patterns and temporomandibular disorders. Orthognathic surgeries are normally prepared by performing model surgery on plaster cast models in articulators using conventional face bows combined with 2D cephalometric. With the recent developments in oral imaging, more orthognathic surgeries are planned using 3D software for more accurate planning, time saving and better results.

For the preoperative preparation, Computed Tomography (CT) images are used for implementing the clinical plan virtually where surgical splints are designed and 3D printed in biocompatible material. For postoperative evaluations, Cone Beam Computed Tomography (CBCT) are taken for each patient 6 weeks, 6 months and 1 year after the surgery.

The main steps of the protocol contains voxel based registration, transformations, cephalometric analysis to get the output measurements between the postoperative maxilla and the planned maxilla. The first three steps are performed in the Amira software as described by Baan et al.<sup>2</sup> and the cephalometric and results part are obtained from another software.

The postoperative CBCT is registered to the preoperative CT using voxel based registration with mutual information. Only the cranial and orbital parts were used for the registration because these are not displaced during surgery.

The maxillary part of the preoperative CT is registered on the maxillary part of the registered postoperative CBCT. This second registration mimics the movements of the preoperative maxilla position to the postoperative position which is captured in a transformation matrix. The preoperative composite maxilla is imported into the Amira software and the transformation matrix is used to perform the actual transformation of the planned position of the maxilla to the postoperative achieved location of the maxilla in the Amira software.



The maxilla in postoperative position is then compared to the maxilla of the virtual planning via 3 landmarks using angular and linear measurements.

We currently changed our protocol to the use of the same CBCT for preoperative as well as postoperative imaging which will be beneficiary to the patients. Further improvements would be to include the evaluation of the distal and proximal parts of the mandible and to make it work also for orthognathic surgeries creating multiple segments. This protocol can also be used to evaluate the occurrence of relapse after 6 months and 1 year after surgery.

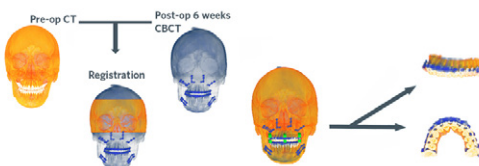
<sup>1</sup> AAOMS Parameters of Care:  
*Clinical Practice Guidelines for Oral and Maxillofacial Surgery (AAOMS ParCare '12)*

<sup>2</sup> Baan F, Liebrechts J, Xi T, Schreurs R, de Koning M, Bergé S, et al. (2016)

*A New 3D Tool for Assessing the Accuracy of Bimaxillary Surgery: The OrthoGnathicAnalyser. PLoS ONE 11(2): e0149625*

**Video** <https://youtu.be/8xKeYmpjFfo> YouTube

<https://www.fei.com/software/UZ-Leuven-uses-Amira/>





University of Leuven  
Department of Imaging & Pathology  
OMFS IMPATH Research Group  
Kapucijnenvoer 7 blok a - box 7001  
3000 Leuven  
BELGIUM  
+32 16 33 24 52  
+32 16 33 27 48  
[www.omfsimpath.be](http://www.omfsimpath.be)









