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SEDENTEXCT

Safety and Efficacy of a New and Emerging Dental X-ray Modality

Newsletter

Inside this issue:

Editorial: Costs and benefits: the perennial problem for healthcare

In these times of economic restraint in Western economies, the need to ensure "value for money" is more pressing than ever. Publicly-funded healthcare, while often seen as a priority area that must be protected from cuts, is not immune from this consideration. Even when health is improving through better prevention strategies and public health programmes, new therapies and technologies continue to pile on the financial costs. In this context, taxpayers expect those involved in healthcare to use common sense in choosing interventions that have been shown to work and that are affordable. Similarly, private health insurers will be very cautious about sanctioning payments for new diagnostics and treatments.

Providers of entirely private medicine may be look at this issue in a different way; new treatments and technologies may involve a significant financial outlay for the provider but, so long as a suitable charge can be levied on the patient, also offer a new way to add to profits. This is, of course, a view that would rightly alarm patients. If we take our car to the garage for a service, we would not be happy to have work done unless it was needed, so why should a patient be comfortable to have procedures performed that are not going to improve their health outcomes?

Whether we are talking about any purchase in life, whether healthcare related or not, we balance the costs against the benefits. Dentistry is a relatively small part of healthcare, and dental imaging is just a component of dentistry. Nonetheless, Cone Beam CT (CBCT) must be viewed against this background of health economics and economic evaluation. Costs do not, of course, stop at the purchase price of a machine; we must consider all direct and indirect costs associated with its use as well as the anticipated lifespan of the equipment. Conducting a cost analysis is onerous but readily achievable. "Effectiveness" is, however, more complex and needs careful thought about what we mean by an "effective" procedure.

There is a long-standing tendency for radiologists to look at the value of imaging techniques in terms of diagnostic accuracy. This is understandable; diagnostic accuracy is an undoubted indicator of effectiveness and radiologists are usually detached from the clinical decision-making that imaging influences. Diagnostic accuracy is not, however, synonymous with effectiveness. An example could be the detection of external root resorption. There are several publications in the literature demonstrating that, in laboratory studies, CBCT is more accurate at detection of [artificial] resorption cavities than conventional radiography. The implication of such results might be that CBCT should be used as the imaging technique of choice for imaging external root resorption. Putting aside the reservations about translating this laboratory work to real patients, such a conclusion would not be appropriate. The question that should be asked is: does this more accurate diagnostic information make any difference to treatment choices and, more importantly, to outcomes for the patient?

These questions underline the need for research addressing the higher levels of the hierarchical model of efficacy described by Fryback and Thornbury in 1991 [1], such as Therapeutic Efficacy (impact of imaging on treatment planning) and Outcome Efficacy (impact of imaging on outcomes of treatment). As part of the SEDENTEXCT project Work package 5, we are currently addressing some of this need for a number of illustrative applications of CBCT and we look forward to presenting the results of this work in the future in combination with cost analysis. We hope that these studies will act as exemplars for others to use. Only with this kind of research data can we conduct a meaningful assessment of benefit to weigh against costs.

Until a substantial research literature has accumulated, how can individual dentists, health insurers

Project partners

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More about SEDENTEXCT at: www.sedentexct.eu

EURATOM

The Seventh Framework Programme of the European Atomic Energy Community (Euratom) for nuclear research and training activities (2007 to 2011)

and public health services judge whether the costs of CBCT are balanced by the benefits? It is self-evident that three-dimensional imaging is superficially more attractive to users than two-dimensional radiography. It may even be proven that CBCT has better diagnostic accuracy for certain clinical applications. This is not the point. When considering purchasing CBCT equipment or when judging its value for a particular patient, we should always ask ourselves: "is CBCT likely to make any improvement to the experience or outcomes for the patient?" Unless the answer is yes, the costs will always exceed the benefits.

Keith Horner

SEDENTEXCT Project Coordinator

[1] Fryback DG, Thornbury JR. The Efficacy of Diagnostic Imaging. Med Decis Making 1991; 11 (2): 88-94

SEDENTEXCT Project meeting in Cluj-Napoca

The SEDENTEXCT project Consortium gathered on July 1-2 2010 for one of our regular meetings. These meetings are essential to allow face-to-face discussion on progress and to assess where we are progressing against project milestones. The current formula for meetings is a day devoted to Work package "Workshops", where the relevant scientists deal with the fine detail of the projects, followed by a day for the plenary Project meeting, where Work package leads present progress to all the Consortium and deal with project management issues.

The venue on this occasion was Cluj-Napoca, in the heart of Transylvania, Romania. For many, this was a first visit to this beautiful part of Europe and the brief times that we had away from the meeting whetted our appetite for a return at some point in the future. We were very thoughtfully hosted by the Cluj team, whose attention to our care and comfort was exemplary, including picking up some of us from the airport in the early hours of the morning.

The meeting helped to galvanise our efforts for the critical next six months of the project, at the end of which much of our work will reach fruition.

The next project meeting will be held in Vilnius, Lithuania on 29th-30th November 2010.

A moment of escape from the project meeting in Cluj. This image shows almost all Project members assembled together in the heart of the city.

SEDENTEXCT at the 30 month milestone: Work package reports

A regular part of our Newsletter is an update on the activities of the scientists in the SEDENTEXCT project. At times, the reader may feel that we are being "opaque" in our descriptions of work; this is necessary because some of the work is not yet ready for placing in the public domain, particularly where this involves potential intellectual property issues. Nonetheless, we hope that a useful idea of our work can be gained.

Work package 1 (http://www.sedentexct.eu/content/work-package-1-justification-and-guideline-development)

This WP addresses guideline development through an "evidence-based" approach.

Since the publication of the *Provisional Guidelines* document in 2009, this WP has been working quietly in the background, accumulating and categorising new publications on CBCT in the scientific literature. Now, however, the WP scientists are starting the exacting process of preparing to produce a "Definitive" Guidelines document in 2011. This starts with systematic review of publications by the Guideline Development Panel. All publications included in the Provisional Guidelines document are being re-examined so that we can obtain an overall picture of the state of knowledge on CBCT. As previously, the bulk of the effort relates to Justification and Referral Criteria, but we anticipate developing far more detailed and practical guidance on the other subjects of the Guidelines than was possible the first time round.

Work package 2 (http://www.sedentexct.eu/content/work-package-2-dosimetry)

This Work package works to conduct dosimetry studies on CBCT (patient and staff doses) and to develop effective methods for dosimetry modelling.

Phantom dosimetry (adult and paediatric) is completed and two important manuscripts are in various stages of preparation. Work has been performed dealing with scatter around CBCT machines which will have much practical significance for staff protection.

Work package 3 (http://www.sedentexct.eu/content/work-package-3-optimisation)

This Work package involves the SME partner, Leeds Test Objects Ltd, and there are important IP issues that prevent detail entering the public domain. As such, this is a limited report.

The QA phantom is now in the final stages of development, with refinement and trialling of the software taking place. We hope to be able to make a prominent announcement about this in the next Newsletter.

Work package 4 (http://www.sedentexct.eu/content/work-package-4-diagnostic-accuracy)

This Work package deals with "diagnostic accuracy" in clinical applications.

This Work package contains a series of clinical studies, involving patient recruitment for a number of key clinical applications of CBCT. This entails an enormous volume of work, particularly by our colleagues in Cluj-Napoca and Leuven. Recruitment has been very good and we look forward to completing this stage so that we can move on to data analysis.

Work package 5 (http://www.sedentexct.eu/content/work-package-5-cost-effectiveness)

This Work package is exploring the difficult and challenging area of economic evaluation of Cone Beam CT and collaborating with team members with international expertise in health economics.

Cost analysis of CBCT in four centres has now been completed and a publication manuscript is being completed for submission. The "other side" of the WP deals with diagnostic benefits. This is being done by observers examining case series of patients for whom CBCT has been used and quantifying the additional diagnostic information obtained by CBCT over conventional imaging. This is onerous work, as it involves scientists in diverse centres viewing images in identical conditions. For this, a laptop computer is passing around Europe .

Work package 6 (http://www.sedentexct.eu/content/work-package-6-training-and-valorisation)

This element of the project deals with "Training and valorisation".

Efforts are now being made to complete the Training elements of the Website.

This involves a website section with discussion forums for users and training materials. The latter includes Powerpoint presentations with voiceover and ancillary training elements.

SEDENTEXCT at ECDMFR in Istanbul

The 12th European Congress of Dento-Maxillo Facial Radiology (ECDMFR) was held in Istanbul, Turkey from 2 to 5 June 2010. This is the premier European scientific meeting for scientists and clinicians with an interest in this field of research. Following the pattern seen at other Dental Radiology Congresses in the past few years, the topics were dominated by CBCT. Scientists from SEDENTEXCT contributed oral and poster presentations, maintaining the high profile of the project.

Olivia Nackaerts (KU Leuven) presents her poster at ECDMFR

The following is a list of the titles and authorship of presentations at the Congress:

CBCT BONE QUANTIFICATION FOR PREOPERATIVE PLANNING OF ORAL IMPLANT PLACEMENT

Mihaela Hedesiu[1], Andrea Vicas[2], Grigore Baciut[2], Reinhilde Jacobs[3], Olivia Nackaerts[3],
[1]Department of Oral Radiology, "Iuliu Hatieganu" University, Cluj-Napoca, Romania. [2]Department of Maxillofacial Surgery, "Iuliu Hatieganu" University, Cluj-Napoca, Romania. [3]Department of Oral Radiology, Katholieke Universiteit, Leuven, Belgium. [4]SEDENTEXCT Consortium.

DENSITY AND MORPHOLOGY OF JAW BONE ASSESSED IN 2D AND 3D IMAGING METHODS

Olivia Nackaerts[1], Christiano Oliveira[2], Ivo Lambrichts[3], Keith Horner[4], Reinhilde Jacobs[1], Sedentexct Consortium[5]
[1]Oral Imaging Center, Katholieke Universiteit Leuven, Belgium. [2]Department of Radiology, Federal University of Bahia, Brazil. [3]Department of Morphology, University Hasselt, Belgium. [4]School of Dentistry, Manchester University, UK. [5]www.sedentexct.eu

A MODEL OF COST-ANALYSIS FOR DIAGNOSTIC IMAGING METHODS IN ORAL HEALTH CARE AN EXAMPLE OF USING INTRAORAL AND PANORAMIC RADIOGRAPHY AND CBCT FOR EXAMINATION OF RETAINED MAXILLARY CANINES

Helena Elisabeth Christell[1], Stephen Birch[2], Keith Horner[2], Madeleine Rohlin[1], Christina Lindh[1], the SEDENTEXCT project Consortium[4].
[1]Department of Oral and Maxillofacial Radiology, Malmö University, Malmö, Sweden. [2]Department of Oral and Maxillofacial Radiology, University of Manchester, Manchester, UK. [4]Listing of partners on www.sedentexct.eu

EVIDENCE OF COST-ANALYSIS ON DIAGNOSTIC IMAGING METHODS IN ORAL HEALTH CARE IS INSUFFICIENT. A SYSTEMATIC REVIEW

Madeleine Rohlin[1], Stephen Birch[2], Helena Christell[1], Keith Horner[2], Christina Lindh[1], Listing Partners[3]
[1]Malmö University, Malmö, Sweden. [2]Manchester University, Manchester. [3]Listing of partners on www.sedentexct.eu

EFFECTIVE DOSE RANGE FOR CONE BEAM COMPUTED TOMOGRAPHY SCANNERS

Ruben Pauwels[1], Jilke Beinsberger[1], Chrysoula Theodorakou[2], Anne Walker[2], Lesley Cockmartin[3], Hilde Bosmans[3], Reinhilde

Jacobs[1], Ria Bogaerts[4], Keith Horner[5], The SEDENTEXCT Project Consortium[6]
[1]Oral Imaging Center, School of Dentistry, Oral Pathology and Maxillofacial Surgery, Faculty of Medicine, Catholic University of Leuven, Belgium. [2]North Western Medical Physics, The Christie NHS Foundation Trust, Manchester, UK.
[3]Department of Radiology, University Hospital Gasthuisberg, Leuven, Belgium. [4]Department of Experimental Radiotherapy, University Hospital Gasthuisberg, Katholieke Universiteit Leuven, Belgium.
[5]School of Dentistry, University of Manchester, UK. [6]Listing of partners on www.sedentexct.eu

PAEDIATRIC ORGAN AND EFFECTIVE DOSES IN DENTAL CONE BEAM COMPUTED TOMOGRAPHY

Chrysoula Theodorakou[1], Ruben Pauwels[3], Jilke Beinsberger[3], Anne Walker[2], Ria Bogaerts[4], Keith Horner[1], The Sedentexct Project Consortium[5]
[1]School of Dentistry, University of Manchester, Manchester, United Kingdom. [2]North Western Medical Physics, The Christie NHS Foundation Trust, Manchester, United Kingdom. [3]Oral Imaging Centre, School of Dentistry, Oral Pathology and Maxillofacial Surgery, Faculty of Medicine, Katholieke Universiteit Leuven, Belgium. [4]Department of Experimental Radiotherapy, University Hospital Gasthuisberg, Katholieke Universiteit Leuven, Belgium.
[5]Listing of partners on www.sedentexct.eu

DEVELOPMENT OF A QUALITY CONTROL PHANTOM SPECIFICALLY DESIGNED FOR CBCT

Harry Charalabos Stamatakis[1], Kostas Tsiklakis[1], Ruben Pauwels[2], Adrian Walker[3], Reinhilde Jacobs[2], Keith Horner[4], The SEDENTEXCT Project Consortium[5]
[1]Department of Oral Diagnosis and Radiology, Dental School, University of Athens, Greece.
[2]Oral Imaging Centre, School of Dentistry, Catholic University of Leuven, Belgium. [3]Leeds Test Objects, Boroughbridge, UK. [4]School of Dentistry, University of Manchester, UK. [5]Listing of partners on www.sedentexct.eu

Profile: young scientists in SEDENTEXCT

Ausra Urboniene

Ausra Urboniene is a graduate in Environmental Physics and was awarded a Masters degree from Vilnius University in 2000. Since 2003, she has been working in the Radiation Protection Centre, Vilnius, Lithuania, as an engineer radiologist. Her work concerns measuring and evaluating occupational, environmental and patient doses of ionizing radiation. Her experience includes working with thermoluminescent dosimetry systems: calibration and maintenance, maintaining quality control procedures, evaluation of system uncertainty and performance of intercomparison measurements. She joined the SEDENTEXCT project in 2009 and works in Work Package 2 "Dosimetry", undertaking patients' CBCT dose measurements at Zalgirio Clinic of the Hospital of Vilnius University.

"I believe that dosimetric measurements performed at Vilnius University and the Radiation Protection Centre will lead to improvements in radiation protection and will also help to optimize and decrease patient doses in dentistry in Lithuania and in other European countries".

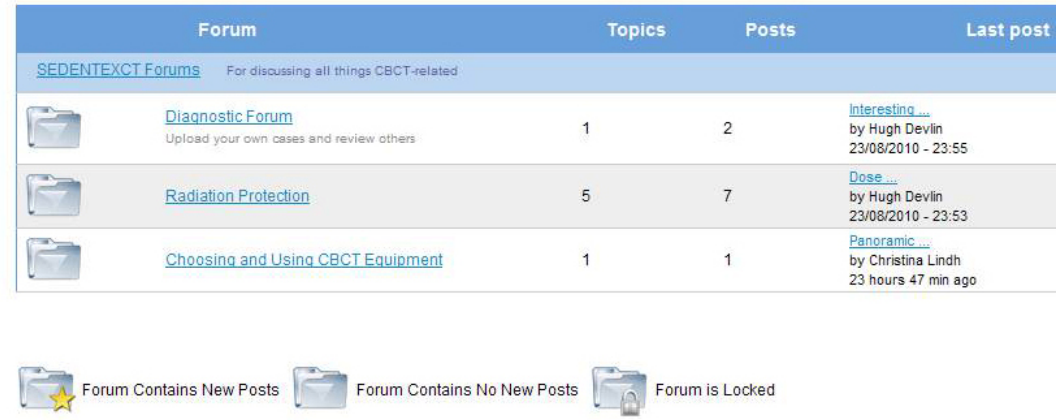
Project Officer change

Our project officer Roberto Passalacqua (see Newsletter 4) has now moved on to another project within the EURATOM family. We wish him well for the future and welcome "on board" André Jouve as our new Project Officer.

New project website developments

There are two new elements of the Project website www.sedentexct.eu which are now up and running.

The Forums section is now available for anyone to post and comment items of interest and debate relat-



ing to CBCT. All that is required is that you log into the site. Anyone who wants to join the Forums should contact gareth.hughes@manchester.ac.uk for a login name and password. The Forums use a simple format familiar to internet users. Please join our community!

Another important part of Work package 6 of the project is the development of a "Training" programme for users to learn about CBCT and aspects of Radiation Protection relevant to CBCT. The structure of this programme is now in place and project partners are populating the programme with Powerpoint presentations and other learning aids. Please visit the website and sample what is available.

There will be an extended commentary on the training elements of the website in our next Newsletter at the end of the year.

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http://cordis.europa.eu/fp7/euratom/ .

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