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SEDENTEXCT

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

Newsletter

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Project partners

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

Justification of CBCT

"Justification" of radiological examinations is a central pillar of radiation protection. The International Commission on Radiological protection (ICRP) reiterated its importance in their 2007 Guidelines, as did the European Commission (EC) Directive 97/43/Euratom of 1997, upon which national legislation in member states is based.

But what do we really mean by "justification"? Surprisingly, its meaning is hard to pin down. ICRP limits its use of the term to "*require that the net benefit be positive*", while recognising that it extends far beyond radiation dose and risk consideration to encompass financial cost and alternative methods of investigation. The EC Directive is more verbose, stating that medical exposures *"...shall show a sufficient net benefit, weighing the total potential diagnostic or therapeutic benefits it produces, including the direct health benefits to an individual and the benefits to society, against the individual detriment that the exposure might cause, taking into account the efficacy, benefits and risks of available alternative techniques having the same objective but involving no or less exposure to ionizing radiation".*

The challenge for clinicians is to relate this concept of "net benefit" to the real world clinical situation. Compared with many medical applications of X-rays, dental imaging does not save lives, but may contribute something to improved quality of life. Meanwhile, the radiation doses in dental imaging are relatively small, with only modest increases in risk. It would seem, therefore, that justification is not a simple matter for the dentist. This, perhaps, is one reason why prescription of dental radiographs varies considerably around the world and even between individual dentists. Weighing a small individual benefit against a small X-ray-associated individual detriment means that other factors (societal benefit, cost efficacy, availability of alternative diagnostic techniques) must play an increasingly important role. Practices in conventional dental radiography have evolved by custom and practice over a century, with an evidence-based approach only recently becoming adopted. As a result, some inappropriate practices, such as screening using panoramic radiographs, have become commonplace. In the case of CBCT we still have an opportunity to "get it right" before opinion-based practice becomes entrenched. Already, however, we are beginning to see in some countries the influence of third party payment/ insurance providers on when and how frequently CBCT can be used. Added to these factors, we have to take into account the influences of peer pressure to have, and to use, CBCT and perceived medico-legal concerns over not using 3-dimensional images in certain clinical situations, such as implant dentistry.

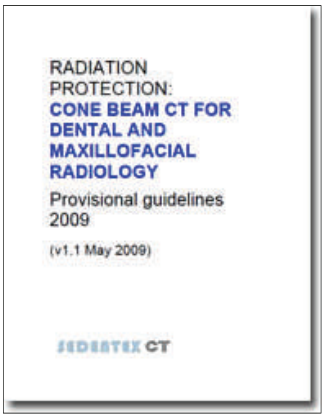
There is no easy answer to these challenges. In the end, it is often easiest to shrug our shoulders and go with our instincts. The provision of carefully prepared Referral (Selection) Criteria can, however, act as a standard of good practice against which dentists can make informed choices about imaging. The recent SEDENTEXCT Provisional Guidelines on CBCT (see p.2) make an initial attempt to provide such referral criteria, while recognising that much essential research evidence is lacking. Most of us seek a second opinion from a colleague when we are uncertain about patient management. For the dentist or radiologist considering using CBCT for a particular patient, the SEDENTEXCT referral criteria might best be seen as an "informed colleague" who can help to focus our decision-making.

What, however, should we do when the evidence is weak or published referral criteria do not give us clear guidance? Sometimes, our obsession with "technical efficacy" of CBCT distracts our thinking from what really matters: the outcomes of treatment as perceived by the patient. When considering the use of any diagnostic or therapeutic technique (such as CBCT) on a patient, perhaps we should be asking only one question of ourselves: *is using this going to improve the happiness and well-being of the patient?*

Keith Horner

SEDENTEXCT Project Co-ordinator

Provisional Guidelines on Dental Cone Beam CT published



In May of 2009, the SEDENTEXCT project reached a major milestone by the online publication of "Radiation Protection: Cone Beam CT for Dental and Maxillofacial Radiology. Provisional Guidelines".
The document was produced by a Guideline Development Panel (GDP) made up of members of the SEDENTEXCT Consortium. It builds upon the "Basic Principles" for CBCT use, developed by the European Academy of Dental and Maxillofacial Radiology and the SEDENTEXCT team. The method chosen was systematic review of the literature. The literature available for formal review was, however, limited in quantity. Because of this, the Guideline Development Panel also reviewed the many case reports/ series and non-systematic reviews available. Of particular note was the proliferation in CBCT equipment manufacturers and models; research evidence for one CBCT machine may not apply to other equipment. As a consequence, caution is recommended in generalising research findings. Many of the recommendations made were "Best Practice" rather than carrying any formal evidence grade, based upon the informed judgement of the Guideline Development Panel. It is important, therefore, to remember that these are provisional guidelines. We hope that, by the end of the SEDENTEXCT project (2011), sufficient high quality evidence will have accumulated to allow us to develop guidelines that are more "evidence-based".
The time required for review and guideline development means that the content lags behind the published research literature by some three months. In a rapidly changing research scene, the GDP will be updating these guidelines regularly during the project to take account of this. The document is freely available for download at: http://www.sedentexct.eu/guidelines where a feedback mechanism is also available.

Cone Beam CT has major presence at International Congress of Dentomaxillofacial Radiology

The International Association of Dentomaxillofacial Radiology (IADMFR) held its 17th International Congress of Dentomaxillofacial Radiology in Amsterdam from June 28th to July 2 2009. The IADMFR holds its Congresses biennially, giving an important opportunity for colleagues to meet and hear about the scientific work being carried out in their discipline.

The Congress theme was "Imaging in Perspective", reflecting the many changes and developments in dentomaxillofacial radiology, not least CBCT. The Pre-Congress course, "CBCT exposed" provided an excellent day's programme with eminent speakers, encompassing Basic principles (Willy Kalender, Germany), dosimetry (John Ludlow, USA), large field CBCT versus volumetric CT (Guy Marchal, Belgium), CBCT 3D imaging and navigation (Bassam Hassan, Netherlands) and a final presentation on CBCT in dentistry by SEDENTEXCT Work Package 3 leader Kostas Tsiklakis (Athens).

The Congress itself was notable by the prevalence of scientific work on CBCT. Around half of the oral presentations and one third of posters were about, or used, CBCT. The breadth and quality of the work presented was impressive and stimulating.

On the final day of the Congress, a special debate/ open session was held "Justification of CBCT: to scan or not to scan, that is the question", co-chaired by the SEDENTEXCT Project Co-ordinator, Keith Horner, Bill Scarfe (USA) and Andres Briner (Chile). Professor Horner began the debate with a short presentation on Justification, culminating in the presentation of two of the more controversial referral criteria for CBCT from the SEDENTEXCT Provisional Guideline document. There were some valuable contributions from the floor before time ran out and the Congress concluded.

There were a number of oral and poster presentations by SEDENTEXCT project members at teh Congress. These are given in full in this Newsletter.

SEDENTEXCT team abstracts from 17th International Congress of Dentomaxillofacial Radiology (ICDMFR)

The accuracy of CBCT in the assessment of artificially induced periapical bone lesions for deciduous and permanent teeth

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Introduction

Cone Beam Computed Tomography (CBCT) may offer improved diagnosis of periapical disease, but the literature is still sparse on this subject.

Objectives

To assess the accuracy of CBCT for diagnosis of simulated periapical lesions in an animal model.

Material and methods

Six pig mandibles (3 with mixed dentition, 3 with permanent teeth) were obtained with ethical approval and prepared by formalin fixation and with soft tissue simulation. Standardized periapical bone defects of 1x1mm; 2x2mm and 3x3mm were made in the premolar and molar regions after tooth extraction and root length measurement. Two different CBCT machines were used to image the mandibles, after repositioning of the teeth in the respective sockets. Seven examiners assessed the presence of apical periodontitis using a 5-point probability scale. Statistical analysis of CBCT accuracy for assessing simulated apical periodontitis was performed.

Results

The accuracy for periapical diagnosis was lower for deciduous teeth (57.8% accuracy) than for permanent teeth (71.6% accuracy). Sensitivity of CBCT for periapical lesion detection increased with lesion size for permanent teeth (65.3% for a 1mm ø defect, 82.1% for 2 mm and 93.9% for 3mm) but remained much lower for deciduous teeth (40.5% for 1mm ø defect, 35.7% for 2mm and 55.1% for 3mm).

Conclusions

CBCT was a useful method for diagnosis of simulated periapical lesions in permanent teeth.

Image analysis of a quality assurance phantom for cone beam CT

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Introduction

There is a lack of tools for quality assurance (QA) testing of cone beam CT (CBCT).

Objectives

To perform an extensive evaluation of a prototype head-sized QA phantom for CBCT.

Materials and methods

A prototype phantom with inserts for image quality analysis was developed by Leeds Test Objects Ltd. The phantom was scanned on 6 CBCTs (3D Accuitomo ®, SCANORA 3D®, GALILEOS®, ProMax 3D®, Picasso Duo®, Kodak 9000 3D®), one MSCT (SOMATOM Sensation 16®) and a high resolution microCT (SkyScan 1172®). Different image quality
parameters were evaluated using the phantom's inserts: spatial resolution, point spread function, line spread function, contrast resolution, image homogeneity, geometric accuracy, and metal artefacts.

Results

Spatial resolution proved to be dependent on voxel size, but also on the orientation of the inserts in the beam. Point spread function and line spread function estimation using, respectively, a steel wire and a Teflon® cube showed its potential for the analysis of spatial and contrast resolution. Further contrast resolution analysis on hydroxyapatite,
aluminium and air in PMMA surrounding showed similar results for all CBCT scanners. Analysis of homogeneity of all previously mentioned materials proved to be dependent on voxel size, exposure (mAs), and the position of the ROI (central vs. peripheral). Geometric accuracy analysis using a 2D grid proved to be as useful as by means of a helix or another three-dimensional shape. Metal artefacts originating from titanium rods proved to be highly device-dependent in their manifestation, showing the need for an objective and clinically relevant artefact analysis.

Conclusions and discussion

All preliminary analyses of this first prototype QC phantom showed its potential for routine quality assurance on CBCT. Based on the initial evaluations, the phantom can be further developed, together with a software analysis tool for (semi-)automatic QA testing.

The use of a specifically developed CBCT quality control phantom for examining the correlation between CBCT pixel intensity values and medical CT numbers

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Introduction
The relation between CBCT pixel intensity values and medical CT numbers using specially designed phantoms has been under investigation since the appearance of this new technique.
Objectives
To examine the use of a specially designed prototype CBCT Quality Control phantom in investigating the correlation between pixel intensity values as recorded by the NewTom3G CBCT unit and medical CT numbers for given materials.
Materials and methods
A prototype Quality Control phantom with test inserts of different materials, developed under the ongoing SedentexCT project, is used. The phantom includes inserts with areas of pmma, hydroxyapatite in different concentrations, aluminium and air. CT numbers of the different materials were recorded with a medical CT unit and consequent scans with a NewTom3G unit were performed. The consistency of the NewTom 3G pixel intensity values for each material and the correlation with the respective CT numbers were investigated.
Results
A correlation between the NewTom 3G CBCT pixel intensity values and medical CT numbers is found, although a non-linear relation is more apparent. Non-uniformity issues have been observed, mostly between the circumference and the central parts of the field of view.
Conclusions and discussion
The use of specifically designed phantoms for QC tests on CBCT units may prove helpful for determining the degree of uniformity of the CBCT scans and investigating the relation between CBCT pixel intensity values of different materials and the respective CT numbers.

A randomized controlled clinical trial comparing 2D versus 3D diagnostic strategies for the removal of impacted third molars

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Objectives
To compare the diagnostic accuracy and surgical outcome of Cone beam CT (CBCT) with panoramic radiography in assessing the mandibular canal before removal of impacted lower third molars.
Study design
Twenty-two subjects (18-51 yrs of age, 13 females) referred for surgical removal of impacted mandibular wisdom teeth to the Maxillofacial Surgery Department of the University Hospitals Leuven were recruited. They were randomly allocated to be radiographed using either panoramic radiography (Cranex Tome, Soredex) or CBCT imaging (Scanora 3D, Soredex). A total of 30 impacted mandibular wisdom teeth were thus included with the presurgical planning and the subsequent surgery being either a CBCT-based or a panoramic-based wisdom tooth-extraction. The perisurgical observations on the vicinity or relation of the mandibular canal with the wisdom tooth served as gold standard for the diagnostic accuracy. The post-operative measures allowed an essential assessment of the surgical outcome in both groups. Radiologic observations were related to peri- and post-operative data, reporting a variety of intraoperative measures on the local tooth-bone situation and any observed tooth-nerve contact besides the post-operative complaints and potential neurosensory disturbances.
Results
CBCT images were significantly better than panoramic images to locate the third molar in the 3-dimensional jaw bone, identify potential ankylosis sites and determine its relation to the mandibular canal. CBCT was significantly better in deciding the surgical removal strategy which led to a decreased surgical time and less post-surgical complaints and neurosensory disturbances.
Conclusions
CBCT had a significantly superior diagnostic accuracy than panoramic images for predicting the relation of the mandibular canal with the roots of impacted wisdom teeth roots. This allowed a more efficient surgical procedure with less post-operative complaints.

Economic evaluation in oral health care

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Introduction
Economic evaluation attempts to weigh costs and effects of alternative interventions with the goal that available resources are used to achieve maximum benefits for patients in terms of health and quality of life. In emerging technologies this is particularly important to avoid inappropriate and excessive use.
Objectives
To analyse evidence on economic evaluation in oral health care, particularly on diagnostic imaging methods, by systematic review.
Material and methods
A search for literature was made starting with a hand made search according to the pearl growing model. This search strategy means that articles and relevant literature are retrieved by talking to renowned specialists in the subject area and by finding indexing and MeSH terms by looking at those articles and their reference lists. From seven articles indexing terms and MeSH terms were chosen and searches were made from PubMed, the Cochrane Library and Science Citations Index. The retrieved primary studies that according to the abstract contained a cost-effectiveness analysis were interpreted by two reviewers using a check-list for assessing economic evaluations (Drummond et al. 2005).
Results
The literature search yielded 258 titles and abstracts. Out of these, 93 studies were selected and read in full text. There was a vast heterogeneity in study design. No clear evidence was found. Methodology regarding the odontological part was acceptable in a few studies

but the methodology for the economic evaluation was insufficient.

Conclusions and discussion

This review reveals a need for studies with improved quality in economic evaluation in oral health care. We will propose and discuss a model for economic evaluation of diagnostic methods that will contain information of how to (i) identify costs (ii) categorise costs and (iii) value costs. This model will be applied in the SEDENTEXCT project on Cone Beam Computed Tomography.

Reference: Drummond MF, Sculpher MJ, Torrance GW, O´Brian BJ, Stoddart GL.Methods for the economic evaluation of health care programmes, Oxford, 2005, Oxford Medical Publications, 3rd ed.

CBCT accuracy for detection and measurement of bone defects – a comparative study with stereomicroscopy as a gold standard

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Introduction

Due to its high spatial resolution characteristics, CBCT may prove a useful tool for quantification of the bone structure of the maxillofacial area.

Objectives

To assess the sensitivity of two different CBCT machines and one MSCT for identification and linear measurement of cortico-trabecular bone defects using stereomicroscopy as the gold standard.

Material and methods

Five pig hemimandibles prepared using formalin fixation and soft tissue simulation were selected to simulate spherical bone defects on the lingual cortex. Another 5 pig hemimandibles were sectioned at the premolar/molar level, obtaining 20 bone blocs, designated for the creation of standardized cortico-trabecular bone defects (diameters 0.5; 0.8; 1; 1.2 and 1.5 mm). CBCT scans and MSCT scans (Bright Speed 8, GE) of all specimens were performed. Seven examiners evaluated these images independently under controlled viewing conditions to identify the presence, number and dimensions of the bone defects. The results were compared to gold standard measurements obtained by stereomicroscopy and dedicated image analysis software.

Results

The smallest lesion size that could be detected on CBCT images was 0.8 mm in trabecular bone (sensitivity=0.58) in contrast to MSCT images, on which only trabecular bone defects larger than 1.2mm (sensitivity=0.50) could be detected. MSCT tended to overestimate the trabecular hole size, while CBCT tended to underestimate the size compared to stereomicroscopy measurements.

Conclusions

CBCT could detect smaller bone defects than MSCT, although lesion size tended to be underestimated compared with MSCT.

Entrance skin dose measurements in dental CBCT

Cockmartin L[1], Pauwels R[1], Bogaerts R[2], Stamatakis H[3], Theodorakou C[4], Ziliukas J[5], Walker A[4], Horner K[6], Jacobs R[1], the SEDENTEXCT Project Consortium[7]. [1]Oral Imaging Centre, School of Dentistry, Oral Pathology and Maxillofacial Surgery, Faculty of Medicine, Catholic University of Leuven, Belgium; [2]Department of experimental Radiotherapy, University Hospitals Leuven, Belgium; [3]Department of Oral Diagnosis and Oral Radiology, School of Dentistry, University of Athens, Greece; [4]North Western Medical Physics, Christie Hospital (NHS) Trust, Withington, Manchester, England; [5]Radiation Protection Centre, Vilnius, Lithuania; [6]School of Dentistry, University of Manchester, UK; [7]Listing of partners on www.sedentexct.eu

Introduction

Dental cone beam CT (CBCT) has been subject to a number of radiation dose evaluations. However, effective dose estimations on anthropomorphic phantoms, or dose quantifications such as the dose-area product, cannot be directly translated to an individual patient.

Objectives

To estimate patient skin dose for CBCT examinations, which can aid in the estimation of effective dose for subsets of patients, and in the determination of dose reference levels (DRLs) for dental CBCT.

Materials and methods

Patient selection was based on age, body mass index (BMI) and craniofacial distances within standard ranges. Ethical approval and informed consent were obtained. Five groups of common radiographic indications were determined, taking ten patients per indication. Eight thermoluminescent dosimeters (TLD-100) were attached on the patient's face and neck. Two TLDs served to capture the background dose. Patients were scanned on the Scanora® CBCT, using the default scanning protocol for the particular indication. Furthermore, entrance dose was measured on the Alderson RANDO and Alderson Radiation Therapy (ART) phantoms to verify the consistency of the entrance dose measurements in standard conditions.

Results

Average skin absorbed doses per patient varied between 345μGy and 1552μGy with a mean value of 879μGy. The highest radiation doses were received in the area of the mouth (2057μGy) and the salivary glands (1173μGy (parotid glands) and 1051μGy(submandibulary glands). The lowest mean absorbed dose was perceived in the thyroid area (156μGy) and the eyes (136μGy). Average skin absorbed dose for the RANDO phantom was 759μGy; for the ART phantom it was 846μGy.

Conclusions and discussion

Skin dose values are influenced by a number of factors, which can be device-, operator and patient-dependent. When coupled with phantom dose measurements, dose simulations or dose-area product values, in vivo dose measurements can aid in theestimation of the effective dose for an individual patient.

Radiographic detection of artificial bone lesions in an *in vitro* mandible

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Objectives

To assess diagnostic accuracy for diagnosis of bone lesions *in vitro* with different Cone Beam CT (CBCT) devices and conventional 2D radiographs.

Materials and methods

A dry human mandible was cut in five serial blocks, artificial bone lesions were created with different depths: 150 µm, 175 µm, 200 µm, 250 µm and 300 µm. Lesions were created in the trabecular bone and in the cortico-trabecular area. Periapical radiographs were made using VistaSCAN perio® (Dürr Dental AG, Bietigheim-Bissingen, Germany). CBCT images were made using Scanora 3D® (Soredex, Finland), 3D Accuitomo® (J.Morita, Japan), Galileos® (Sirona, Germany), Kodak 9000 3D® (IMTEC/Kodak dental System, USA), ProMax 3D® (Planmeca, Finland) and Picasso® (Vatech, Korea). Six calibrated observers, evaluated all digital images with at least one week between subsequent sessions. Observers rated the presence or absence of lesions in the trabecular layer and in the cortico-trabecular area on a 5-point probability scale. The observers indicated the locations of the lesions on schematic figures of the bone blocks for both imaging modalities.

Results

CBCT images were significantly better to detect bone lesions in the mandible than periapical images. For the different CBCT systems, minimal detection threshold ranged from 175 µm to 250 µm. More specific, for the Scanora 3D® the threshold was 175 µm. For ProMax 3D® and 3D Accuitomo® it was 250 µm. The detection of bone lesions in the cortico-trabecular area was significantly better than the detection in trabecular bone. Detecting the cortico-trabecular lesions with the Galileos® was more difficult compared to the other CBCT devices.

Conclusions

CBCT images show a significantly better diagnostic accuracy than periapical images. For the different CBCT systems, the threshold for detecting bone lesions ranged from 175 to 250 µm.

A survey of organ and effective doses for seven dental cone beam computed tomography (CBCT) units

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Introduction

Dental CBCT has been associated with higher radiation risk compared to conventional dental imaging and lower radiation risk compared to multi-slice CT (MSCT). Several studies have reported on radiation doses but the number of TLDs and the range of CBCT units used were rather too limited to provide an accurate estimation of the radiation risk.

Objectives

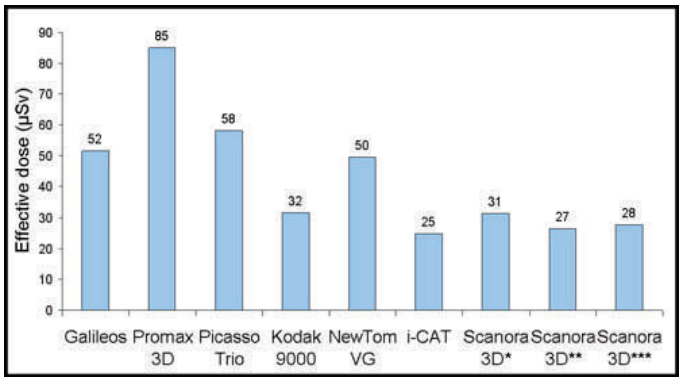
The objective of this study is to measure the organ (OD) and effective doses (ED) for seven dental CBCT units.

Materials and methods

Radiation absorbed doses were measured using two adult ART head and neck phantoms using a large number of thermoluminescent dosimeters (TLD-100 and TLD-100H) positioned at the most radiosensitive organs for seven CBCT. Correction factors were applied to the skin and red bone marrow absorbed doses for each phantom slice to account for the fraction of the total mass of the specified organ in the phantom. The EDs were calculated using the ICRP 103 tissue equivalent factors.

Results

The average ODs for brain, salivary glands, thyroid, red bone marrow and skin were 0.13 mGy, 1.52 mGy, 0.48 mGy, 0.02 mGy and 0.02 mGy respectively. The salivary glands and the skin received the highest and lowest absorbed doses respectively. PlanmecaProMax 3D and Scanora 3D exhibited the highest and lowest effective dose respectively. The wide range in the EDs for the same clinical examination can be attributed to the different exposure conditions set by the different manufacturers.



Conclusions and discussion

This study reported and compared organ and effective doses for seven dental CBCT units. In addition, this study confirmed that CBCT radiation doses are one-twentieth of published MSCT radiation doses but four times higher than the average panoramic dose published by the Health Protection Agency (UK).

SEDENTEXCT project progress

SEDENTEXCT is now over 18 months old and approaching its half way point. There has been steady progress since the last Newsletter, some excellent achievements and, inevitably, a few setbacks. Each Workpackage is reported below, highlighting the events of the last six months.

Work package 1 (http://www.sedentexct.eu/wp1)

This Work package deals with Guideline development through systematic review. The past six months have been eventful. The systematic review process was finished early in the new year, and the next stage was to use the information to develop evidence-based guidelines. The team that had contributed to the systematic review process were invited to a Guideline Development Panel meeting in Manchester in March. We met for two days, during which time we carefully considered the evidence collated from the systematic reviews. The biggest challenge was to develop the Referral Criteria. To facilitate the process, the Panel were asked to consider, for each potential clinical application of CBCT, "can you recommend CBCT as a routine method of imaging for....?" and, if the answer was no, "can you recommend CBCT in specific situations for...?". In subsequent weeks, a lot of effort was put into writing the Provisional Guideline document (see p.2 of this Newsletter), leading to the launch in May 2009.

We are having a brief rest at the moment, but in September we plan to recommence the process, with a view to producing an updated version of the Provisional Guideline document in early 2010.

Work package 2 (http://www.sedentexct.eu/wp2)

Getting the methodology correct is key to a successful project. In WP2, some considerable time has been spent dealing with calibration of TLDs between the participating centres and in refining the original protocol for WP2.1, leading to a slight delay on the project progress. The determination of a standardised dose index has proven to be complicated for dental CBCT, based on the results from measurements up to now. Measurements with a water phantom by Leuven and with a PMMA phantom in Manchester have been carried out and a preliminary report prepared, containing currently performed measurements. Measurements will continue in the next few months to obtain a more detailed view on the dose distribution, which will allow for an appropriate definition of a dose index.

Anatomical phantom dosimetry has been performed for a wide range of CBCT equipment, and this work is continuing. Some results were presented at the 17th ICDMFR in Amsterdam and we are pleased with the progress we have made here, particularly using paediatric phantoms. Meanwhile, we have made early progress on *in vivo* dosimetry, mathematical modelling and scatter dose assessment.

Work package 3 (http://www.sedentexct.eu/wp3)

Reviewing of the specifications for the 2nd prototype stage phantom and inserts was mandatory after the initial software results. Several changes were suggested to the original design of the phantom housing, its positioning and alignment together with additional modifications on the design of specific inserts. The initial evaluation results and the concluding modifications on the design of the phantom were presented in detail at the 17th ICDMFR in Amsterdam as oral presentations and posters, while a paper has already been submitted to the DMFR journal. Regarding the software development, it was decided that the MATLAB approach described in the DoW is still the most suitable for the needs of the WP, only with the addition of ImageJ as a necessary initial extra step for evaluating the inserts, resulting to a standalone software tool for the evaluation of the prototype phantom images.

Work package 4 (http://www.sedentexct.eu/wp4)

Since January 2009, a great amount of time has been spent in finalizing the *in*

vitro section of WP 4 (diagnostic accuracy). Within this *in vitro* section, we started writing down the reports on diagnostic accuracy in detecting bone and root lesions *in vitro*. The challenge was to remain up to date in the use of CBCT devices for comparative studies. Therefore some additional scans and analyses were done for all studies. The bone/root defect studies have now been rounded out for report writing but we will continue scanning the material for further comparison of state of the art techniques. Of the selected samples for segmentation accuracy, µCT images were taken for gold standard purposes. Image analysis has started in the form of image registration and the automated calculation of deviations from the gold standard. The report of all calculations is expected in May 2010.

The clinical studies in this work package for diagnostic accuracy of CBCT in clinical cases have made slow but steady progress in recruitment. The coming months this section of the work package will receive most attention.

Work package 5 (http://www.sedentexct.eu/wp5)

The Work package is investigating the cost and diagnostic efficacy of CBCT compared to conventional radiographic examinations. During the latest period focus has been on patients with retained maxillary canines. Eight different protocols were developed to be able to analyse cost for intraoral and panoramic radiography and for CBCT for this group of patients. These protocols will serve as model protocols to be used for patients with other clinical conditions where CBCT is currently used. The cost analysis was based on actual costs (labour, equipment, technique and overhead) and patient costs in terms of time spent in clinic and travel costs. More than 100 patients with retained maxillary canines have been examined in Cluj, Leuven, Malmö and Vilnius. As a result from the cost analysis it can be concluded that examination with CBCT is more costly compared to examination with intraoral and panoramic radiographs in combination for patients with retained maxillary canines. The work to also analyse the diagnostic benefits of CBCT compared to the conventional examinations has begun as well as examinations of patients with other clinical conditions such as radiography before implant treatment and removal of lower wisdom teeth.

Work package 6 (http://www.sedentexct.eu/wp6)

This work package deals with the delivery of online training and information dissemination through a web portal, with content based on the findings of a needs analysis conducted among stakeholders (WP6.1). This element of the project initially suffered major delays due to recruitment issues; these have now been resolved and a full time web developer is now employed within Manchester University to deliver the work package.

A first draft of the website will be delivered at the end of August 09. Much of the site content is currently being generated via stakeholder contributions to the wiki software which has been specially developed for the project. This first version of the site also features a 'diagnostic forum', allowing discussion of CBCT imagery among stakeholders. Future work scheduled for the remainder of 2009 and into 2010 includes the delivery of online assessments and interactive 3D visualisations of CBCT images.

Profiles: young scientists in SEDENTEXCT

As usual in our Newsletters, we focus on the younger members of our teams and try to see how their involvement in the project will benefit them.

Anastasia Mitsea

Anastasia graduated from the Dental School of the University of Athens and obtained her MSc degree in "Oral Diagnosis and Radiology" in 1999 at the Dental School. She obtained her PhD degree in 2008 at the Medical School, University of Athens, Greece. Anastasia has also ob-

tained several postgraduate certificates in Oral Radiology and Forensic Dentistry and currently finalized her PhD in Oral Radiology in the Dental School, University of Athens, Greece. She was involved in the Osteodent project (5th EC Framework Programme).

Anastasia says: "Working in the Osteodent project gave me a unique opportunity to collaborate with European researchers. Being able to share their experience and knowledge, helped me to advance my scientific profile.

My participation with the SEDENTEXCT team, would be beneficial to expand my knowledge and to develop my competency to organize an excellent scientific research. I look forward to completing this research with great enthusiasm and I value my contribution towards this project, especially as scientists of different fields from several European Universities are taking part".

Gareth Hughes

I initially trained as an ecologist, gaining my MSc in Behavioural Ecology in 1998 in Manchester, but have worked in web development in both the private and university sectors since studying computer science at Aberdeen University in 1999. My main interests are in online database development, web standards and the utilisation of 3D technologies in web development. Prior to moving to Manchester University I worked in the delivery of several web development projects at Salford University, mainly concerning the Built Environment.

I am currently working on work package 6 of the SEDENTEXCT project which is concerned with the development of a Web portal that offers training, education,

information and guidelines to stakeholders about CBCT. I'm very much looking forward to developing techniques for delivering 3D CBCT content to users of the SEDENTEXTCT website and gaining experience in working as part of an international collaborative project.

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"Provisional Guidelines on CBCT for Dental and Maxillofacial Radiology" can be downloaded at:

http://www.sedentexct.eu/guidelines

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

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