



Basic Principles for Use of Dental Cone Beam CT

**Consensus Guidelines of the European Academy of Dental and
Maxillofacial Radiology**

January 2009

The Academy

The objective of the European Academy of DentoMaxilloFacial Radiology (EADMFR) is to promote, advance and improve clinical practice, education and/or research specifically related to the specialty of dental and maxillofacial radiology within Europe, and to provide a forum for discussion, communication and the professional advancement of its members.

EADMFR has a membership exceeding 300 individuals whose special interest is imaging of the dental and maxillofacial region. It is multi-disciplinary, including dental radiologists, medical physicists, radiographers and scientists. It includes both academics (teachers and researchers) and clinicians.

The Guidelines

The introduction of Cone Beam Computed Tomography (CBCT) represents a radical change for dental and maxillofacial radiology. The three-dimensional information appears to offer the potential of improved diagnosis, for a wide range of clinical applications and usually at lower doses than with “medical” multislice CT. Usually, however, CBCT gives increased radiation doses to patients compared with conventional dental radiographic techniques. While there is a rapidly accumulating literature on CBCT, there are no current evidence-based guidelines on its use and there is a risk of inappropriate examinations being performed. The latter is a particular concern where CBCT equipment is sited in primary dental care without the skills of radiology specialists.

EADMFR recognised an urgent need to set standards for CBCT use. This need has also been recognised by the European Atomic Energy Community's Seventh Framework Programme (Euratom FP7, 2007-11), which has co-funded a research project “SEDEXCT” (Safety and Efficacy of a New and Emerging Dental X-ray Modality) in 2008 which aims to acquire key information necessary for sound and scientifically based clinical use of Cone Beam Computed Tomography (CBCT). As part of this aim, the project has set an objective of developing evidence-based guidelines for dental and maxillofacial use of CBCT.

In the absence of a satisfactory volume of evidence upon which detailed guidelines can be currently devised, some basic principles can be based upon existing sources. These include fundamental international principles, EU Directives^{1,2} and previous Guidelines³. In view of the mutual aims of EADMFR and SEDEXCT, a decision was taken to collaborate in the development of a set of “Basic Principles” for the use of dental CBCT.

A Guideline Development Panel was formed to develop a set of draft statements using existing EU Directives and Guidelines on Radiation Protection. These statements were revised after an open debate of attendees at the 11th EADMFR Congress on 28th June 2008. A modified Delphi

procedure was then used to present the revised statements to the EADMFR membership, utilising an online survey in October/November 2008. Consensus of EADMFR members, indicated by high level of agreement for all statements, was achieved without a need for further rounds of the Delphi process.

A set of 20 “Basic Principles” on the use of Dental CBCT have been devised. They will act as core standards for EADMFR and, it is hoped, will be of value in national standard setting within Europe for dentists, dental specialists and equipment manufacturers.

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Kostas Tsiklakis, Immediate Past President EADMFR

Eric Whaites, Founding President EADMFR

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January 2009

References

1. The Council of the European Union. Council Directive 96/29/Euratom of 13 May 1996 laying down basic safety standards for the protection of the health of workers and the general public against the dangers arising from ionizing radiation. Official Journal of the European Communities N° L 159, 1996. Available from:
http://ec.europa.eu/energy/nuclear/radioprotection/doc/legislation/9629_en.pdf
2. The Council of the European Union. Council Directive 97/43/Euratom of 30 June 1997 on health protection of individuals against the dangers of ionizing radiation in relation to medical exposure, and repealing Directive 84/466/Euratom. Available from:
http://ec.europa.eu/energy/nuclear/radioprotection/doc/legislation/9743_en.pdf
3. European Commission. Radiation Protection 136. European Guidelines on Radiation Protection in Dental Radiology. Luxembourg: Office for Official Publications of the European Communities, 2004. Available from:
http://ec.europa.eu/energy/nuclear/radioprotection/publication/doc/136_en.pdf

EADMFR Basic Principles on the use of Cone Beam CT

1	CBCT examinations must not be carried out unless a history and clinical examination have been performed
2	CBCT examinations must be justified for each patient to demonstrate that the benefits outweigh the risks
3	CBCT examinations should potentially add new information to aid the patient's management
4	CBCT should not be repeated 'routinely' on a patient without a new risk/benefit assessment having been performed
5	When accepting referrals from other dentists for CBCT examinations, the referring dentist must supply sufficient clinical information (results of a history and examination) to allow the CBCT Practitioner to perform the Justification process
6	CBCT should only be used when the question for which imaging is required cannot be answered adequately by lower dose conventional (traditional) radiography
7	CBCT images must undergo a thorough clinical evaluation ('radiological report') of the entire image dataset
8	Where it is likely that evaluation of soft tissues will be required as part of the patient's radiological assessment, the appropriate imaging should be conventional medical CT or MR, rather than CBCT
9	CBCT equipment should offer a choice of volume sizes and examinations must use the smallest that is compatible with the clinical situation if this provides less radiation dose to the patient
10	Where CBCT equipment offers a choice of resolution, the resolution compatible with adequate diagnosis and the lowest achievable dose should be used
11	A quality assurance programme must be established and implemented for each CBCT facility, including equipment, techniques and quality control procedures
12	Aids to accurate positioning (light beam markers) must always be used
13	All new installations of CBCT equipment should undergo a critical examination and detailed acceptance tests before use to ensure that radiation protection for staff, members of the public and patient are optimal
14	CBCT equipment should undergo regular routine tests to ensure that radiation protection, for both practice/facility users and patients, has not significantly deteriorated
15	For staff protection from CBCT equipment, the guidelines detailed in Section 6 of the European Commission document ' <i>Radiation Protection 136. European Guidelines on Radiation Protection in Dental Radiology</i> ' should be followed
16	All those involved with CBCT must have received adequate theoretical and practical training for the purpose of radiological practices and relevant competence in radiation protection
17	Continuing education and training after qualification are required, particularly when new CBCT equipment or techniques are adopted
18	Dentists responsible for CBCT facilities who have not previously received 'adequate theoretical and practical training' should undergo a period of additional theoretical and practical training that has been validated by an academic institution (University or equivalent). Where national specialist qualifications in DMFR exist, the design and delivery of CBCT training programmes should involve a DMF Radiologist
19	For dento-alveolar CBCT images of the teeth, their supporting structures, the mandible and the maxilla up to the floor of the nose (eg 8cm x 8cm or smaller fields of view), clinical evaluation (' <i>radiological report</i> ') should be made by a specially trained DMF Radiologist or, where this is impracticable, an adequately trained general dental practitioner
20	For non-dento-alveolar small fields of view (e.g. temporal bone) and all craniofacial CBCT images (fields of view extending beyond the teeth, their supporting structures, the mandible, including the TMJ, and the maxilla up to the floor of the nose), clinical evaluation (' <i>radiological report</i> ') should be made by a specially trained DMF Radiologist or by a Clinical Radiologist (Medical Radiologist)

Links

European Academy of DentoMaxilloFacial Radiology (EADMFR):

<http://www.eadmfr.org/>

The SEDENTEXCT project:

<http://www.sedentexct.eu/>

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

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

Contacts:

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SEDENTEX CT

The research leading to these results has received funding from the European Atomic Energy Community's Seventh Framework Programme (Euratom FP7, 2007-11 under grant agreement no. 212246 (SEDENTEXCT)).

