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Highlights from the Evidence-Based Guidelines on Cone Beam CT for Dental and Maxillofacial Radiology (SEDENTEXCT Project)

This document features highlights from the document *Radiation Protection No 172 – Cone beam CT for dental and maxillofacial radiology (Evidence-based guidelines* published in 2011 by the SEDENTEXCT project.)

The SEDENTEXCT document in its entirety has been incorporated by reference as part of the standards for BC. The highlights included in this summary document are therefore not a complete list. The reader should be familiar with the entire document in order to understand the full range and context.

1. INTRODUCTION AND GUIDELINE DEVELOPMENT

1.1 Imaging in dentistry and the dental and maxillofacial specialties

All stakeholders have a responsibility to deliver radiographic technology to patients in a responsible way, so that diagnostic value is maximized and radiation doses kept as low as reasonably achievable.

2. BASIC PRINCIPLES

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	Or staff protection from CBCT equipment, the guidelines detailed in Section 6 of the European Commission document 'Radiation Protection 136. European Guidelines on Radiation Protection in Dental Radiology' 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 (e.g. 8cm x 8cm or smaller fields of view), clinical evaluation ('radiological report') 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 ('radiological report') should be made by a specially trained DMF Radiologist or by a Clinical Radiologist (Medical Radiologist)

3. JUSTIFICATION AND REFERRAL CRITERIA

3.1 The developing dentition

Justification of X-ray examinations in children is especially important because of the higher risks associated with exposure in children (see section 2.4).

CBCT may be indicated for the localized assessment of an impacted tooth (including consideration of resorption of an adjacent tooth) where the current imaging method of choice is conventional dental radiography and when the information cannot be obtained adequately by lower dose conventional (traditional) radiography.

3.1.2 *Generalized application of CBCT for the developing dentition*

Large volume (craniofacial) CBCT, imaging at least the entire facial skeleton, is currently being used as a routine tool for orthodontic-related radiological assessment by some clinicians.

As in our previous review, the Panel felt that much of the literature on using large volume CBCT for routine orthodontic diagnosis and treatment was anecdotal, case report- and opinion-based, with a lack of evidence of significant clinical impact.

Large volume CBCT should not be used routinely for orthodontic diagnosis.

Research is needed to define robust guidance on clinical selection for large volume CBCT in orthodontics, based upon quantification of benefit to patient outcome.

3.2. Assessment of periapical disease

CBCT is not indicated as a standard method for identification of periapical pathosis.

Limited volume, high resolution CBCT may be indicated for periapical assessment, in selected cases, when conventional radiographs give a negative finding when there are contradictory positive clinical signs and symptoms

3.3. Endodontics

CBCT is not indicated as a standard method for demonstration of root canal anatomy.

Limited volume, high resolution CBCT may be justifiable for selected cases, where endodontic treatment is complicated by concurrent factors, such as resorption lesions, combined periodontal/endodontic lesions, perforations and atypical pulp anatomy.

3.4. Dental trauma

Limited volume, high resolution CBCT is indicated in the assessment of dental trauma (suspected root fracture) in selected cases, where conventional intraoral radiographs provide inadequate information for treatment planning.

3.5 Surgical applications

3.5.1 *Exodontia*

Where conventional radiographs suggest a direct inter-relationship between a mandibular third molar and the mandibular canal, and when a decision to perform surgical removal has been made, CBCT may be indicated.

3.5.2 *Implant Dentistry*

CBCT is indicated for cross-sectional imaging prior to implant placement as an alternative to existing cross-sectional techniques where the radiation dose of CBCT is shown to be lower.

For cross-sectional imaging prior to implant placement, the advantage of CBCT with adjustable fields of view, compared with MSCT, becomes greater where the region of interest is a localized part of the jaws, as a similar sized field of view can be used.

3.5.3 *Bony pathosis*

Limited volume, high resolution CBCT may be indicated for evaluation of bony invasion of the jaws by oral carcinoma when the initial imaging modality used for diagnosis and staging (MR or MSCT) does not provide satisfactory information.

3.5.4 *Facial trauma*

For maxillofacial fracture assessment, where cross-sectional imaging is judged to be necessary, CBCT may be indicated as an alternative imaging modality to MSCT where radiation dose is shown to be lower and soft tissue detail is not required.

3.5.5 *Orthognathic surgery*

CBCT is indicated where bone information is required, in orthognathic surgery planning, for obtaining three-dimensional datasets of the craniofacial skeleton.

3.5.6 *Temporomandibular Joint*

Where the existing imaging modality for examination of the TMJ is MSCT, CBCT is indicated as an alternative where radiation dose is shown to be lower.

4. TRAINING

4.1 Roles and responsibilities

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.

Continuing education and training after qualification are required, particularly when new CBCT equipment or facilities are adopted.

Dentists and dental specialists responsible for CBCT facilities who have not previously received “adequate theoretical and practical training” should undergo a period of theoretical and practical training that has been validated by an academic institution (University or equivalent) [*CDSBC added*:] or by an appropriate regulatory body.