CONE BEAM COMPUTED TOMOGRAPHY

[Adapted from the report by Dr. Shahril Effendi Bin Shuib]

ReviewGroup Membership

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Introduction

The definitive diagnosis of complex oral and maxillofacial problems is a challenge encountered in clinical practice. Sometimes it is done in a multidisciplinary team where different specialists of dental medicine have to manage and treat the patient. In such complicated cases good diagnostic tools and easy communication are essential. Computed science has an increasing impact in almost every aspect of the diagnosis, practice, treatment, research and education of such cases. The term Cone Beam Computed Tomography has become more popular nowadays especially in the oral and maxillofacial field.

Cone Beam Computed Tomography (CBCT) is a medical imaging technique consisting of X-ray computed tomography where the X-rays are divergent and form a cone. It has a tremendous impact on the diagnosis and treatment planning since it was introduced for the past last decade. CBCT provides a 3 dimensional radiographic image which is more reliable and accurate when compared to conventional dental radiography. With the development of CBCT, there is a reduction in radiation exposure to the patient when compared to conventional CT and therefore allows its use for safely obtaining 3 dimensional images of the craniofacial structures. This should allow the clinician to visualize the hard and soft tissues of the craniofacial region from multiple perspectives, which could have far-reaching implications for diagnosis and treatment planning.
This technology review was conducted following a request from Senior Director of Dental Health, Ministry of Health (MOH) Malaysia about the effectiveness, cost effectiveness and safety of using CBCT in dental field for expansion of CBCT utilization in MOH dental facilities.

Objective/Aim

The objective of this technology review is to review evidence on the effectiveness, cost-effectiveness and safety of using CBCT in MOH dental facilities.

Results and Conclusions

There was fair level of retrievable evidence to indicate that Cone Beam Computed Tomography is effective in improving dental diagnosis such as Inflamatory Roots Resorption, Root Fractures, Mandibular invasion by lower gingival carcinoma, assessment of fracture line, clarify morphology of periapical defect, detecting canine impaction and irreversible pulpitis. Subsequently, CBCT also can improve treatment plan compared to conventional radiography.

There was no retrievable scientific evidence on the safety or adverse events related to the use of CBCT in improving dental diagnosis and treatment planning from the scientific database. However, the United State Food & Drug Administration (US FDA) has cleared CBCT for premarket notification (510k) to sell in the US market and subjected to strict safety and quality rules (registered medical device). The US FDA regulates manufacturers of dental CBCT devices through the Electronic Product Radiation Control (EPRC) and medical device provisions of the Federal Food, Drug, and Cosmetic Act. Dental CBCT systems are classified under 21 CFR 892.1750. The American Dental Association (ADA) and the FDA recommended that clinicians perform dental X-ray examinations, including dental CBCT, only when necessary for the diagnosis or treatment of disease.

There was only one study reporting about cost analysis on CBCT in different health care systems. The cost of CBCT examination seemed to be vary in different health care systems, highest being in Malmö (€556.93), Sweden and the lowest being in Leuven (€233.06), Belgium. The capital cost of CBCT was reported to be in the range of £95,000 to £130,000 (depending on the software package).

Methods

Literatures were searched through electronic databases specifically PubMed, Medline, Cochrane, Ovid, Horizon scanning databases, other websites; US FDA, MHRA and from non scientific database - Google search engine. In addition, a cross-referencing of the articles retrieved was also carried out accordingly to the topic. Relevant articles were critically appraised and evidence graded using US/Canadian Preventive Services Task Force.