Diagnostic Efficacy of Cone Beam Computed Tomography in Paediatric Dentistry: A Systematic Review and Meta Analysis

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Abstract

Background: Regarding the clinical use of CBCT, a sizable number of guidelines have been established, including referral guidelines (sometimes referred to as "appropriateness considerations" and "eligibility requirements"). Although they have been revised, they discovered very little information specifically on the use of CBCT in children.

Aim: This systematic review and meta analysis was carried out to evaluate the diagnostic efficacy of CBCT in children

Methods and Materials: Data were extracted from studies included in systematic review and meta analysis using standardized forms for evaluation of research quality including evidence synthesis. Two review writers independently extracted data for the key studies on diagnostic efficacy, and disagreements were found and discussed with a third independant reviewer wherever required. The following data were included in the information that was extracted: authors details with year and country of publication, clinical context under which the study was carried out, purpose of imaging, level of diagnostic efficacy, description of sample of study participants, study settings, main outcomes of study, strengths of study and weakness of study. The pertinent data was recorded using a specific form for the other study categories. Though they weren't properly reviewed, case reports with less than five distinct cases were compiled to show the usage. Meta analysis was then carried out

Results: 13 publications were included. According to systematic analyses of research of diagnostic accuracy that were primarily conducted outside human body, CBCT can produce extremely high diagnostic levels of accuracy for root fracture in teeth that have not undergone endodontic treatment. The majority of studies involving the use of CBCT imaging compared to intraoral radiography showed minimal difference in diagnostic accuracy, and the evidence linking to CBCT with caries diagnosis was based primarily on ex vivo research. Acute dental infections were not indicated for CBCT based on any evidence of diagnostic effectiveness, and no pertinent guidelines could be located. According to the data, CBCT scanning is necessary before bone grafting because it enables a volumetric evaluation of the lesion. In perspective of radiation exposure, it is superior to CT.

Conclusion: CBCT can be useful in cases of acute infections of dental origin where traditional radiography technique is not able to indicate about the location of lesion even though there are signs regarding presence of lesion in bone. CBCT is useful in situations when traditional radiographic technique fails to locate suspected fracture of root in teeth having no previous history of endodontic management and subsequently provide adequate assistance in treatment planning.

Keywords: CBCT, diagnostic efficacy, paediatric patients

Introduction

Cone beam computed tomography popularly considered as CBCT is employed for a range of dental diagnostic procedures, including those involving adolescents and teenagers. The radiation exposure for CBCT is often larger than for conventional radiography. Due to the increased levels of dangers that come with X-ray irradiation in younger age groups, this fact is significant in use of CBCT in paediatric subjects. This has sparked work on CBCT dose optimization and justification in the setting of paediatrics. Additionally, unless its use results in cost savings somewhere else all along patient care pathway, the financial expenses of employing CBCT rather than, or in conjunction to, conventional imaging are likely to increase the overall expenditures of healthcare.[1,2]

Use of a diagnostic X-ray technology is not primarily determined by radiation dose or danger. Justification, a fundamental aspect of radiation safety, dictates that any potential advantages of its use must outweigh any risks. The advantages are conceptualised in a conceptual structure of diagnostic efficacy developed by Fryback and Thornbury in 1991. It is not certain that effectiveness present at lower levels also exists at greater levels.[3-9]

Regarding the clinical use of CBCT, a sizable number of guidelines have been established, including referral guidelines (sometimes referred to as "appropriateness considerations" and "eligibility requirements"). Although Horner et al. reviewed these, they discovered very little information specifically on the use of CBCT in children. This systematic review and meta analysis was undertaken primarily to evaluate this shortcoming.[10-12] The goal was to identify the clinical circumstances and age groups in paediatric patients in which the prescription of CBCT is appropriate or inappropriate. A general review question was created with the goal of achieving this goal: "What are the justifications and limitations for the application of CBCT in the dental treatment of paediatric and young adolescents as an aspect of diagnosis and management?"

Materials and methods

Eligibility criteria

Study designs

Pediatric in vivo studies of diagnostic effectiveness according to Fryback and Thornbury. (Table 1).

Included:

• Systematic evaluations of in vivo studies carried out to evaluate effectiveness of CBCT in diagnosis.

• Primary research on in vivo diagnostic effectiveness if they have not been included in a systematic review.

• Additional sources of information include literature reviews, case reports, case series, assessments of clinical CBCT use, and other identified research designs (observational research, observer reliability research, and guideline publications).

Excluded:

• Research on technological effectiveness (level 1)

• Research of any type whose goals were to assess therapies and in which CBCT was used just as a diagnostic instrument.

• Ex vivo and in vitro research

• Animal research.

• CBCT research on applications for orthodontics, while some flexibility was allowed if they were applicable to paediatric dentistry.

• Studies on radiation dosimetry.

Participants

Under 18-year-olds who are under treatment for any of six clinical situations (dental caries, dental infections of acute nature, trauma to dental tissues, anomalies of teeth, developmental disorders of face and teeth and pathological conditions of maxilla and mandible).

There is now a seventh clinical context category that includes "other uses" of CBCT. If statistics for the latter category could be extracted, we considered research that comprised both adults study participants and children/young study participants at the same time. Studies that were only applicable to adults study participants (18 years or older) were disregarded only if the clinical setting was deemed to clearly also apply to children and adolescents.

Intervention

Dental diagnostics utilising CBCT. Studies utilising CBCT and multislice ("medical") CT technology not intended for dental use were omitted.

Comparators

A standard reference comparator was necessary for investigations of diagnostic accuracy of level 2 (surgical exploration; histopathological evaluation; micro computed tomography; other technique judged to have adequate validity). Comparative evaluation with traditional dental radiography such as intraoral radiographic technique, panoramic radiographic technique, and cephalometric radiographic technique. or other imaging modality or another diagnostic test was anticipated for research at levels 2 to 6 of diagnostic efficacy. Trials without such a comparator were taken into consideration for admission at level 6 , on an individualized level.

Outcomes

Regarding the application of CBCT across the 6 healthcare situations under investigation, in contrast to any other imaging technique(s) or, in the absence of any imaging comparator, to clinical examination alone:

• A modification in one or more diagnostic accuracy measurements.

• A shift in diagnostic assumptions, such as doctors' assurance in their assessment or their assessment of the value of imaging in making a diagnosis.

• A change in the management decision(s), including the physicians' belief in the decision(s) they made or their perception of the value of imaging in that decision (s).

• A change in the patient's condition after treatment.

• A modification in costs, expense, cost-effectiveness, or other financial efficacy measure(s).

Setting

Oral healthcare research whether in a primary or secondary context.

Language

Prudently, research in languages other than English taken into consideration for inclusion if the review team had a translation tool.

Information sources and searches

Medical key terms (MeSH) and text terms associated with CBCT, children and adolescents, and dental problems were used to create literature search techniques. This search method was modified in certain places from Leclercq et al. .There was extensive literature search in reliable and authentic databases like Pubmed, Scopus, Web of Sciences, Ovidsp, Cochrane Library for obtaining papers focusing on diagnostic efficacy of CBCT in paediatric subjects.

Study selection

The searches were compiled and duplicate references were removed using EndNote. In order to find publications that may have matched the inclusion criteria, recovered abstracts and titles were independently reviewed by two reviewers from the team in pairs. A third group member assessed the screened lists and consolidated them into a separate single list. Two members of the review committee acquired the whole texts of these possibly eligible studies and separately evaluated them. Conversation with a neutral third party helped to address disagreements regarding eligibility. Studies were categorized into ten study design on the basis of the six clinical contexts (plus "other applications").

Data collection process

Data were extracted from studies included in systematic review and meta analysis using standardized forms for evaluation of research quality including evidence synthesis. Two review writers independently extracted data for the key studies on diagnostic efficacy, and disagreements were found and discussed with a third independant reviewer wherever required. The following data were included in the information that was extracted: authors details with year and country of publication, clinical context under which the study was carried out, purpose of imaging, level of diagnostic efficacy, description of sample of study participants, study settings,main outcomes of study, strengths of study and weakness of study. The pertinent data was recorded using a specific form for the other study categories. Though they weren't properly reviewed, case reports with less than five distinct cases were compiled to show the usage.(table 1,2)

Risk of bias in individual studies

The possibility of bias in systematic reviews and original research of diagnostic efficacy was evaluated independently by the two review authors. Table 4 displays the anticipated critical appraisal instruments. Disagreements were settled through conversation and, if necessary, the participation of a third neutral reviewer.

Data synthesis

In order to examine the connections and conclusions both inside and across the included research, we engaged in a rigorous narrative synthesis. The objective was to offer information that enabled for the identification of CBCT indications as well as contraindications precisely for each clinical condition.

Statistical analysis

It was done to create a descriptive synthesis of the study's outcome data. Quantitative information on the diagnostic efficacy in paediatric patients using CBCT was synthesised. Using the software namely Meta-Analyst and Review Manager software v.5.3 and the random-effect paradigm with maximal likelihood estimation, we carried out the meta-analysis. To carry out the statistical analysis, quantitative data and accuracy metrics were taken into account. The inconsistency test (I2) was used to assess heterogeneity; a value of > 50% was seen as a sign of significant heterogeneity. We took into account the 5% level of significance.

Table 1: The hierarchical Model of diagnostic efficacy. Fryback and Thornbury (1991)

Diagnostic accuracy level	Example measures of evaluation
Level six : Societal diagnostic efficacy	Cost per outcome alteration, cost analysis, and expenditure, evaluation from a societal perspective
Level five: Patient outcome efficacy	For eg:. Patients' pre-test to post-test improvements; avoidance of procedures or morbidity following test findings
Level four: Therapeutic efficacy	For eg. circumstances where the treatment plan was presented prospectively and changed from pre-test to post-test
Level three: Diagnostic thinking efficacy	For eg. Differences between pre-test and post-test diagnoses made by physicians; variation in the proportion of cases in a series where the image was deemed "useful" in forming a diagnosis
Level two: Diagnostic accuracy efficacy	Specificity,sensitivity predictive values, odds ratios for diagnosis, and analysis of the ROC curve
Level one: Technical efficacy	Greyscale, sharpness, contrast-noise ratio, spatial resolution, Modulation Transfer Function (MTF), and linear accuracy

Results

Study selection

A total of 13 papers were included. There was inclusion of original research, systematic reviews, case series and case reports. (Figure 1).

Risk of bias within systematic reviews and diagnostic efficacy studies

Jawad et al. (2016)[25], Goodell et al. (2018)[18], Christell et al (2012a)[9], Haney et al (2010)[19] had low risk of bias. Mak (2015)[35], Christell et al (2012a)[11], Alqerban et al. (2011)[2], Katheria et al (2010)[26] Bornstein et al (2009)[6] had high risk of bias. Sansare et al (2014)[44], Ziegler and Klimowicz (2013)[57], Botticelli and colleagues. (2011)[7], Wriedt et al. (2017)[55] had questionable risk of bias. (Table 4)

Results according to clinical context

Caries

The majority of studies involving the use of CBCT imaging compared to intraoral radiography showed minimal difference in diagnostic accuracy, and the information establishing association between diagnosis of dental caries with CBCT was based primarily on research carried outside body. (Abogazalah and Ando 2017). Ex vivo/in vitro radiography may produce images of higher quality than those obtained through clinical means, and artefact from nearby high impedance restorations is typically not present. According to an ex vivo investigation, employing CBCT rather than bitewing radiographs can help identify cavities of proximal lesions more precisely (Wenzel et al. 2013). The same group then conducted a clinical diagnostic precision research as a follow-up, which was included in our evaluation.[10-16] This investigation supported the ex vivo observations and came to the conclusion that carious lesions should be recorded on scans performed for other causes. The elevated levels of diagnostic effectiveness were not supported by research. Current recommendations unanimously against employing CBCT as a primary imaging modality for diagnosis of dental caries. (Sansare et al. 2014),(figure 2,3,4),(table 2,3)

Acute dental infections

Acute dental infections were not indicated for CBCT based on any evidence of diagnostic effectiveness, and no pertinent guidelines could be located. The use of CBCT can provide a higher level of diagnostic performance and efficiency than traditional radiographic technique for periapical bone cavities, according to systematic evaluations of ex vivo investigations. (Aminoshariae et al). Observational research shows that utilising CBCT leads to the identification of more periapical inflammatory lesions than when using periapical radiography. (table 2,3)

Dental trauma

According to systematic analyses of research of diagnostic accuracy that were primarily conducted outside human body, CBCT can produce extremely high diagnostic levels of accuracy for root fracture in teeth that have not undergone endodontic treatment. Additionally, these accuracy values are greater than those achieved with periapical radiography (Hidalgo Rivas ; Chang et al, Salineiro et al). (figure 2,3,4),(table 2,3). Cervical fracture at the cervical position was observed more frequently on CBCT leading to change in treatment planning (Bornstein et al),

Dental anomalies

CBCT resulted to an alteration in diagnosis of tooth location in a significant minority of cases. Studies that examined modifications to treatment decisions using CBCT discovered this in a portion of cases, leading to greater clinician confidence . These results appear to be relevant for any treatment-required unerupted tooth and impacted tooth. There was evidence that employing CBCT would affect patient outcomes, however there was evidence of higher expenses (Christell et al). Apart from case studies, there was little proof of the diagnostic effectiveness of other dental defects.[35-45] These included claims that CBCT was helpful for imaging dental morphological anomalies, particularly with endodontic treatment planning, specifically for the dens invaginatus anomaly, fusion, and gemination.),(figure 2,3,4),(table 2,3)

Developmental disorders

The majority of the CBCT imaging studies of people with cleft palate and lip patients were reported in the publications found by the current analysis that dealt with developmental problems. According to the data, CBCT scanning is necessary before bone grafting because it enables a volumetric evaluation of the lesion. In perspective of radiation exposure, it is superior to CT. It might be helpful to image the teeth near a cleft, however the studies we reviewed did not provide any proof that this altered treatment options or prognoses (Wriedt et al.). Despite they may be a part of a multidisciplinary teams caring for a child, paediatric dentists do not have an unique responsibility for managing clefts.[46-48] The review discovered that

CBCT played a part in the creation of three-dimensional information of the facial bones in addition to CLP patients.(figure 2,3,4), (table 2,3)

Added uses

In Online Resource 6, the use of CBCT for additional purposes is discussed. The review on forensic investigations (Murphy et al) contained one study on diagnostic accuracy, although it was mostly comparing results to those from panoramic radiographs and had little bearing on paediatric dental treatment. The use of CBCT in surgical planning for tooth autotransplantation is recognised due to its significance in paediatric study participants, specifically because it enables the creation of surgical guides and a three-dimensional model of the tooth that may be utilised to prepare the transplant site.[55-56],(figure 2,3,4), (table 3,4)

Table 2: Salient features of some studies included in the study

Authors and year of publication	Clinical context(s)	Diagnostic efficacy level	Imaging (index tests)	Key outcomes	Study strengths	Study weaknesses
Sansare et al. (2014), India[44]	Caries	Level 2	CBCT Bitewing radiography	The accuracy and sensitivity of CBCT was significantly higher statistically.	The investigators who evaluated the findings were kept unaware of the design of study to reduce the bias	Recruitment process unclear
Bornstein et al. (2009), Switzerland[6]	Dental trauma	Level 3	CBCT Periapical radiograph Occlusal radiograph	Cervical fracture at the cervical position was observed more frequently on CBCT leading to change in treatment planning	Consecutive patients Clearly described methods	Retrospective study Selection bias possible:
Ziegler and Klimowicz (2013)[57]	Dental anomalies	Level 2	1: CBCT 2: Intraoral or panoramic radiographs	Higher proportion of correct pre-operative localisation of bucco-palatal position using CBCT	Prospective study Surgical reference standard	Recruitment process unclear Uncertain time gap between the index tests
Haney et al. (2010)[19]	Dental anomalies and pathological	Level 3: Level 4:	1. CBCT: 2. Panoramic radiograph 3. Occlusal radiograph 4. Two	Assessors make different decisions on aspects of diagnosis and	Prospective study on consecutive patient sample Full range of	Presentation of images as print-outs on paper Risk of recognition

	conditi ons		periapical radiographs	treatment plans using CBCT for a minority of cases	conventional radiographs available	of cases by assessors;
Katheria et al. (2010)[26]	Dental anomalies and pathological conditions	Level 3: Diagnostic thinking efficacy and level 4: therapeutic efficacy	1. CBCT: 2. Panoramic image and maxillary occlusal image	No significant difference in "pathology diagnosis" using TR or CBCT		Retrospective design Small number of cases
Alqerban et al. (2011)[2]	Dental anomalies and pathological conditions	Level 3: diagnostic thinking efficacy	CBCT Panoramic radiography	Applying CBCT resulted in increased agreement amongst investigators for all parameters.	Consecutive patient sample Inter-observer agreement assessed thoroughly	Retrospective Major weakness was no intraoral radiographs, s
Botticelli et al. (2011)[7]	Dental anomalies	Level 3: Level 4:	1. CBCT: Conventional imaging: panoramic radiograph, periapical radiograph and lateral cephalogram	Observers' decisions based on CBCT and conventional radiography were statistically significantly different	Prospective Comprehensive conventional radiographic series Eight observers Clear written and visual presentation of findings	Lack of detail about conduct of index tests Images presented as Powerpoint presentations, with pre-selected CBCT images No intra-observer repeatability assessment Combining observations and decisions of assessors for data analysis
Christell et al. (2012a)[9]	Dental anomalies	Level 6:	CBCT	Healthcare systems' assessments of direct as	Input of health economist to research	No assessment of outcomes for patients

				well as indirect expenses differed.	team Consecutive patients	
Christell et al. (2012b)[11]	Dental anomalies	Level 6:	CBCT Panoramic radiograph	Framework for performing a cost analysis developed Adoption of “new” imaging method resulted in an incremental cost per examination	Novel framework for cost analysis of diagnostic methods Input of health economist to research team Consecutive patients	No assessment of outcomes for patients Based on single clinic: specifc costs not generalisable
Wriedt et al. (2017)[55]	Developmental disorders	Level 3	CBCT Panoramic radiograph	Comparing CBCT and conventional radiographic imaging, the type of cleft remained the same in majority of assessments.	Consecutive patients Twelve examiners Inclusion of study casts, not only imaging	Retrospective design No intraoral occlusal radiograph, only panoramic
Mak (2015)[35]	Pathological conditions	Level 2	CBCT Intraoral radiograph Panoramic radiography	No discernible variations in radiographic imaging's diagnostic efficacy.	Adequate evaluation of interpersonal bias for nine researchers	Sample size was relatively small, and a low incidence of resorption
Goodell et al. (2018)[18]	Pathological conditions	Level 4	CBCT RVG	Employing CBCT, treatment strategies in individual patients were modified in 56.7% of instances.	Clinical scenario provided to observers	Retrospective design Risk of selection bias
Jawad et al. (2016)[25]	Pathological conditions	Level 3	CBCT Conventional radiographs	CBCT and conventional radiographs showed root resorption in 63 percent and	Assessment of intra-observer repeatability made	Retrospective study Limited information on the sample

19 percent of patients, respectively.	of study participants

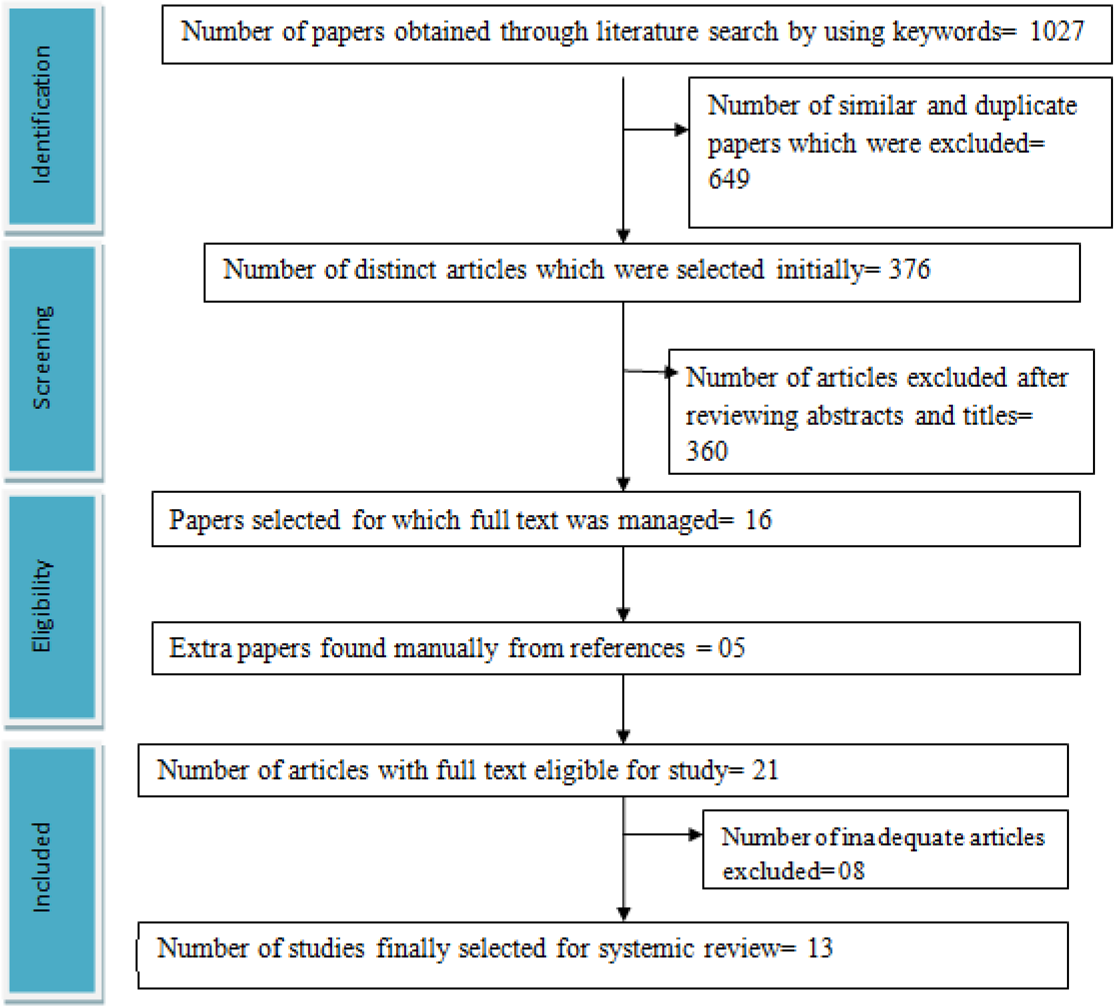

Figure 1: Prisma analysis showing the selection of articles in this systematic review and meta analysis

Table 3: Results from the meta analysis for diagnostic efficacy of CBCT in different clinical outcomes

	95% prediction	**Effect**	**tau² (95% CI)**	***P***	***n***	***I*² (95% CI)**
Caries	−2.29, 3.87	MD: 0.80 (0.50, 2.21)	0.4 (0.2, 0.76)	0.54	4	36% (4%, 91%)
Acute dental infections	NC	MD: −0.14 (−3.13, 2.01)	2.13(0.1, 258.55)	0.77	3	79% (4%, 98%)
Dental trauma	−20.99, 27.47	MD: −2.87 (−4.73, 0.21)	2.24(0.6, 33.62)	0.001	3	52% (6%, 98%)
Dental anomalies	NC	RR: 0.83 (0.51, 2.39)	0.23(0.4, 23.71)	0.001	3	71% (6%, 100%)
Developmental disorders	−12.83, 9.73	MD: −0.66 (−4.84, 3.74)	27.36(5.85, 95.63)	0.003	8	96% (84%, 96%)

Pathological conditions	−21.36, 24.96	MD: 2.92 (0.75, 3.01)	0.65(0.7, 18.46)	0.2	5	61% (7%, 94%)
Other uses	−2.29, 2.33	MD: 0.11 (−0.27, 0.32)	0 (0.4, 0.74)	0.73	4	34% (0%, 89%)

Table 4: Summary Cochrane ROB assessment for individual studies

Details of Study	Sequence generation	Allocation concealment	Blinding of participants, personnel	Blinding of outcome assessors	Incomplete outcome data	Selective outcome reporting	Overall bias	Overall
Sansare and colleagues (2014)[44]	?	+	+	+	?	?	?	?
Bornstein and colleagues. (2009)[6]	?	?	?	?	?	?	-	?
Ziegler and Klimowicz (2013)[57]	+	+	+	+	?	?	?	+
Haney and colleagues (2010)[19]	?	-	?	?	?	?	+	?
Katheria and colleagues. (2010)[26]	?	-	-	?	?	?	-	-
Alqerban and colleagues. (2011)[2]	?	-	+	-	?	?	-	-
Botticelli and colleagues. (2011)[7]	?	+	+	+	?	?	?	+
Christell and colleagues. (2012a)[9]	?	+	+	+	?	?	+	+
Christell and colleagues. (2012a)[11]	?	+	?	+	?	+	-	

Wriedt et al. (2017)[55]	?	-	?	?	?	?	?	+
Mak (2015)[35]	?	-	-	?	?	?	-	
Goodell et al. (2018)[18]	?	-	+	-	?	?	+	
Jawad et al. (2016)[25]	?	+	+	+	?	?	+	

+ Low Risk of Bias

? Unclear Risk of Bias

- High Risk of Bias

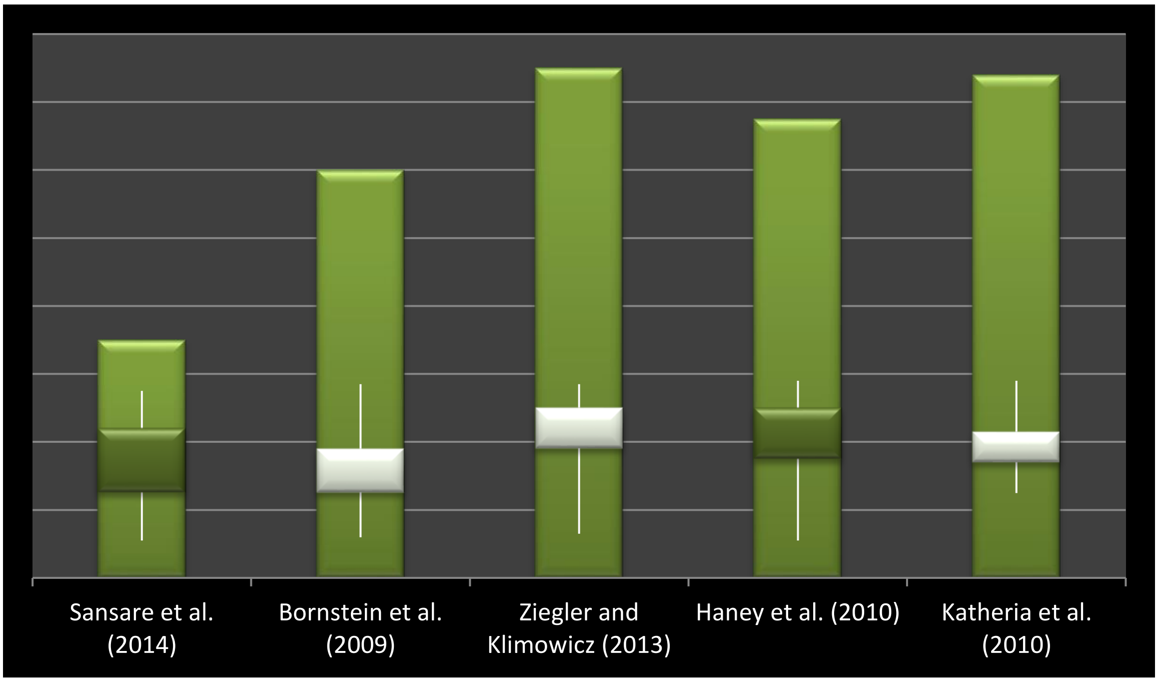

Figure 2: Box and whisker plot showing the analysis of different studies for diagnostic efficacy of CBCT in paediatric patients

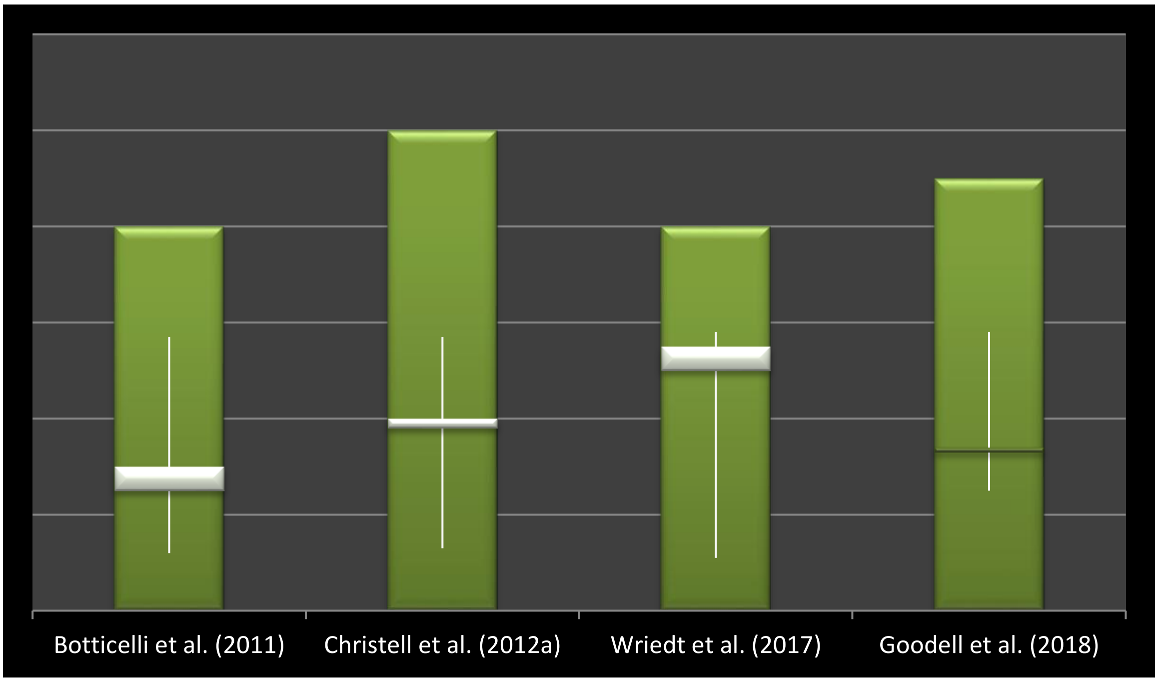

Fig 4: Box and whisker plot showing analysis of different studies for diagnostic efficacy of CBCT in paediatric patients

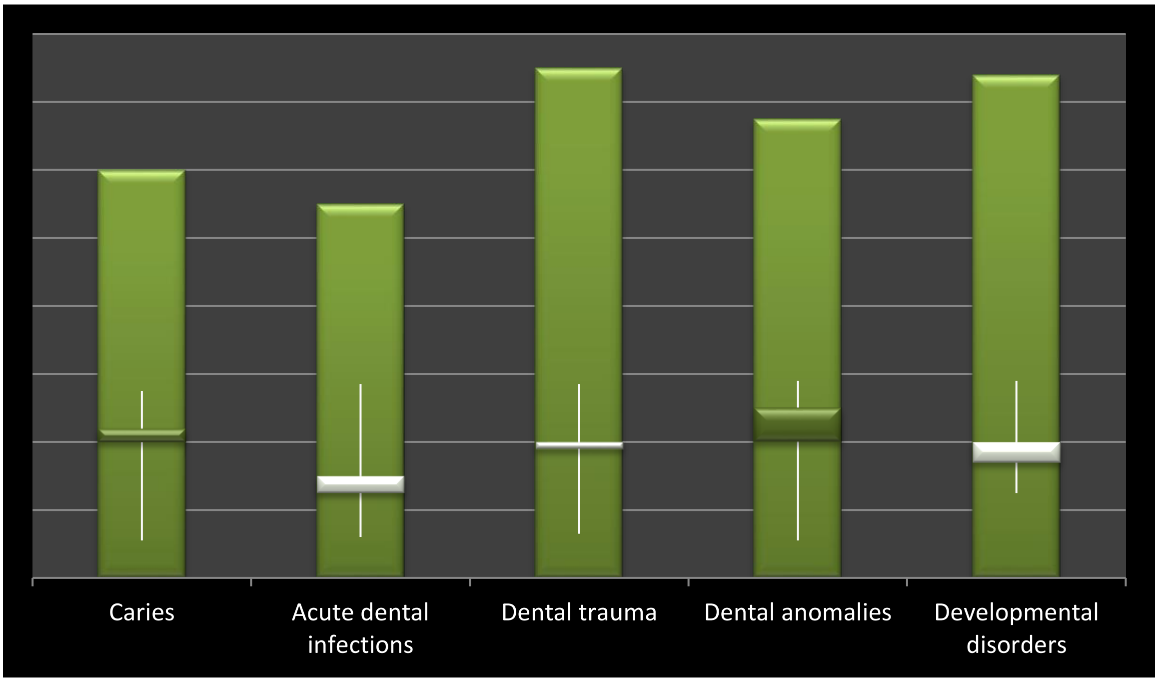

Figure 2: Box and whisker plot showing the analysis of evaluation of different clinical conditions by CBCT in paediatric patients

Discussion

The panel charged with conducting this study found it difficult to pinpoint the function of a diagnostic radiographic imaging method in six clinical scenarios. Except for probably "caries," each of the six scenarios was made up of several or more settings, such as "pathological disorders" and "dental abnormalities." Additionally, the diagnostic effectiveness of CBCT may vary considerably depending on the situation. For instance, while employing CBCT may increase diagnostic performance for root fractures in comparison to a radiographic technique, it might not in the case of luxation injuries. This review was quite detailed and might have been meticulously divided into several separate systematic reviews..

The choice to exclude orthodontic research and to only include in vivo and paediatric studies was appropriate given the scope of our work. It was a tactic to simplify the process, but it inevitably constrained the literature. Little information about CBCT specific to children's age groups was found in the review, so the criteria for inclusion had to be loosened in order to include any research on diagnostic efficacy at all. The lack of any study at the clinical performance efficacy level was a significant result. Further inspection for systematic reviews focused on research carried outside the human body and research carried out in adolescents thus gained importance as a knowledge resource..[10-14]

When thinking about a CBCT exam for a paediatric patient, it is critical to emphasize a few key points. All circumstances fall under the fundamental rules of applying CBCT as advocated by European Commission, especially the part that states, "Employment of CBCT is carried out when the health issue which require CBCT might not get resolved appropriately by traditional radiography causing less radiation exposure." A thorough evaluation is required to determine that the individual can participate with the examination, particularly by remaining still for an extended amount of time. Previous knowledge from other X-ray exams should be helpful. For instance, if a child moved during a conventional panoramic radiography, then there is maximum possibility that CBCT examination will not be effective.

Unwanted movement of individuals while carrying out CBCT results in recognizable picture artefacts more frequently in pediatric population according to Spin-Neto et al.. In fact, a research concluded that the possibility of displacement increased eleven folds in study participants aged 15 than for people over the age of 31. (Spin-Neto et al.). If movement occurs repeatedly, continuously, or in more than one plane during the scan recording, the impact on image resolution is greater. This demonstrates why relying solely research carried outside the human body is probably going to overrate the diagnostic precision of CBCT for radiographic assessments requiring perfect accuracy, like identification of fracture, and could be a big problem for diagnostic applications..[15-16]

A few warning remarks must be mentioned before wrapping up. First off, there is a tonne of information showing that different CBCT devices have varying degrees of technical efficacy. The majority of the research findings is based on investigations employing pricey, "high-end" tools that typically provide photos of excellent quality..[17-19]

Second, although the post-acquisition alteration of the photographs is typically an opinion, it affects their diagnostic usefulness. When assessing scans, practitioners may or may not increase the scans' brightness and contrast, although CBCT enables a number of image processing operations that can alter the diagnostic value. The responsibility for diagnostic performance according to model advocated by Fryback and Thornbury's varies with the investigator who evaluated the photos. This value changes throughout time and from person to person as well as within any given person. The process of deciding whether CBCT radiographic examination are warranted or not requires an individual approach and should not be decided on the basis of theoretical contraindications and indications of CBCT.[50-57]

Conclusions

CBCT can be useful in cases of acute infections of dental origin where traditional radiography technique is not able to indicate about the location of lesion even though there are signs to indicate the presence of lesion in bone. CBCT is useful in situations when traditional radiographic technique fails to locate suspected fracture of root in teeth having no previous history of endodontic management and subsequently provide adequate assistance in treatment planning.

• When traditional radiography evaluation has proven to be insufficient for therapy, CBCT is likely recommended for the evaluation of resorption (presumed or confirmed).

• CBCT is likely recommended for imaging bigger benign bone pathologies to help with surgical planning and to show the characteristics of the lesion.

• An important factor to take into account in the rationale of CBCT scans is patient participation, especially when there is increased possibility of patient displacement during extended duration of exposure .

• CBCT is not recommended for diagnosing caries. The teeth should be examined using existing scans that were taken for other purposes, with care given to avoid making a false-positive diagnosis.

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