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Diagnosing Dental disturbances on OPG in mixed dentition-A retrospective study

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Abstract

Aim: The aim of this study was to use panoramic dental radiographs (OPG) to evaluate presence of any dental or skeletal developmental disturbances, anomalies, diseases and pathologies, particularly in the mixed dentition period.

Materials and Methods: The study comprised 115 subjects of mixed dentition, chosen from both the genders of age group between 7 to 14 years.

Result: The study revealed that in 83% cases, dental caries was present. Delayed eruption of permanent teeth was observed in 23.8% OPG. In 3.48% cases, supernumerary teeth were present and in 8.6%, hypodontia was observed. Impacted third molars were present in 6.2% cases. In 2% dilacerations and premolar rotation were also detected.

Conclusion: As recorded by OPG, dental caries is the most common dental problem found in mixed dentition period. Panoramic radiography can be used as a primary diagnostic aid in pediatric dentistry for diagnosis, interception and treatment planning.

Keywords: Panoramic radiograph, mixed dentition, diagnosis, dental caries.

Introduction

Panoramic radiography is a simple and cost-effective extra-oral procedure done to visualize whole of maxilla and mandible in one film.[1] Since the time OPGs have been introduced into the dental practice, they have

proven to be essential diagnostic tool.[1,2] As panoramic radiography allows examination of the entire dentition, underlying alveolar bone, temporomandibular joints, and adjacent structures easily, its use for day-to-day screening of patients at a number of academic institutes as well as private dental offices has increased.[3,4] However, it still does not enjoy the popularity that intra-oral periapical radiography does. Panoramic radiography has wide use in both general diagnosis and varied specialized clinical diagnosis, and is usually used to examine third molars before trans-alveolar extraction.[5] In the past years, different techniques have been developed for digital panoramic radiography. The solid-state digital X-ray units and photostimulable phosphor plate systems which are used with conventional OPG units are available commercially. The diagnostic outcome of panoramic images is the same as that of intraoral periapical radiograph (IOPA), however, the use remains limited.[6]

Over a period of time, many studies have concluded that the ability of OPGs to diagnose dental caries accurately was lesser than intraoral radiographs.[7-10] Though it was clear that the IOPAR demonstrated better accuracy in comparison to the OPGs in diagnosis of anterior caries because of the poor image details of latter canine to canine,[9,11-13] the diagnosis of posterior caries of OPGs was at par with periapical x-rays.[,10,12,13] According to Galal, bitewing radiographs diagnosed highest number of proximal caries in molar area and there was no significant differences between IOPAR and OPGs.[9] Douglass concluded that the mean positive and negative predictive values of IOPAR, bitewing and OPGs to detect molar dental caries were almost same.[11] These observations were similar with those of Oba and Katayama[12] and Stewart and Bieser.[13]

Compared to clinical examination, radiographs are preferred to detect dental conditions like periapical pathologies, impaction or missing tooth, maxillary sinus conditions, and pathologies of condyles, which cannot be detected clinically. Particularly OPGs, owing to greater coverage area, are essential for detecting impacted teeth and other developmental anomalies.[9,14-16] Shin et al conducted a study where there were 33.6% of impactions, 11.6% of sinus-related pathologies, 2.1% abnormalities of condyle and 24.5% of dental pathologies.[14]

In spite of its diagnostic abilities, panoramic radiographs don't enjoy widespread popularity like IOPAR. Since these radiographs cover a wider range of dental and associated skeletal structures, they are essential for preliminary assessment and an aid to clinical diagnosis. From diagnosis of dental caries, pulpal, periapical and periodontal pathologies, they also play an important role in assessment of bone pathologies like cysts, tumours and fractures of maxilla and mandible. Particularly in the mixed dentition period, panoramic radiographs are a primary aid in early orthodontic diagnosis and intervention, as they help in assessing the exfoliating and erupting status of deciduous and permanent teeth, spacing and crowding in the dental arches, presence of various dental anomalies, dental age assessment, root end closure, impactions and various other anomalies.

Keeping panoramic radiography's diagnostic accuracy in mind, this retrospective study was designed to evaluate presence of various dental and skeletal pathologies in mixed dentition period using panoramic radiographs.

Materials and Methods

Study Population

OPGs of patients who reported to the Department of Pediatric and Preventive Dentistry, SGT University Gurugram between December 2018 to December 2019

were included in the study. Approval from the institute's ethical committee were obtained.

Radiographic Examination

After an initial assessment of 300 radiographs, 115 OPGs of patients between age group of 7 to 13 years were selected. All OPGs were obtained using digital devices (Kodak® 8000, Rochester, New York, USA) by the same radiographic technician according to exposure parameters suitable for the patient's age and weight. Poor quality OPGs, including the ones with blurry anterior regions, under- or over-exposed images and those obviously affected by patient movement, were excluded from the analysis. Patients with only primary dentition, those with any syndrome or contributory medical history and the ones with history of previous orthodontic treatment were excluded too.

After a thorough analysis of the radiographs, the findings were evaluated and tabulated.

Results

In more than 75% OPGs, dental caries was the most common finding in both, deciduous as well as permanent teeth. Retained deciduous teeth were observed in more than 15% of OPGs, Early or delayed eruption of permanent teeth in 13% OPG. In 3.48% cases, supernumerary teeth were present. Impacted third molars were present in about 7% cases. Out of developmental dental anomalies, hypodontia was seen in 8.7% cases.

From orthodontic point of view, rotation was found to be most common with a share of 8.7%.

Asymmetry in level of eruption when compared with opposite side was seen in 15.7% cases. (Table 1, 2 and 3)

Table 1. Findings	Total number of OPG	Percentage
Dental caries		
Primary tooth	78	67.8%
Permanent tooth	9	7.8%
Periapical pathology	8	6.9%
Retained deciduous teeth	18	15.6%
Early or delayed eruption of permanent teeth	15	13.%
Treatment done in primary teeth		
Pulpectomy	5	4.3%
Pulpotomy	2	1.8%
Crown	5	4.3%

Table 2 Findings	Total number of OPG	Percentage
Dental Anomalies	10	8.7%
Hypodontia	1	0.87%
Oligodontia	6	5.21%
Supernumerary teeth	4	3.48%
Dilaceration	1	0.87%
Fusion/Gemination	1	0.87%
Taurodontism	4	3.48%
Ectopic eruption		
Bony pathology	1	0.87%
Trauma	2	1.74%
Fracture	1	0.87%
Presence of teeth in nasal cavity	1	0.87%

Table 3. Findings	Total number of OPG	Percentage
Crowding	5	4.3%
Space loss	3	2.6%
Rotation	10	8.7%
Impaction Molar	8	6.9%
Incisor	2	1.8%
Canine	3	2.6%
Premolar	3	2.6%
Status of developing permanent canines and premolars		
Altered axial inclination	11	9.5%
symmetry in nolla staging when compared with opposite side	13	11.3%
Asymmetry in level of eruption when compared with opposite side	18	15.7%

Discussion

Panoramic radiography shows both maxilla and mandible along with teeth in just one film by a fast and uncomplicated process. As in periapical radiography, it does not cause discomfort to the patients like poking by IOPAR film. Because of this simplicity and convenience, OPGs have been regularly used in screening and in epidemiological studies. [14-16] Introduction of panoramic radiography lead to early and quick finding of dental/oral diseases and better prognosis.

If dental diseases are not diagnosed timely, they advance quickly leading to severe complications. Dental caries has been the chief reason for tooth mortality all over the world.[17] It has also been found that children with extensive caries at the time of treatment were vulnerable to failure of the treatment. Hence, dental treatment requires diagnosis of caries at an initial stage.

Where odontogenic tumours and cysts are suspected, immediate diagnosis is crucial. Pippi mentioned: "odontogenic tumours are more frequently diagnosed in the first three decades of life and therefore they can interfere with the physiological growth of the dento-skeletal apparatus. An early radiographic screening is therefore important to reveal these tumours at an initial stage of their development, when clinical signs or symptoms are not yet present".[18]

Although OPGs are effective, it should be kept in mind that radiation exposure must be maintained as low as reasonably achievable (ALARA). This is possible by using physical methods of minimizing radiation, choosing apt candidate, and repeatedly making high quality radiographs to evade repetition. No lead barriers are needed while taking OPGs.

With the use of OPG in mixed dentition period, most of the dental and skeletal pathologies can be detected at an early stage, making their treatment convenient and timely.

Conclusion

Guiding the development and observing the eruption pattern of dentition is a primary part of comprehensive oral health care in pediatric patients. Normal dentofacial development contributes towards establishing an aesthetically acceptable and functionally stable permanent dentition. Any anomaly during periods of growth and development, if diagnosed and intervened early, will effectively reduce the severity of condition, time and complexities of future treatment.

An OPG is an indispensable diagnostic tool in the stream of pediatric dentistry. With limited radiation exposure, a single film can provide access to a number of dentofacial structures, hence it plays an important role in early diagnosis and treatment planning. Therefore, a pediatric dentist must be well versed with the knowledge of landmarks of a panoramic radiograph and should be trained enough to understand and evaluate all the developmental disturbances or abnormalities that can be identified on an OPG.

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