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Evaluation of mandibular third molar impaction distribution on OPG: A digital radiographic study

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Abstract

Introduction: Third molars are the most common teeth that may follow an abortive eruption path and become impacted as a result of pathology, anatomical structures or insufficient osseous space posterior to the second molars.

Aims & Objectives: The present study evaluated (1) the distribution of the impaction of mandibular third molar; (2) the distribution of the patterns of impaction radiographically; and (3) the gender distribution for pattern of impaction.

Methodology: This hospital-based digital retrospective study was conducted over a course of 12 months in the Department of Oral Medicine and Radiology and presents the analysis of 150 panoramic radiographs of patients between the age group of 18-30 years. They were interpreted and assessed for the impaction of mandibular third molars. Statistical analysis was done by Chi-square test.

Results: Bilateral impaction of mandibular third molar is more common than unilateral in both the sexes, with mesioangular being the most common pattern. In males, mesioangular pattern was followed by horizontal, whereas in females it was followed by vertical.

Conclusion: The present study provides useful data regarding the radiographic status of impacted mandibular third molars in patients.

Keywords: Mandibular third molar, Impaction, OPG

Introduction

Impaction is defined as completely or partially unerupted and positioned against another tooth, bone or soft tissue, such that its further eruption would be unlikely. Third molar, also known as the "wisdom tooth," is the only tooth to erupt in adolescents or even in adults [1]. Impactions may be unilateral or bilateral. Pattern of impacted third molar (Winter's classification) is determined by the angle formed between the intersected longitudinal axis of the second and third molars [Vertical impaction (10° to -10°), mesioangular impaction (11° to 79°), horizontal impaction (80° to 100°), distoangular impaction (-11° to -79°)] [Figure 1] [2]. The present study intended to provide data regarding the radiographic status of impacted mandibular third molars in patients.

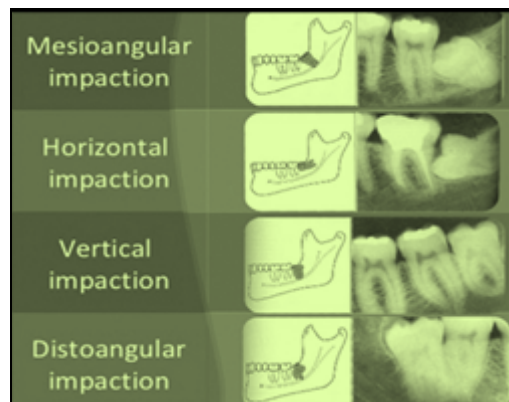


Fig 1: Patterns of mandibular third molar impaction

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Methodology

This hospital-based retrospective study was conducted during a period of 12 months, from July 2015 to June 2016, in the Department of Oral Medicine and Radiology. This study represents the analysis of panoramic radiographs of those patients who were advised the same for various purposes. All panoramic radiographs were taken by Kodak 8000C panoramic machine. Previous records of the patients were collected whose panoramic radiographs were to be assessed. A total of 150 panoramic radiographs of patients in the age group of 18-30 years were interpreted and assessed for the mandibular third molar impactions. The panoramic radiographs were chosen according to the following criteria. Inclusion criteria: No history of trauma, Impacted mandibular third molars with completed root formation radiographically and Images of good quality that had the clearest reproduction of teeth without any superimposition. Exclusion criteria: Impacted teeth other than mandibular third molars, third molar tooth buds or third molars having underdeveloped roots, Agenesis of mandibular third molars and patients with history of extraction of mandibular third molars, mandibular fractures or orthodontic treatments and patients with developmental anomaly, congenital or systemic disease. The pattern of impaction was determined by measuring the angle formed between the lines intersecting the long axis of the second and third molars. The angle thus formed was used to interpret the mesial or distal inclination in relation to second molar. The third molars that had reached the occlusal plane in relation to the second molar were considered to be normally erupted teeth. The data obtained were sent for statistical analysis using Statistical Package for Social Sciences Software (SPSS) version 20.0, (IBM Corporation, New York, US). A *P* value of ≤ 0.001 was considered to be statistically significant.

Results

A total of 150 panoramic radiographs for impacted mandibular third molars were studied and recorded by performing Chi-square test. They were then classified according to sex; 66 (44%) were males and 84 (56%) females [Table 1]. Bilateral impactions, with a frequency of 88 (58.66%), were more common than unilateral impactions (on

either left / right side) with a frequency of 62 (41.33%) [Table 2]. The most common pattern of impaction seen in both unilateral as well as bilateral impactions was mesioangular, which was statistically significant ($P < 0.001$) followed by equal number of vertical and horizontal types (25.8%) in unilateral impactions. In bilateral impactions, mesioangular (46.59%) was followed by vertical (28.9%) and horizontal (15.9%). The least common pattern in both unilateral and bilateral was distoangular [Table 3]. In the present study, bilateral impactions were studied in detail for gender distribution of type of impaction. Gender distribution for common pattern of bilateral impaction was mesioangular, both in males (48.71%) and in females (44.89%), followed by horizontal pattern in males (23.07%) and vertical pattern in females (35.71%), which was statistically significant with $P < 0.001$ [Table 4].

Table 1: Gender distribution of impaction

Gender	Frequency	Percentage
Male	66	44 %
Female	84	56 %
Total	150	100 %

Table 2: Bilateral and Unilateral patterns of impaction

Side	Frequency	Percentage
Unilateral	62	41.33 %
Bilateral	88	58.66 %
Total	150	100 %

Table 3: Different patterns of impaction in unilateral and bilateral impactions

Side	Angulation	Frequency	Percentage
Unilateral	Mesioangular	25	40.32
	Distoangular	5	8.01
	Horizontal	16	25.8
	Vertical	16	25.8
	Total	62	100
Bilateral	Mesioangular	82	46.59
	Distoangular	15	8.5
	Horizontal	28	15.9
	Vertical	51	28.9
	Total	176	100

Table 4: Gender distribution of patterns of bilateral impactions

Side	Gender	Angulation				Total	X ²	P
		Mesioangular	Distoangular	Horizontal	Vertical			
Bilateral	Male	38	6	18	16	78	18.172	<0.001
		48.71%	7.6%	23.07%	20.51%	100%		
	Female	44	9	10	35	98		
		44.89%	9.18%	10.2%	35.71%	100%		
	Total	82	15	28	51	176		
		46.59%	8.5%	15.9%	28.9%	100%		

Discussion

As early as 1954, Mead [3] defined an impacted tooth as a tooth that is prevented from erupting into position because of malposition, lack of space or other impediments. Later, Peterson [4] characterized impacted teeth as those teeth that fail to erupt into the dental arch within the expected time. Later in 2004, Farman [5] stated that impacted teeth are those whose eruption is prevented due to a physical barrier within the path of eruption. In universal, third molars have been found to erupt between the ages of 17 and 21 years. Furthermore, the time of third molar eruption has been reported to vary with race [6]. The

average age for the eruption of mandibular third molars in males is approximately 3-6 months ahead of females [7]. Lack of space is the major cause for abortive eruption. As an associated complication, it can also cause incisor crowding, resorption of adjacent tooth roots, inflammatory processes (pericoronitis), and temporomandibular joint dysfunction [1]. Impaction of mandibular third molar is more symptomatic and disturbs an individual's routine [8]. Impaction of mandibular third molars is a common condition related with the difficulty of extraction and risk of various associated complications such as pain, swelling, inferior alveolar nerve damage, alveolitis, incomplete root removal, bleeding, delayed healing,

postoperative infection^[9].

The location and configuration of impacted third molar, adjacent teeth, surrounding bone and mandibular canal are important in imaging diagnosis for the proper surgical operation planning. Periapical radiographs have been used for many years to assess the jaws during impacted teeth surgery.^[10] During the recent times, many dental practices replaced the film with digital imaging systems.^[11] Cone beam computed tomography (CBCT) has been advocated as the method of choice only when there is a need to obtain a three dimensional view of the mandibular third molar and adjacent anatomical structures^[12, 13]. At present, orthopantomography (OPG) is the radiographic technique of choice to evaluate impacted mandibular third molars. The estimated specificity for radiographic signs, as predictor of nerve injury ranges from 96 to 98%^[14].

The present study was conducted to document the distribution of impaction, its unilateral or bilateral involvement, as well as its pattern. Out of a total of 122, the orthopantomographs were classified according to sex; 71 (58.2%) were males and 51 (41.8%) were females. There was not much sexual difference in the current study in relation to prevalence of third molar impaction, which was in agreement with Kramer and Williams and raised the question against Hellmen's statement that jaws of the female stopped growing, when third molar just started to erupt, whereas in males the growth of the jaws continued beyond the time of third molar and hence, he proposed that impaction of third molar is common in females than in males^[3].

As already stated in literature by many authors and in many studies by Linden *et al.*,^[15] Hattab *et al.*,^[16] and Knutsson *et al.*,^[17] maximum number of third molar impactions were found to be mesioangular. In the present study also, the most common pattern of impaction seen in both unilateral as well as bilateral impactions was mesioangular, which was statistically significant ($P < 0.001$). It appears that mesioangular impactions are probably the most common type which may be due to their late development and maturation, path of eruption, and lack of space in mandible at later age.^[10] However, this result was not in accordance with the study conducted by Gupta *et al.*^[14] and Hazza'a *et al.*^[18] because they found the highest number of vertically placed third molars followed by mesioangular, distoangular and horizontal patterns. These variations in angular position of mandibular third molars may be because of the fact that the studied population in each study was quite different from each other. In the present study, we observed that mesioangular was followed by equal number of vertical and horizontal types in unilateral impactions and by vertical and horizontal in bilateral cases. In the present study, gender distribution for the pattern of impaction was also investigated. Mesioangular was the most common pattern seen in both males and females. Mesioangular was followed by horizontal pattern in males and vertical pattern in females which was statistically significant. [Table 1, 2, 3 & 4] These values are in concordance with the study conducted by Ramamurthy *et al.*^[1]

Conclusion

Panoramic radiographs can be used as valuable predictor of the outcome of the impacted mandibular third molars position as they appear to have quite good cost-information ratio. Radiographic diagnosis of the presence, position and degree of third molar formation is a crucial part of integral treatment planning. Classification of mandibular third molar impaction enables the clinician to determine the degree of difficulty in

removal of the impacted tooth, to choose the optimal treatment and to avoid a majority of possible complications. To summarize Mesioangular is the most common pattern of impaction in both unilateral and bilateral impactions and Bilateral impactions are more common than unilateral.

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