Prevalence of Distal Caries of Second Molars Due to Impacted Mandibular Third Molars

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ABSTRACT

BACKGROUND

Most commonly occurring impacted teeth encountered in dental surgery are mandibular 3rd molars. Reasons of impactions may be due to evolution and modern dietary habits, lack of space, decreased skeletal growth, and disproportionate crown size. Impacted tooth may cause various complications, if left untreated distal caries is commonly seen in mandibular 2nd molars. The aim of the current study was to determine the prevalence of distal caries of mandibular 2nd molars due to impacted mandibular 3rd molars. Symptoms like distal caries of 2rd molars is one of the major factors affecting the oral health next to periodontal disease and periodontal abscess.

METHODS

The study included 103 patients, reported to the dental department of Tripura Medical College and BRAM &Teaching Hospital, Agartala. The study was done from July 2019 – December 2019, age ranged from 18 to 50 years. Panoramic radiographic examinations were carried out in each patient. Angulations of impaction and incidence of caries of the adjacent mandibular 2nd molars were recorded. All data were collected and analysed using percentage analysis.

RESULTS

103 patients panoramic radiographs were studied, out of 103, 63 (61 %) were male, 40 (39 %) were female. 31 patients (30.1 %) out of 103 patients were found to have distal caries of mandibular 2nd molars adjacent to mandibular 3nd molars. 85 % of caries was associated with mesioangular impaction.

CONCLUSIONS

Careful monitoring to detect the caries lesions in early stage is necessary, as the distal caries on the mandibular 2nd molars was found to be high. Subsequently proper measures should be taken for restoration of mandibular 2nd molars and removal of impacted mandibular 3rd molars, if necessary.

KEYWORDS

Distal Surface Caries, Mandibular 2nd Molars, Impacted Mandibular 3rd Molars, Angulation

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BACKGROUND

Causes that can be attributed to impaction of tooth include genetics, lack of space, retarded growth process, direction of growth, eruption force and direction and the influence of external oblique ridge of mandible.[1] It is true also in case of mandibular 3rd molar impaction. Impacted tooth may cause a series of clinico-pathological sequel like; pain, caries, pericoronitis, periodontitis, systemic lesions, root resorption and neoplasm.[2] Adjacent tooth may be affected adversely which may be reversed by taking early measure, as stated by Allen RT et al.[3] Allen et al (2009) demonstrated that incidence of 42 % distal caries associated with partially or completely impacted mandibular 3rd molars.[3]

Tooth or teeth unable to erupt in dental arch within expected time are called impacted teeth / tooth. Impaction may also be due to hindrance in the eruption path, improper positioning of teeth / tooth, disproportionate crown size, or other impediments. Prevalence of impacted third molars are higher in mandible than maxilla, Polat HB et al[4] had stated this in their study. It is accounted for being 98 % of all impacted teeth. Mandibular third molars tend to erupt into the oral cavity between age of 17 and 21 years and a higher frequency of impaction is observed in females than males, Padhye MN et al and EI say MJ[5,6] et al stated the same in their studies. Various aetiologic factors have been suggested for impacted mandibular third molars. Some authors stated that, change in orientation or position of the erupting third molar tooth, differential root growth between the mesial and distal root, etc. also play an important role in the impaction process.

"Impaction" the word derived from Latin word "Impactus" meaning a structure (an organ) which has been prevented from assuming its normal position due to abnormal conditions. As human diets are becoming less plant based; jaw size has become smaller and the functional need of third molars are hence, getting minimal, stated by Danial J.et al and Boeddinghaus R. et al.[7,8] So third molars often require to be removed, to prevent treatment of third molar associated disease states, like, distal surface caries in second mandibular molars.

Orthopantomography (OPG) is very useful tool for assessment of dental pathologies and dental impaction. To determine the location and angulations of third molar and their relation to adjacent tooth structures, OPG is very useful. OPGs are also cost effective and exert low radiation dose, according to Prabhu SR et al.[9]

Tooth eruption is a complex process which is not fully understood. It is related with growth of jaws where a series of physical and bio-logical events meet, various local and systemic factors are responsible for this complex process. Any alteration in this path of eruption of tooth may cause impaction.

As human evolution has progressed, jaw size as well as tooth size has decreased gradually and food habits have changed from course to fine granules. Due to decrease in size of the jawbone and modern soft diet, there has been an increase in the incidence of impacted third molars, same observation was expressed in the Quek Sl et al study.[10]

Angulation of impacted tooth is measured by Winter's classification system and its relationship with the 2nd molar, 3rd molar has been classified by Pell and Gregory classification system.[11] The angle of the impaction can be measured using Winter's classification system with reference to the angle formed between the intersected longitudinal axis of the second & third molar. Depth or level of impaction can be well measured by Pell and Gregory classification. In many studies, angulation of impaction has been made by visual impression based on Winter's classification (Quek et al).[10] Hugoson and Kugelberg[12] proposed a set of angular guidelines, but angular distance was still estimated using visual impression (Quek et al) 2003.[10]

(Quek et al) 2003[10] reported mesioangular impaction was most common (33.4 - 62 %), followed by the horizontal impaction (17.6 %), various studies support this. Level B was the most common level of impaction and various researchers reported this while analysing the level of impaction, Hugoson A, Kugelberg CF et al[12] and various studies support these.

Removal of impacted mandibular third molar is a common procedure. Surgical intervention is directly related with the angulations of the impacted third molar. In gender predilection to impaction-opinion varies. Brown et. al and Montelius[13] have given views that there is no sex predilection but Hugoson Kugelberg et al[12] reported higher percentage in females as compared with males.

Among all the pathologic sequels of impacted mandibular 3rd molars distal caries of the mandibular 2nd molar is one of the most common (0.5 – 20 %) sequel.[14-17] Some study has been documented that the prevalence of distal caries in mandibular second molars, caused by impacted mandibular third molars is up to 32 %.[18] Allen et al[3] (2009) demonstrated that incidence of 42 % distal caries associated with partially or completely impacted mandibular 3rd molars,[3] authors such as Kang f et al has reported higher figure (52 %). With this background, this study was done to determine the prevalence of distal caries of mandibular 2nd molars due to impacted mandibular 3rd molars, with the help of clinical and radiographic i.e. orthopantomography findings.

METHODS

A cross sectional study was conducted among patients with impacted third molars, reporting to Dental department of Tripura Medical College and Dr. BRAM Teaching Hospital, Hapania, Agartala, Tripura. Orthopantomograms (OPGs) of these patients was screened over a period of six months (July 2019 - December 2019) and was selected according to the inclusion criteria.

Inclusion Criteria

- Patients complaining of impacted mandibular 3rd molar.
- Age within 18 - 50 yrs.
- Patients willing to participate in the study.

Exclusion Criteria

- Absence of adjacent mandibular 2nd molar or 3rd molar
- Patients who did not give consent.

Sample Size Calculation

The estimated sample size was calculated according to the formula

$n = Z^2 pq / l^2$

Where Z = confidence interval
P = prevalence of patients having distal caries in 2nd molars due to impacted mandibular 3rd molars,
q = (1 - q), and l = allowable error

By considering prevalence of patients having distal caries in 2nd mandibular molars due to impacted mandibular 3rd molars as 42 % (0.42) from previous study[3] with allowable error (l) as 0.1 (10 %) and Z as 1.96 for 95 % level of confidence, the sample size was calculated to be 93.581376, round up to n = 94. Final sample size was n = 94 + 9.4 (considering 10 % drop out of study participants, round up to = 9) = 103.

Sampling Technique

A convenient sample of patients having distal caries in 2nd molars due to impacted 3rd molars, were taken in the study. 103 patients who fulfilled the inclusion criteria of the study, attending the Outpatient Department of Dentistry, Tripura Medical College and BRAM Teaching Hospital, Agartala, Tripura, with in the period from July 2019 to December 2019 were included in the study.

Study Tools and Materials Required

- Pre-designed patient proforma.
- History and examination of patient.
- X-ray OPG.

Statistical Analysis

Data was entered and analysed using Microsoft office excel 2007. Analysis were presented as percentages, proportions and figures.

Ethical Consideration

Informed consent was obtained from study subjects before enrolling them in the present study. Ethical permission to conduct the study was obtained from Institutional Human Ethics committee (IHEC) before conducting the study. The personal and clinical information were kept confidential during and after conduct of the actual study.

Orthopantomograms of these patients were screened over a period of six months (July 2019 – December 2019) and were included according to the inclusion criteria. OPGs were collected by digital OPG machine. In OPGs, third molar: its presence, location, depth and angle with the second molar were recorded. The clinical and radiological (OPGs) examinations determined the angulations of third molar with second molar long axis, in the mandible. For OPGs interpretation, we used good viewing box, magnifying lens, divider and scale. Then we determined both clinically and radiologically that the third molar impaction was its non-alignment with second molar long axis and rest of the dentition. Then whether the third molar was mesioangular, distoangular, horizontal and vertical angulations patterns was decided from Winter's classification. In the study if third molar had not fully erupted to attend normal functioning position in occlusal plane then it was considered as impaction of third molar. Angulations formed between the intersected longitudinal axis of the second & third molar determined the angulations of the impaction of mandibular third molar, subsequently recording of this information is done, using Winter's classification. Depth of the impaction was determined by – Pell and Gregory classification.

For this study OPGs, x-rays were selected carefully, therefore patient with any of the following condition were excluded. Patients with absent mandibular second molar, with any pathosis or trauma to the jaw that disrupted the dentition alignment, third molar with incomplete root formation and the presence of congenital disease or facial deformity were excluded from the study. Patients complaining of impacted mandibular 3rd molar, age within 18 - 50 yrs. and patients willing to participate in the study were included in this study.

Data was recorded for each patient included age, sex, angulation, eruption status of impacted third molar, molar to molar contact, present or absent of dental caries in second molar and outcome of these caries teeth.

Radiographic assessment of the posterior mandibular teeth with OPGs, were viewed by well illuminated x ray viewer box and magnifying glass and the distal surface caries of mandibular second molars were explored. Each of OPGs were analysed by one investigator. OPG with impacted third molar teeth were identified. Of these OPGs, with impacted third molar teeth, prevalence of distal caries of mandibular second molars were assessed and analysed in relation to age and gender. The impacted third molars causing distal caries in the mandibular second molars were identified and were recorded. Impacted mandibular third molars were classified as per the standard Pell and Gregory classification and Winter's classification as vertical, mesioangular, distoangular and horizontal. Data was entered and analysed using Microsoft office excel 2007. Analyses was presented as percentages, proportions and figures.

RESULTS

Sl. No.	Angulation	No. of Impactions	Percentage
1	Mesioangular	43	41.75 %
2	Vertical	30	29.13 %
3	Horizontal	17	16.50 %
4	Distoangular	13	12.62 %

Table 1. Prevalence of Impaction According to Angulation

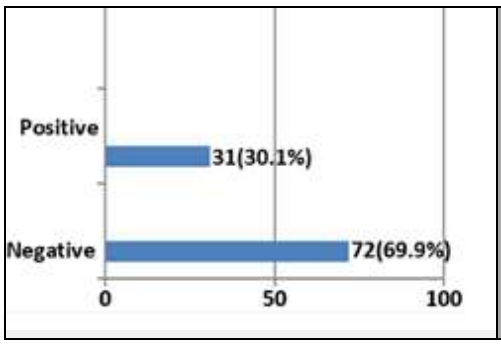

Figure 1. Patients with Distal Caries

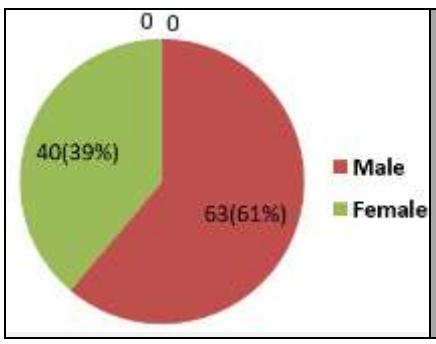

Figure 2. Gender Variation

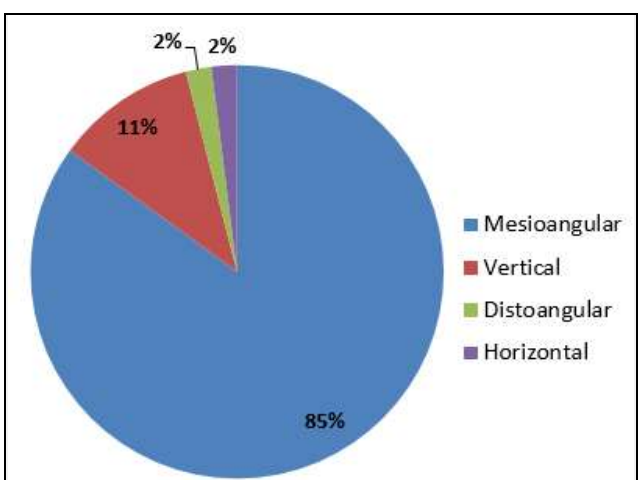

Figure 3. Distribution of Distal Caries

In present study of 103 patients, 31 (30.1 %) patients were found to have distal caries in 2nd molars, adjacent to impacted mandibular 3rd molars (Figure 1). The age range was from 18 - 50 years (mean age 31.21). Male patients were 63 (61 %); females were 40 (39 %) (Figure 2). The highest number 85 % of caries were associated with mesioangular impaction followed by vertical impaction (11 %), distoangular (2 %) horizontal (2 %) (Figure 3). Relation between 3rd molar angulation & 2nd molar distal caries was, hence, mentionable here. Also, mesioangular angulation had highest prevalence of impactions (41.75 %) (Table 1).

DISCUSSION

Most authors stated that mesioangular tilt position is highly related with caries occurrence, while vertical, distoangular are unlikely to initiate caries process.[15-20] The highest number 85 % of caries in mandibular 2nd molars were associated with mesioangular impaction of mandibular 3rd molars were detected in our study. Most common cause of an impacted tooth has been reported as failure of rotation from the mesioangular to vertical direction.[20.] Radiographic examinations also provide supplementary information like; reporting adjacent teeth condition, amount of surrounding bone, anatomical characteristic and the position of 3rd molar according to Winters classification[21], which aims to support our study examination.[14] One third of the partially impacted mandibular 3rd molar have greatest possibility to cause pathological lesion like caries.[22] Sasano et al 2003 has also supported this in their study. Partially exposed impaction offers favorable condition for bacterial accumulation – as plaque accumulation in this area cannot be cleaned through normal brushing or flossing, resulting in caries.[23] It was also described by Fejerskov and Kidd (2008).

Allen et al (2009) demonstrated that incidence of 42 % of distal caries was associated with partially or completely impacted mandibular 3rd molars.[3] Partial impacted mesioangular mandibular 3rd molars contacts the CE (Cemento-Enamel) junction of 2nd molars, place the teeth were at a risk of developing cavities in the distal cervical region.[23] Whether it was contacting above the CE Junction poses less risk to creating distal caries.[24] In this study, prevalence of caries on mandibular 2nd molar, due to mesioangular impaction of impacted mandibular 3rd molars had significantly higher scores than others, with a contact point of CE junction of mandibular 2nd molars were noticed clinically and radiologically. This result may be explained by removal of impacted mandibular 3rd molars. Previous studies have shown that incidence of distal surface caries was (7 - 32) %. [15-18] Vander Linden et al – have reported 32 % of distal caries lesion in their study, Allen et al demonstrated 42 %, Ozee et al on Turkish population revealed 20 %. This was correlated with our study. Prevalence of distal caries in mandibular 2nd molars in our study was 30.1 %. These differences were probably due to racial, regional and socio-cultural differences. Impacted mandibular 3rd molars position was more relevant factor for mandibular 2nd molars distal surface caries development in comparison with the other factor such as high susceptibility to dental caries in general, most authors demonstrated these. These observations were also found in our study. Mesioangular tilt seems to be highly associated with caries occurrence, most authors also described the same.[15-17] Chang et al and Mc. Ardle et al and Ozee et al described the distal surface caries of mandibular 2nd molars were mostly due to mesioangular impaction of impacted mandibular 3rd molars.[17] Our finding also correlated with them which showed that highest percentage of distal surface caries of mandibular 2nd molars were associated with impacted mandibular 3rd molars – mesioangular position – 85 % (31 cases).

CONCLUSIONS

Within the limitations of this study, it can be suggested that mesioangular impaction of impacted mandibular 3rd molars may represent a risk for the development of distal caries lesions in mandibular 2nd molars. In our study, the incidence

of distal surface caries on mandibular 2nd molars was found to be high. It is important to detect the caries in early stage by frequent careful monitoring and radiographic examination. Development of distal surface caries in mandibular 2nd molars indicates the need for extraction of impacted mandibular 3rd molars and simultaneously restoration of mandibular 2nd molars.

Data sharing statement provided by the authors is available with the full text of this article at jebmh.com.
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