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A Retrospective Study of Correlation of Third Molar Impaction Pattern with Distal Caries in Abutting Second Molar

[1]Dr. Kedar Kawsankar; [2]Dr. Uma Mahindra; [3]Dr. Lata Kale;
[4]Dr. Deepak Motwani; [5]Dr. Rashmi Gaikwad; [6]Dr. Nishigandha Pawar

[1]Senior Lecturer, Department of Oral and Maxillofacial Surgery,
CSMSS Dental College, Chhatrapati Sambhajinagar.
[2]Professor & HOD, Department of Oral and Maxillofacial Surgery,
CSMSS Dental College, Chhatrapati sambhajinagar.
[3]Dean, CSMSS Dental College, Chhatrapati Sambhajinagar
[4]Professor, Department of Oral and Maxillofacial Surgery,
CSMSS Dental College, Chhatrapati Sambhajinagar.
[5]Senior Lecturer, Department of oral and Maxillofacial Surgery,
CSMSS Dental College, Chhatrapati Sambhajinagar.

[6]Post-Graduate Student, Department of Oral and Maxillofacial
Surgery, CSMSS Dental College, Chhatrapati Sambhajinagar.

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Abstract:

- ***Aim:***
  To study distal caries prevalence in mandibular second molar and its relationship with mandibular third molar impaction pattern.

- ***Subject & Methodology:***
  The study was cross-sectional, retrospective which assessed 500 digital panoramic radiographs of 469 patients.

- ***Observation & Results:***
  The study involved 500 cases aged 18 to 59, with 66% presenting with decayed teeth and 59% experiencing pain; mesioangular was the most prevalent pattern of 3rd molar impaction, and a significant correlation (P = 0.001) was noted between caries in the abutting second molar and mesioangular 3rd molar impaction in class I and level B.

- ***Conclusion:***
  The presence and type of impaction are definitely correlated with distal caries in mandibular second molar.

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I. INTRODUCTION

The tooth which fails to erupt in the oral cavity in its functional position and which has lost its further potential of eruption is considered as impacted tooth. Mandibular third molars are most common impacted teeth. The indications for extraction of Mandibular Third Molar (MTM) are infections, unrestorable caries, periodontal diseases, cyst formation, atypical pain etc. [1]

The eruption age of mandibular 3rd molar is usually 18 to 24 years, but one which is failed to erupt beyond chronologic age of eruption results in impaction. [2]

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According to the degree of inclination the mandibular 3rd molar relative to the long axis of the 2nd molar, Winter categorized third molar impaction into four types: Mesioangular, Distoangular, Vertical, and Horizontal. Extent of eruption of the MTM, along with its position and angle in relation to the adjacent Mandibular Second Molar (MSM), considered as factor for the development of distal caries in the MSM. Aim of present study is to find out the 3rd molar impaction pattern and the clinical implications for the neighboring 2nd molar, as these findings are clinically relevant. [3, 4, 5]

II. MATERIAL AND METHOD-

A retrospective analysis done on 500 orthopantomography (OPG's) from 469 patients range between age group 18 to 45 years and both male and females whose radiograph were recorded from 1 January 2024 to 30th December 2024 in oral medicine and radiology department at CSMSS dental college and hospital, Chhatrapati sambhajinagar and $P \leq 0.05$ was considered as statistically significant with 95% confidence interval. Chi-square test was applied to search relation among caries and 3rd molar impaction. All OPG's were required to adequately display the relationship among impacted MTM and adjacent MSM. (Figure 1)

Fig 1 – OPG Showing Developing Distal Caries in MSM

The classification by Pell and Gregory categorizes the MTMs as- Position A indicates that the highest point of the third molar is either above or aligned with the occlusal plane of the second molar; Position B signifies that the highest point is situated between the occlusal plane and the cervical line of the second molar; and Position C, the uppermost part of the third molar is situated beneath the cervical line of the second molar. [6, 7, 8]

The degree of inclination of the mesioangular 3rd molar was assessed by calculating the angle formed at the intersection of the mandibular occlusal plane and the occlusal plane of the third molar, following the Shiller classification. Endodontically treated MSM and Extracted MSM were excluded from study. Master chart prepared after data recording.

III. RESULT

The distal caries prevalence in the MSMs was 52.0% (n=260). Chi-square test revealed significant relation between distal caries in MSMs and various factors statistically, including the impaction depth of the MTMs, the angulation of the MTMs, the distance from the cemento-enamel junction (CEJ) of the distal MSM to the mesial MTM, as well as the presence of pericoronitis in the MTM. Additionally, patient demographics such as gender and age were also found to be significant, with all P values falling below 0.05 (refer to Table 1).

The statistical analysis indicated a notable relation between distal caries in the MSM & MTM located in Position A. This association was particularly evident at angulations ranging from 43° to 126° and with clinical crown-to-edge junction (CEJ) distances of 6 to 15 mm between the distal MSMs and the mesial MTMs.

Distal caries in the MSMs was related with the MTMs in Position A, with the angulations of 43°-73° (OR=3.51, IC95%: 1.9-6.5, P<0.0001) and CEJ distances of 6-15 mm between the distal MSMs and the mesial MTMs (6-8 mm). In addition, the patients aged 27-59 years were more likely to be affected by distal caries in the MSMs.

A strong association observed among the degree of inclination of the MTM and the CEJ distance from the distal MSM to the mesial MTM. The scatter plot depicts the relationship between MTM angulation and the CEJ distance between the distal MSM and mesial MTM, revealing that carious second molars typically exhibited angulations of 43° to 73° and CEJ distances of 6-15 mm, while no significant

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correlation was found between impaction depth and either MTM angulation (P=0.097) or CEJ distance (P=0.210).

IV. DISCUSSION

The presence of distal caries in the mandibular second molars is regarded as one of the significant complications related to the impacted 3rd molar. Therefore, the preventive extraction of the relevant MTM should be evaluated concerning the associated risk of distal caries in adjacent MSM. [2, 9, 10]

In the current study, the prevalence of distal caries in MSM was found to be 52.0%, significantly exceeding the rates documented in earlier research. Several factors may account for this discrepancy. Numerous patients tend to delay seeking dental care until they experience noticeable symptoms in their teeth. Consequently, mesioangularly impacted third molars with distal caries were more frequently represented in this study. [11, 12, 13]

The CEJ distance, defined as the measurement between the distal cementoenamel junction (CEJ) of the MSM and the mesial CEJ of the MTM, was established by Leone et al. Chang et al. identified a CEJ distance ranging from 7 to 9 mm as a significant risk factor for the development of distal caries in the MSM due to the presence of the MTM. Similarly, Falci et al. reported comparable findings for CEJ distances between 3 and 10 mm. In the current investigation, a CEJ distance of 6 to 15 mm was associated with an increased likelihood of distal caries in the MSM, aligning with the previously mentioned CEJ distance ranges. [14-21]

When MTM crown overlaps with the CEJ of the distal MSM in radiographic images, accurately measuring the CEJ distance becomes challenging. Present study revealed a linear relationship between the angulation specifically, greater angulations of the MTM correlated with increased CEJ distances. Thus, in evaluating risk factors related with the MTM, the angulation of the 3rd molar appears to serve as a more intuitive and consistent indicator. Consequently, the angulation of the MTM may serve as a substitute for the CEJ distance between the distal MSM and the mesial MTM, thereby streamlining the assessment of MTM-related risks. [22-27]

In the current investigation, patients ranging from age 25 to 55 years were 2.17 times prone to experience distal caries in MSMs compared to those aged 16 to 24 years. The progression and intensity of distal caries in MSMs appear to correlate with the duration of exposure to the oral environment, which offers a logical rationale for our findings. Furthermore, our research did not reveal any significant gender differences concerning incident of caries distally in the MSMs. This contrasts with the study of Falci et al., who documented a greater frequency of distal caries in MSMs among male patients. [27-33]

V. CONCLUSION

According to the findings of this study, we recommend that 1) the precautionary extraction of third molars of mandible be contemplated when the third molar shows an angulation between 43° and 73°, or an impaction depth classified as Position A; 2) the degree of inclination of MTM is reliable and dependable illustrator than the distance from the cemento-enamel junction (CEJ) to the distal marginal ridge of the second molar & the mesial MTM for assessing possible risk associated with the MTM; 3) individuals over the age of 25 should closely monitor their subclinical third molars.

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