Third molar impaction in different facial types and mandibular length: A cross-sectional study

ABSTRACT

Background: The etiology of mandibular third molar impaction is proposed to be mainly due to inadequate space between the distal of the second mandibular molar and the anterior border of the ramus of the mandible. This study was aimed to assess whether an association exists between different facial types and mandibular length to impaction of mandibular third molars.

Materials and Methods: The study consisted of 170 patients who were assessed for facial type clinically based on facial index and mandibular length radiographically on lateral cephalogram. The impaction status was determined clinically and radiographically on orthopantomogram. The facial type was categorized as euryprosopic (broad face), mesoprosopic (normal facial type), leptoprosopic (long face), hypereuryprosopic (extra broad face), and hyperleptoprosopic (extra long face).

Results: Of 170 patients, 18.8% of cases were with hypereuryprosopic profile, 33.5% of cases with euryprosopic profile, 24.7% with mesoprosopic profile, 21.8% with leptoprosopic, and 1.2% with hyperleptoprosopic profile were found. Nearly 42.2% of cases with hypereuryprosopic profile, 52.6% of cases with euryprosopic profile, 53.6% cases of mesoprosopic profile, and 60.3% cases of hyperleptoprosopic and leptoprosopic profile had impacted mandibular third molars. As for mandibular length assessment, 66% cases of short mandibular length, 64.5% cases of normal mandibular length, and 27.9% cases of long mandibular length had impaction.

Conclusion: Within the limitations of the study, it was concluded that, though a higher incidence of impacted third molar was noted in patients with long facial pattern, no significant difference could be established among facial types and their association with impacted mandibular third molars. A significant association was noted between mandibular length and impaction.

Keywords: Euryprosopic, facial type, impaction, leptoprosopic, mandibular third molar, mesoprosopic

INTRODUCTION

Third molars, also called wisdom teeth, typically erupt between the age of 18 and 24 years. It is found, however, wisdom teeth often fail to erupt (unerupted tooth) or erupt only partially (partially erupted tooth). Unerupted or partially erupted teeth may be impacted, which means they are prevented from completely erupting into the normal functional position, due to a lack of space, obstruction by another tooth, or an abnormal path of eruption.

The facial types may be classified basically into broad facial type (euryprosopic), normal facial type (mesoprosopic), and long facial type (leptoprosopic). Individuals with broad facial type were proposed to have greater horizontal occlusal plane length hence have more space for third molars to erupt,
whereas individuals with long facial type would have less space available for third molar eruption due to narrow arches.

A brief guideline document was issued by the National Institute of Clinical Excellence[3] in 2000 regarding prophylactic removal of pathology-free impacted third molars. Several recommendations for further research were given that included study of factors affecting third molar impaction in a bid of optimally predicting third molar impaction. This study was hence aimed at studying facial type and mandibular length as factors that affect impaction of mandibular third and trying to predict at an early age the probability of impaction or eruption of the mandibular third molar.

MATERIALS AND METHODS

This was a cross-sectional study carried out on patients who reported to the Department of Orthodontics, Government Dental College, Trivandrum, Kerala. The study was approved by the Institutional Ethics Committee. Orthopantomogram (OPG) and lateral cephalogram were required for our study which are taken for routine orthodontic treatment plan. One hundred and seventy patients were assessed for their facial type, mandibular length, and impaction status of lower third molar teeth.

Individuals above 18 years were included in this study with exclusion criteria being gross facial asymmetry and patients who had undergone orthognathic surgery.

Following anatomic landmarks were used in this study-

Clinical landmarks
1. Soft-tissue nasion
2. Soft-tissue menton
3. Soft-tissue zygion.

Radiographic landmarks
1. Gonion (Go)
2. Gnathion (Gn).

With the above points in mind, each patient was assessed for clinical measurements: (measured using digital sliding Vernier calipers)
1. Facial height: Soft-tissue nasion to soft-tissue menton [Figure 1]
2. Facial width: Zygion to zygion [Figure 2].

Cephalometric measurements: measured using scale and protractor [Figure 3]
1. Mandibular length: Linear measurement from Go to Gn Range: males: 82–90 mm and females: 77–85 mm
2. Facial index: Calculated as explained by Martin and Saller[5] in 1957 which is also cited by Rakosi et al.[6] in Colour Atlas of Dental Medicine Orthodontics.

Following interpretations are withdrawn from the formula:
Facial Index= facial height ×100/facial width
1. Hypereuryprosopic<78.9%
2. Euryprosopic-79–83.9%
3. Mesoprosopic-84–87.9%
4. Leptoprosopic-88–92.9%
5. Hyperleptoprosopic>93%.

For simplicity sake in further discussion, hypereuryprosopic and euryprosopic facial types are referred to as brachyfacial (broad face) and those with hyperleptoprosopic and leptoprosopic facial types are referred to as dolicofacial (long face).

Third molar status
The eruption status of the lower third molar was determined both clinically and radiographically on an OPG.

Statistical analysis
Data were analyzed using computer software Statistical Package for the Social Sciences version 11.0 (SPSS 11.0. Chicago, USA: SPSS Inc.). Data were expressed in its mean and standard deviation. Independent t-test was used as parametric test to compare parametric data. The association between categorical variables was conducted using Chi-square test. For statistical evaluations, a two-tailed probability of value, <0.05 and <0.01 was considered statistically significant.

RESULTS

The study consisted of 170 patients (67 males and 103 females). Of these, 85 (50%) individuals were aged between 18 and 20 years of age and 58 (34.1%) were aged between 21 and 23 years and 27 patients (15%) were >23 years of age [Tables 1 and 2].

Coming to the issue under question, it was noted that the participants with leptoprosopic and hyperleptoprosopic profiles together had higher percentage of impaction (60.3%) though no statistically significant association could be established. However, there was a statistically significant association between the facial type and impaction among males alone, with 66% of leptoprosopic males having impacted third molars [Table 3].

There was a significant association noted in mandibular length and impaction overall as well among males and females separately. Individuals with short and normal mandibular length showed very high percentage of impaction (66% and
DISCUSSION

Mandibular third molar impaction is a commonly encountered condition, with various studies suggesting incidences ranging from 9.5% to 23% (Hellman,7 Bjork et al.,8 Haralabakis,9 Dachi and Howell10). Such impacted third molars have been found to be a cause of various pathosis such as caries, infections (pericoronal and periapical), caries, and periodontal problems associated with second molars, odontogenic cysts, and tumors. Such problems indicate the extraction of these teeth, which again is associated with complications related to their removal such as nerve injuries, periodontal defects distal to second molars which together constitute a great social burden. Some investigators have even advocated prophylactic removal of the third molars to prevent such pathologies (Henry11 and Laskin12), and there are investigators such as Henry and Morant13 who even advocated enucleating the third molar germ at age as early as 8 years.

Hence, it is very important that factors that affect the impaction of third molars be studied and efforts made...
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Individuals of age 18 years and above were considered for this study based on the various studies\(^{17-19}\) which suggested that mandibular growth after puberty is not appreciable, and if the third molar is not fully erupted and properly positioned at the age of 17 years, it is highly probable that it might remain impacted. The mean age of individuals in this study was 21.2 years with standard deviation of 3.2 years.

The second most influential factor was mandibular length. A short mandibular length predisposed to mandibular third molar impaction.\(^ {20}\) However, according to a study by Eröz et al.,\(^ {21}\) the mandibular length was shorter in the long-face pattern type, consistently supporting the hypothesis that dolichocephalic patients have an increased risk of third molar impaction. In our study, it was found that participants with longer mandibular length had a low percentage of impaction compared to those with short mandibular length, and this difference was found to be highly significant (\( p = 0.00 \)) on overall basis as well as in males and females separately. The results are in agreement with Bjork et al.,\(^ {22}\) Richardson,\(^ {22}\) and Broadbent.\(^ {23}\)

The purpose of this study was to assess the existence of such association between the facial type and mandibular length with impaction. The results obtained showed a higher percentage of impactions among dolichocephalic types, but a significant difference in association could be demonstrated only among males (\( p = 0.046 \)). Similar results were reported by Breik and Grubor\(^ {24}\) who found incidence of impaction to be twice as high in long facial pattern participants compared to those with broad facial pattern. These findings are not consistent with studies of Olive and Basford,\(^ {25}\) Richardson,\(^ {22}\)

\( \chi^2 \): Chi-square test, \( P \): Probability of value

### Table 1: Distribution according to gender (\( n=170 \))

|Sex| Count (%) |
|---|------------|
|Male| 67 (39.4) |
|Female| 103 (60.6) |

### Table 2: Distribution according to age

|Age| Count (%) |
|---|------------|
|18–20| 85 (50.0) |
|21–23| 58 (34.1) |
|>23| 27 (15.9) |

Mean±SD = 21.2±3.2

### Table 3: Association between facial index and impaction based on gender

|Gender| Facial index| Impaction, count (%) | \( \chi^2 \) | \( P \) |
|---|---|---|---|---|
|Male| Hypereuryprosopic| 2 (20.0) | 8 (80.0) | 8.02* | 0.046 |
|Male| Euryprosopic| 21 (52.5) | 19 (47.5) |
|Male| Mesoprosopic| 18 (50.0) | 18 (50.0) |
|Male| Lepto/Hyperleptoprosopic| 32 (66.7) | 18 (33.3) |
|Female| Hypereuryprosopic| 25 (46.3) | 29 (53.7) | 1.09 | 0.780 |
|Female| Euryprosopic| 39 (52.7) | 35 (47.3) |
|Female| Mesoprosopic| 27 (56.3) | 21 (43.8) |
|Female| Lepto/Hyperleptoprosopic| 15 (50.0) | 15 (50.0) |
|Total| Hypereuryprosopic| 27 (42.2) | 37 (57.8) | 4.65 | 0.199 |
|Total| Euryprosopic| 60 (52.6) | 54 (47.4) |
|Total| Mesoprosopic| 45 (53.6) | 39 (46.4) |
|Total| Lepto/Hyperleptoprosopic| 47 (60.3) | 31 (39.7) |

*Statistical significant association. \( \chi^2 \): Chi-square test, \( P \): Probability of value

### Table 4: Association between mandibular length and impaction based on gender

|Gender| Mandibular length| Impaction, count (%) | \( \chi^2 \) | \( P \) |
|---|---|---|---|---|
|Male| Short mandibular length| 24 (63.2) | 14 (36.8) | 16.02* | 0.000 |
|Male| Normal| 49 (58.3) | 35 (41.7) |
|Male| Long mandibular length| 0 (0.0) | 12 (100.0) |
|Female| Short mandibular length| 46 (67.6) | 22 (32.4) | 21.39* | 0.000 |
|Female| Normal| 58 (70.7) | 24 (29.3) |
|Female| Long mandibular length| 19 (33.9) | 37 (66.1) |
|Total| Short mandibular length| 70 (66.0) | 36 (34.0) | 30.79* | 0.000 |
|Total| Normal| 107 (64.5) | 59 (35.5) |
|Total| Long mandibular length| 19 (27.9) | 49 (72.1) |

*Statistical significant association. \( \chi^2 \): Chi-square test, \( P \): Probability of value

to predict this condition at an early age so that early intervention may be possible to reduce the postoperative complications as well as various associated pathologies. At the same time, it has been noted that these teeth that seem to be impacted at earlier ages may gain a normal position later on in life (Hattab,\(^ {14}\) Kruger et al.,\(^ {15}\) and Ventâ et al.\(^ {16}\)). Keeping these facts in mind, it is important to not only predict impaction but also predict if a presently asymptomatic impacted tooth would eventually erupt to normal occlusion if given time.

This study was done with an effort to make such prediction possible, with a hypothesis that individuals with brachyfacial pattern of growth would have lesser impaction rates as compared to individuals with dolichocephalic pattern of growth.

Another factor studied was the association between mandibular length and incidence of impaction with hypothesis that individuals with longer mandibular length would have lesser chances of impaction compared to individuals with shorter mandibular lengths.
who found that impaction was related to retrognathic and prognathic skeletal base patterns.

Nanda\textsuperscript{[26]} also noted that the amount of time of growth differed between different facial types. It was shown that brachyfacial patients exhibited a prolonged period of facial growth in contrast to dolichofacial patients. This may also account for the greater amount of resorption of the anterior border of the ramus.

CONCLUSION

It may be said that the patients with dolichofacial pattern had a higher percentage of impaction though a significant association could not be established. There was a definite and significant association noted between mandibular third molar impaction and mandibular length. Further research is suggested to study these factors and other factors associated with the impacted mandibular third molars.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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