PATTERNS OF THIRD-MOLAR AGENESIS IN AN ORTHODONTIC PATIENT POPULATION WITH DIFFERENT SKELETAL MALOCCLUSIONS

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ABSTRACT

Current study was performed to examine the relationship between third molar agenesis and different skeletal malocclusion patterns. Pretreatment records of 477 orthodontic patients (aged 13-17 years) were used. Third molar agenesis was calculated with respect to gender, number of missing teeth, jaws and skeletal malocclusion patterns. The Pearson Chi-Square test was performed to determine potential differences.

Among the 477 subjects, 127 subjects were diagnosed with third molar agenesis (26.6%) with no statistical gender difference (P > .05). It was more common in the maxilla than in the mandible or in both jaws (P > .05). The prevalence of third molar agenesis in those with a class III malocclusion was higher than in those with Class I or Class II (P > .05).

These results suggest that agenesis of the third molar depends on sagittal skeletal malocclusions in this region.

INTRODUCTION

Wisdom teeth are important in assessing the dental age of juveniles and also provide forensic specimens.1,2 Orthodontic treatment planning is also affected by third molar (M3) agenesis3, especially when arch distalization is planned. Dental agenesis is the absence of formation of one or more teeth.4 “Oligodontia” is the absence of more than six teeth.5 Whereas “Anodontia” is the absence of all teeth.6 Agenesis is the most common anomaly of the human dentition with an incidence of 20% in case of 3rd molars.7 Bailit suggested that when a third molar is absent, agenesis of the remaining teeth becomes 13 times more likely8 and it also predisposes to reduced size9 and delayed development of certain teeth10 and other dental anomalies especially when three or all four third molars are missing.11 All of these in turn affect orthodontic treatment planning. Third molar agenesis is also strongly associated with the very rare condition Hypohyperdontia.5 In this condition, there is associated agenesis of teeth and presence of supernumerary teeth in the same subject as shown in different studies.12-23 Despite being the most variable teeth in the dentition, third molars remain the most reliable biologic indicator available for estimation of age during the middle teens and early twenties.24 Trisoric found that when agenesis occurs it is often bilateral.25 Although any teeth can be susceptible to agenesis, lateral incisors and second pre-molars show a great probability of absence concomitant with the agenesis of third molars.4 Garn and Lewis26 noted that missing third molars delayed the formation and eruption of the premolars and molars on the same side.

Because of all these contrasting findings, this study was conducted to generally look for third molar agenesis in orthodontic patients and their frequencies in different skeletal malocclusions and relate third molar to anterio-posterior dimensions of the maxilla and mandible.

METHODOLOGY

This study was undertaken with the pretreatment records, including history files and radiographs, of 447 patients who were randomly selected from the dental
records of the orthodontic patients treated at the department of orthodontics in Khyber College of Dentistry. The patients in the age range of 13 to 17 years were recruited. Subjects with congenital deformities, such as a cleft palate, history of previous orthodontic treatment and with radiographs of poor quality were excluded from the study. In addition, the subjects with a missing tooth other than a third molar (M3) were not included in the study. The subjects were also checked to confirm that they had not undergone surgical removal or extraction of one or more M3. M3 was classified as developmentally missing when there was no evidence in the records that it had been extracted and when there was no sign of mineralization of the M3 tooth crown on the panoramic radiographs. Panoramic radiographs taken at the initial examination were used to determine the presence of M3 germs. In cases in which it was impossible to judge the presence of M3 germs from panoramic radiographs taken at the initial examination, subsequent panoramic radiographs taken before the age of 17 years were used. The lateral cephalometric films of all patients were traced and the anterior-posterior skeletal relationship of the maxilla and mandible was classified as skeletal Class I (ANB angle between 0º and 4º), Class II (ANB angle 5º or more), and Class III (ANB angle less than 0º) using the measurements of the Witz and ANB angle.

All assessments were performed by one investigator in a darkened room with a radiographic illuminator to ensure contrast enhancement of tooth images. To avoid observer bias, each panoramic radiograph was coded with a number, and thus the observer was blinded for the skeletal patterns of the patient. The M3 agenesis was calculated with respect to genders, number of missing teeth, jaws, and skeletal malocclusion patterns. The Pearson chi-square test was performed to determine potential differences in the distribution of M3 agenesis when stratified according to the above parameters. In addition, randomly selected radiographs were evaluated by another researcher four weeks after the initial survey to determine the reliability of diagnosis of the M3 agenesis. There was 100% agreement between the investigators. All statistical analyses were performed using the SPSS software package (Statistical Package for Social Sciences, version 19.0). P value of 0.05 was considered statistically significant.

RESULTS

Among the 447 subjects, 127 were diagnosed with M3 agenesis. Therefore, the overall prevalence of M3 agenesis was 26.6% in this orthodontic population (Table 1). Girls (27.9%) were found to have more M3 agenesis as compared with boys (24.8%) (P> 0.05) (Table 2). The prevalence of M3 agenesis in different sagittal skeletal malocclusion was determined as in Class I (24.4%), Class II (27.6%) and Class III (32.6%). (Table 4). The prevalence of M3 agenesis in those with a Class III malocclusion was significantly higher than in those with Class I or Class II.

## Table 1: The Comparison of Third-Molar Agenesis Between Genders

<table>
<thead>
<tr>
<th></th>
<th>Girls</th>
<th>Boys</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>N</td>
</tr>
<tr>
<td>Absent</td>
<td>76</td>
<td>27.9</td>
<td>51</td>
</tr>
<tr>
<td>Present</td>
<td>196</td>
<td>72.1</td>
<td>154</td>
</tr>
<tr>
<td>Total</td>
<td>272</td>
<td>100</td>
<td>205</td>
</tr>
</tbody>
</table>

*NS indicates nonsignificant

## Table 2: Characteristic Features of Patients with Third Molar Agenesis

<table>
<thead>
<tr>
<th>Jaw</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maxilla</td>
<td>73</td>
<td>57.5</td>
</tr>
<tr>
<td>Mandible</td>
<td>29</td>
<td>22.8</td>
</tr>
<tr>
<td>Both</td>
<td>25</td>
<td>19.7</td>
</tr>
<tr>
<td>Total</td>
<td>127</td>
<td>100</td>
</tr>
</tbody>
</table>

## Table 3: Pattern of Number of Third Molars Missing

<table>
<thead>
<tr>
<th>Missing</th>
<th>n</th>
<th>Prevalence (%)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tooth agenesis</td>
<td>30</td>
<td>23.6</td>
</tr>
<tr>
<td>2</td>
<td>Teeth agenesis</td>
<td>72</td>
<td>56.7</td>
</tr>
<tr>
<td>3</td>
<td>Teeth agenesis</td>
<td>3</td>
<td>2.4</td>
</tr>
<tr>
<td>4</td>
<td>Teeth agenesis</td>
<td>22</td>
<td>17.3</td>
</tr>
<tr>
<td>5</td>
<td>Total</td>
<td>127</td>
<td>100</td>
</tr>
</tbody>
</table>

## Table 4: Distribution of Patients with Third Molar Agenesis in Different Sagittal Skeletal Malocclusions

<table>
<thead>
<tr>
<th>Malocclusion</th>
<th>Absent</th>
<th>Present</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class I</td>
<td>53</td>
<td>164</td>
<td>217</td>
<td>24.4</td>
</tr>
<tr>
<td>Class II</td>
<td>60</td>
<td>157</td>
<td>217</td>
<td>27.6</td>
</tr>
<tr>
<td>Class III</td>
<td>14</td>
<td>29</td>
<td>43</td>
<td>32.6</td>
</tr>
</tbody>
</table>
When we assessed the distribution of the number of M3 agenesis among the skeletal classes, we found that in subjects with Class I and II malocclusions there was more agenesis of 2 M3s than class III malocclusions. (P, >.05). It was also found that 3 M3s were the least prevalent in all three skeletal malocclusions (Table 5).

**DISCUSSION**

The frequency of third molar agenesis in this study was 26.6%, which is more than that reported by Levesque et al in his study on French Canadian population (9%). Kruger carried out his study on the New Zealand population and reported a much less frequency (15.2%), which is also similar to a study by Harris for American adolescents (15%). Rozkovcova et al, in his study on Czech population reported 22.5% frequency. Sandhu and Kaur in a study carried out on Asian Indian students also reported 22% frequency.

Differences of prevalence of third molar agenesis seen among studies in different populations might be due to racial variations. Each study had a different sample size which also affects the results. The diagnostic criteria and age limit taken in different studies is also different and these factors also greatly affect the results and contribute to the reasons for differences in the results.

Results of this study coincide with studies conducted by Boehme (26.1%), Weise and Schurholz (27.3%) on German population. Adler (27.6%) in his study on Hungarian population and Mok and Ho on Singaporean population also reported percentages ranging between 23% and 28%. These results also correspond to the results in our study. Fanourakis study also reported similar results on Greek population (27.8%).

It was also found in the current study that third molar agenesis was more common in females with a frequency of 27.9%, than males with a frequency of 24.8%. These results are consistent with many other studies showing that third molar agenesis can be related to gender and is more common in females than males.

According to some studies, the order of frequency for third molar agenesis is 1, 2, 3, 4 missing third molars. While the order of frequency for third molar agenesis in a recently published paper was 1, 2, 4, 3 third molars. However, the order in our study was 2, 1, 4, 3 which is in agreement with the study done by Banks.

This study showed that skeletal class III patients had the highest incidence of third molar agenesis followed closely by skeletal class II patients. Subjects with class II malocclusions had more agenesis of 2 and 4 third molars than those with class I and III patterns. On the other hand, agenesis of 1 third molar was most common in class I patients followed closely by class II and then class III. Agenesis of 3 third molars was more in class III and then class II and least in class I. Limited studies have been carried out on relating agenesis of third molar to skeletal sagittal relationship of the jaws. Therefore, the results of this study cannot be compared with other studies because of the limitations of other studies.

When comparing upper and lower arches, in our study, third molar agenesis was found to be more common in the maxilla with a frequency of 20.1% than in the mandible (11.7%). The results of a study carried out by Celikoglu and Kamak on Turkish population were also in accordance to our study, showing that third molar agenesis is more frequent in maxilla than in mandible. Another study, by Kazanci, also concluded that the frequency of third molar agenesis was found to be more in maxilla than in mandible. This study was also carried out on Turkish population. However, the results of a study by Barka done on Greek population were in contrast to the findings of this study regarding the difference in frequency of third molar agenesis between maxilla and mandible.

**CONCLUSION**

M3 agenesis was most commonly observed in maxilla and less commonly in mandible for all skeletal patterns. The prevalence of patients with two M3 agenesis was the most commonly found type. The results

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**TABLE 5: MISSING M3 IN DIFFERENT SAGITTAL MALOCCLUSIONS**

<table>
<thead>
<tr>
<th></th>
<th>CI</th>
<th></th>
<th>CII</th>
<th></th>
<th>CIII</th>
<th></th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>N</td>
<td>%</td>
<td>N</td>
<td>%</td>
<td>N</td>
</tr>
<tr>
<td>Agenesis of 4 M3s</td>
<td>7</td>
<td>31.8</td>
<td>12</td>
<td>54.5</td>
<td>3</td>
<td>13.6</td>
<td>22</td>
</tr>
<tr>
<td>Agenesis of 3 M3s</td>
<td>1</td>
<td>33.3</td>
<td>1</td>
<td>33.3</td>
<td>1</td>
<td>33.3</td>
<td>3</td>
</tr>
<tr>
<td>Agenesis of 2 M3s</td>
<td>32</td>
<td>44.4</td>
<td>35</td>
<td>48.6</td>
<td>5</td>
<td>6.9</td>
<td>72</td>
</tr>
<tr>
<td>Agenesis of 1 M3</td>
<td>13</td>
<td>43.3</td>
<td>12</td>
<td>40</td>
<td>5</td>
<td>13.7</td>
<td>30</td>
</tr>
</tbody>
</table>
suggest that agenesis of M3 germs depends on sagittal skeletal malocclusions in this orthodontic population.

REFERENCES

Patterns of third-molar agenesis in an orthodontic patient


CONTRIBUTION BY AUTHORS

Farhana Afzal: Statistical analysis, main writer.
Hasan Ali Raza: Helped in article writing and proof reading.
Summiya Bashir: Helped in data collection and devising methodology.
Sana Afzal: Helped in data collection and tabulation.
Ghulam Rasool: Title selection, interpretation and discussion.