INTRODUCTION

Dental anomaly is defined as an abnormality in which a tooth or teeth have deviated from normal in form, function, or position. Any variation in tooth number, shape and size can affect the maxillary and mandibular arches and occlusion, which may complicate treatment planning. The occurrence of multiple abnormalities involving single or groups of teeth may be genetically determined and can be associated with specific syndromes. However, most anomalies arise sporadically and some involving shape and size may be affected by environmental factors acting during the morphodifferentiation stage of tooth formation. There are thousands of anomalies that can be identified but certain anomalies are more common than others.

Agenesis or missing teeth are commonly observed and three terms are used in their description: Hypodontia is developmental absence of less than six teeth, oligodontia is developmental absence of six or more teeth and anodontia denotes developmental absence of all teeth. As far as etiology is concerned, it is a multifactorial condition with genetic and environmental influences. Recent advances in molecular genetics have established the importance of different mutations in two transcription factors i.e. MSX1 and PAX9, in dental development. Familial tooth agenesis follows an autosomal dominant pattern. The most commonly missing teeth are the third molars followed by mandibular 2nd premolars and then maxillary lateral incisors. Missing teeth can be a real challenge for both orthodontists and restorative dentists. Supernumerary teeth are another commonly seen dental anomaly. These are the extra teeth that occur in addition to the normal series and may arise due to dichotomy of a tooth bud; however the most acceptable cause is localized independent hyperactivity of the dental lamina. They may occur in any region with a predilection for premaxilla and the most common being the mesiodens in the maxillary midline. Treatment depends on the type and position of the supernumerary tooth and on its effect on adjacent teeth.

Taurodontism, also called bull-like teeth, is defined as the apical extension of pulp chamber below cementoenamel junction resulting in proportionately shortened root and lengthened crown and with the bifurcation of root more apical. Molars are generally affected with taurodontism.

Dilaceration is a sharp bend or angulation of the crown or root portion of tooth. It typically occurs secondary to trauma to...
its primary predecessors during formation of the tooth, but it may be idiopathic as well. The dilacerations of the root is more common than that of the crown.

These anomalies can be observed on panoramic radiographs which are one of the commonly requested radiographic examinations. Orthodontists frequently use these radiographs to diagnose malocclusion, plan treatment and assess progress and achievement of treatment goals. An orthodontist should be aware of the potential of presence of pathology in their patients and can expect to discover anomalies on radiographs. The present study was conducted to investigate the pattern of dental anomalies like congenitally missing teeth, supernumerary teeth, dilacerations and taurodontism and to find out the most frequently occurring ones on the panoramic radiographs of orthodontic patients at the Aga Khan University Hospital.

**METHODOLOGY**

This was a retrospective study which was carried out using pretreatment panoramic radiographs of orthodontic patients who visited the dental clinic at the Aga Khan University Hospital, Karachi. Panoramic radiographs of 570 patients, who met our selection criteria, were retrieved. The inclusion criteria were (1) availability of pretreatment panoramic radiographs (2) no history of extraction of any permanent tooth prior to orthodontic treatment (3) no history of trauma and (4) no significant medical history. The exclusion criteria adopted were (1) third molars (2) patients with craniofacial anomalies or syndromes and (3) teeth with incomplete root formation.

Analysis of the panoramic radiographs was done through direct observation over an illuminator by a single investigator. On the pretreatment panoramic radiographs, following dental anomalies were noted: agenesis, supernumerary teeth, taurodontism and dilaceration. Data was pooled and analysed for frequency, gender and tooth type involved.

**RESULTS**

Out of a total of 570 patients, dental anomalies were seen in 74 patients (12.9%), with 39 of them being females (52.7%) and 35 being males (47.2%). The age range was 10-26 years with a mean age of 15.8 years (S.D ± 4.45). Table I shows the frequencies of various anomalies, while Table II shows their gender distribution.

The most commonly seen anomaly in the study sample was congenitally missing teeth. It accounted for 6.8% of the total patients (20 females and 19 males) and 52.7% of the total anomalies seen. The mandibular second premolar was found missing in 11 cases and hence it was the most commonly missing tooth (28.2%) followed by maxillary lateral incisor which was missing in 10 cases (25.6%), as shown in Fig 1. These were followed by lower central incisors which were absent in 6 cases (8.1%). Regarding the number of missing teeth per individual, it was found that 16 patients (41%) presented with one missing tooth, 16 patients (41%) with 2 missing teeth, one patient (2.5%) with 5 missing teeth, one patient (2.5%) with 15 and one patient (2.5%) was seen with 18 missing teeth.

**Table I: Frequency of various anomalies**

<table>
<thead>
<tr>
<th>Anomalies</th>
<th>No.</th>
<th>Anomaly % out of total anomalies</th>
<th>Anomaly % out of the sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Missing</td>
<td>39</td>
<td>52.7%</td>
<td>6.8%</td>
</tr>
<tr>
<td>Dilaceration</td>
<td>25</td>
<td>33.7%</td>
<td>4.3%</td>
</tr>
<tr>
<td>Supernumerary</td>
<td>6</td>
<td>8.1%</td>
<td>1%</td>
</tr>
<tr>
<td>Taurodontism</td>
<td>4</td>
<td>5.4%</td>
<td>0.7%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>74</td>
<td>100%</td>
<td>12.9%</td>
</tr>
</tbody>
</table>

**Table II: Gender distribution of various anomalies**

<table>
<thead>
<tr>
<th>Anomalies</th>
<th>Female</th>
<th>Male</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Missing</td>
<td>20</td>
<td>19</td>
<td>39</td>
</tr>
<tr>
<td>Dilaceration</td>
<td>15</td>
<td>10</td>
<td>25</td>
</tr>
<tr>
<td>Supernumerary</td>
<td>4</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Taurodontism</td>
<td>4</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>39</td>
<td>35</td>
<td>74</td>
</tr>
</tbody>
</table>

**Fig 1:** Graphic representation of frequency of missing teeth followed by lower central incisors which were absent in 6 cases (8.1%). Regarding the number of missing teeth per individual, it was found that 16 patients (41%) presented with one missing tooth, 16 patients (41%) with 2 missing teeth, one patient (2.5%) with 5 missing teeth, one patient (2.5%) with 15 and one patient (2.5%) was seen with 18 missing teeth.

**Fig 2:** Graphic representation of frequency of supernumerary teeth
Supernumerary teeth were found in 6 patients (1% of the sample) comprising of 2 females and 4 males. Four patients (80%) presented with mesiodens and two (33%) with supplemental teeth (Fig 2).

Dilacerations were recorded in 25 patients (4.3% of the sample) comprising of 15 females and 10 males. The total number of dilacerated teeth was 44. The mandibular 2nd molar was the most commonly affected tooth, occurring in 15.9% of the dilacerated teeth, followed by maxillary 2nd premolar (9%), as shown in Fig 3. Fourteen patients (56%) had only one tooth each with dilacerated roots, 8 patients (32%) had 2, 2 patients (8%) reported with 3 and one patient (2.2%) with 7 dilacerated teeth.

Taurodontism was observed in 4 patients (0.7%) and the total number of teeth was 8. The majority of the teeth affected were mandibular 1st and 2nd premolars (present in each of 3 patients), and each accounting for 28.5% of teeth involved in taurodontism. One patient presented with three maxillary teeth i.e. maxillary 1st and 2nd premolars and 1st molar, involved in taurodontism (Fig 4).

DISCUSSION

Approximately 2% to 10% of the populations have been shown to exhibit missing teeth. In the present study dental agenesis occurred at a frequency of 6.8% which is comparable with the finding of 8.1% by Thongudomporn. The most frequent congenitally absent tooth, after the third molar, is the mandibular second premolar. It was found missing in 2.5% to 4% of the population and was bilaterally absent 60% of the time and this is followed by absence of maxillary lateral incisor. In our study mandibular 2nd premolars were missing in majority of the cases. Contrary, a study by Kennedy showed maxillary lateral incisor as the most commonly missing tooth. Hence it has been observed that the frequency of missing mandibular second premolars, maxillary lateral incisors and maxillary second premolars varies with the population investigated, as can be seen in Table III. It has been observed that most individuals lack only one or two permanent teeth and this coincides with our study which showed that most of the patients had one or two missing teeth. Two patients presented with oligodontia with 18 and 15 missing teeth each and there was one patient who reported with five missing teeth.

The frequency of supernumerary teeth was 1% which is in the range of other studies like that of Thongudomporn, Basdra and Yousof. Thongudomporn found 1.8 % supernumerary teeth in a sample of Australian population. According to Basdra, the occurrence of supernumerary teeth in general Caucasian population ranges from 0.1% - 3.8% in the permanent dentition and 0.3% - 0.8% in primary dentition. Scheiner observed most frequent supernumerary teeth in anterior maxillary region followed by mandibular premolar region. Our findings are consisted with this study as all our supernumerary teeth (4 mesiodens and 2 supplemental lateral incisor) are found in anterior maxillary region.
Hamasha et al. recorded prevalence of dilacerations in 3.7% of the teeth examined. In his study he found the most commonly affected teeth were mandibular first molars (5.6%) after the mandibular third molar teeth. This is in contrast to our study in which mandibular second molar is the most affected tooth with dilacerated roots. Root dilacerations occurring in mesial or distal directions are clearly noticed on panoramic radiographs but those that occur in labial and lingual directions cannot be detected on these radiographs. For the detection of these types of anomalies, additional radiographs from different angles will be useful.

Darwazeh reported taurodontism in 8% of subjects and 4.4% of the teeth examined and found that maxillary second molar was the most commonly affected tooth. However in our study where taurodontism was seen in 0.7% of patients, the majority of cases were also of mandibular 1st and 2nd molars. A higher frequency (46.4%) of taurodontism has been reported by MacDonald-Jankowski and Li in adult Chinese population. The difference might arise from differences in diagnostic criteria or due to racial variations. The precise diagnosis of taurodontism from panoramic radiographs is difficult because molar areas usually appear distorted and may result in incorrect diagnosis and therefore supplementary radiographs are essential to confirm taurodontism.

CONCLUSION

It was found that about 13% of orthodontic patients at The Aga Khan University Hospital showed at least one dental anomaly. ‘Congenitally missing teeth’ was the most common anomaly (6.8%) and taurodontism was the least frequently seen anomaly (0.7%) in our orthodontic patients. The orthodontists have the responsibility to have full knowledge of these anomalies as these may have treatment planning and/or treatment execution complications for orthodontic patients.

REFERENCES


Pattern of Dental Anomalies in Orthodontic Patients at a tertiary care hospital