INTRODUCTION

Impaction or pathological impaction is defined as failure of a tooth to erupt in its appropriate site in the dental arch within its normal period of growth.1,2 A large number of completely impacted teeth may be retained in either jaw without any symptom.3 The impacted tooth could be one of the permanent tooth or a supernumerary tooth. A supernumerary tooth is one that is additional to the normal series and can be found in any region of the dental arch.4 The occurrence of supernumerary teeth is a relatively uncommon dental anomaly. Supernumerary teeth have frequently been observed as solitary teeth. The etiology of supernumerary teeth is still remaining unclear. However several theories have been proposed. Multiple supernumerary teeth are rare. Most cases are found in association with syndromes such as Gardner's syndrome, cleidocranial dysostosis and cleft lip and palate.5,6 It has been reported that the prevalence for non-syndrome multiple supernumerary teeth is less than 1%.7,8 The literature reported prevalence of supernumerary teeth within the mandible and maxilla varies from 0.2-0.9%.9,10 Mesiodens is considered the most common supernumerary tooth with reported incidence of 0.15 to 1.9% and has a slight male predominance. Any permanent tooth in the dental arch can be impacted, but the teeth most frequently involved in a descending order are the mandibular and maxillary third molars, the maxillary canines, the mandibular and maxillary second premolar, and maxillary central incisors.11 Therefore, the aim of this research was to study the prevalence of completely impacted teeth in dentate and edentulous jaws.

METHODOLOGY

This is a retrospective study based on 2000 panoramic radiographs of adult individuals. The panoramic
radiographs were chosen randomly from active dental record at the college of dentistry, King Saud University. All of the panoramic radiographs were made using one of two different panoramic machine (orthopantomograph 10 machine (Siemens, Germany) or orthopantomaograph –OP 100; instrumentarium, Finland with exposure parameters of 57-90 KVP, 2-16 mA, and equivalent filtration of 2.5 mm Al, using Kodak Lanex regular intensifying screen and Kodak T-MAT G/RA) . The films were processed using HP processor according to manufacturer instructions. The panoramic radiographs were originally made for various dental purposes and not for this study. Thus, no attempt was made to pre-select the panoramic radiograph. All panoramic radiographs were evaluated by the author. The tooth was considered impacted when it is completely covered with bone or not aligned with the rest of the teeth in either dental arch or certain pathological condition that prevent tooth from eruption such as dentigerous cyst or odontoma. Patients recorded and panoramic radiographs were evaluated and the following data were recorded: age, sex, number of impacted teeth and the type (permanent or supernumerary) of tooth is recorded as well as their location and pathologies associated with impaction. Third molar impactions were excluded because in some cases the tooth might be impacted and removed surgically outside the dental college which cannot be confirmed, therefore it is not considered in this study. The evaluation was performed under standard conditions of radiographic interpretation such as viewing box and dim room lighting.

Data analysis was performed using statistical Package for the Social Sciences SPSS software program. Gender, mean age and dental status were analyzed. Significant differences between the dentate and edentulous patients were analyzed as well as the difference between males and females with respect to type of impaction using Pearson’s Chi-square test. The level of statistical significance was set at 5%. The research project was approved by the College of Dentistry Research Center (CDRC) King Saud University.

RESULTS

The study sample comprised of 2000 panoramic radiographs which belongs to 1124 female (56.2%) with mean age of 37 years (SD 15.5 ) and 876 male (43.8%) with mean age of 39.7 (SD 15.9). The age of the total sample ranged from 15-90 years.

There were 1737 dentate (86.9%) with mean age of 35 years (SD13.7) and 263 (13.2%) edentulous patients with mean age of 60 years (SD9.6).

One hundred forty one (7.1%) patients out of 2000 were found to have either single or multiple completely impacted teeth of either type, these impacted teeth were found in 127 dentate and 14 edentulous patients,

TABLE 1: DISTRIBUTION OF IMPACTION TYPE BY DENTAL STATUS

<table>
<thead>
<tr>
<th>Dental Status</th>
<th>Impacted teeth</th>
<th>Supernumerary</th>
<th>Permanent teeth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dentate</td>
<td>127 (7.3%)</td>
<td>22 (17.3%)</td>
<td>105 (82.7%)</td>
</tr>
<tr>
<td>Edentulous</td>
<td>14 (5.3%)</td>
<td>0 (0%)</td>
<td>14 (11.8%)</td>
</tr>
<tr>
<td>Total</td>
<td>141 (7.1%)</td>
<td>22 (17.3%)</td>
<td>119 (84.4%)</td>
</tr>
</tbody>
</table>

Percentages within dental status

TABLE 2: THE DISTRIBUTION OF IMPACTIONS BY TOOTH TYPE AND GENDER

<table>
<thead>
<tr>
<th>Gender</th>
<th>Canine</th>
<th>Premolar</th>
<th>Central</th>
<th>Canine &amp; central</th>
<th>Canine &amp; premolar</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>36 (85.7%)</td>
<td>3 (7.1%)</td>
<td>1 (2.4%)</td>
<td>0</td>
<td>2 (4.8%)</td>
<td>42 (100%)</td>
</tr>
<tr>
<td>Female</td>
<td>58 (74.4%)</td>
<td>15 (19.2%)</td>
<td>1 (1.3%)</td>
<td>2 (2.6%)</td>
<td>2 (2.6%)</td>
<td>78 (100%)</td>
</tr>
<tr>
<td>Total</td>
<td>94 (78.3%)</td>
<td>18 (15.0%)</td>
<td>2 (1.7%)</td>
<td>2 (1.7%)</td>
<td>4 (3.3%)</td>
<td>120 (100%)</td>
</tr>
</tbody>
</table>

Percentages within gender
although no significant differences were found between them with p value 0.24. Table (1) demonstrates the frequency, percentage and type of impacted teeth in dentate and edentulous patients.

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The impacted teeth were found more commonly in female than in male. They were 83 (7.4%) and 58 (6.6%) female and male patients respectively, however, no significant difference were found between them using Pearson’s Chi-square test with P value 0.43. The most common tooth found to be impacted were permanent canines where they were found in 94 patients (4.7%) followed by premolars where they were found in 18 patients (0.9%) and to less frequently central incisors (0.1%). None of the patients had impaction of the first or second molar. Table (2) demonstrates the number and prevalence of various types of permanent teeth impactions in male and female patients.

Permanent tooth/teeth impaction were found more commonly than supernumerary teeth. It was found in 119 patients (6%) while the supernumerary impactions were recorded in 22 dentate patients (1.1%). Total of 35 supernumerary impacted teeth were recorded in 22 dentate patients, more in males than females. Table 3 shows the frequency of various types of supernumerary teeth impaction in male and female dentate patients.

None of the supernumerary impacted teeth were found in edentulous patients. Supernumerary impacted teeth were found more commonly in males (29.3%) than in female (6%) with slight significant difference between them with P value 0.02. Supernumerary impacted tooth that resemble the morphology of the premolar tooth in the premolar area were more common than mesiodens in the anterior area where it

Table 3: the frequency of various type of supernumerary impacted teeth by gender.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Premolar morphology</th>
<th>Mesiodens</th>
<th>Distomolar</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>11 (64.7%)</td>
<td>59 (29.4%)</td>
<td>1 (5.9%)</td>
<td>17 (100%)</td>
</tr>
<tr>
<td>Female</td>
<td>3 (60.0%)</td>
<td>2 (40.0%)</td>
<td>0</td>
<td>5 (100%)</td>
</tr>
<tr>
<td>Total</td>
<td>14 (63.6%)</td>
<td>7 (31.8%)</td>
<td>1 (4.5%)</td>
<td>22 (100%)</td>
</tr>
</tbody>
</table>

Percentage within gender

had been recorded as 0.7 percent and 0.4 percent for the premolar morphology and mesiodens respectively. The recorded impacted mesiodens was single in all of the seven patients with various pattern of impaction have

Figure 1 showed impacted permanent teeth in dentate patients.

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Figure 2: A panoramic radiograph of 20 year female patient shows multiple impacted permanent teeth # 15, 25 and 45 with dentigerous cyst formed around the crown of tooth # 45 leading to thinning of the inferior border of the mandible.

Figure 2: A panoramic radiograph of 45 years male patient shows multiple impacted permanent teeth number 13, 23, 24, 33, 34, 43 and 44 with well defined unilocular radiolucency surrounding the crown on impacted teeth # 43 and 44.
be demonstrated, where as impacted supernumerary tooth with premolar morphology recorded either single or multiple throughout the dental arches. Multiple supernumerary impacted teeth more than five teeth was uncommon in this study, the prevalence was 0.1%, only one case had been found with ten impacted supernumerary teeth in the premolar area. Figure 3 shows a panoramic radiograph of a 34 year male patient with multiple impacted teeth without any complication to the adjacent teeth.

DISCUSSION

Impacted tooth remain embedded in the jaw bone for various reasons, the most common cause of impaction of permanent teeth are crowding of the teeth that lead to no room for the tooth to erupt in the jaw at the appropriate time. Teeth may also become displaced in the jaw due to unknown causes resulting in impaction of the tooth. Many impacted teeth may cause no problem for people and may never be aware of this problem unless radiographic examination performed for the patients when they start to seek dental treatment. Whereas, some impaction may cause serious complication therefore early discovery of this impacted teeth may prevent such complication.

In this study permanent tooth impaction found more commonly than supernumerary teeth, as well as impacted teeth more common in dentate patients and this finding is compatible with other findings. Despite the fact that in some edentulous patients, it was difficult to know if the impacted teeth especially in the premolar area are permanent or supernumerary, therefore all the impacted teeth in the edentulous patients were considered permanent because no previous panoramic radiographs were available for comparison. The result of this study showed that permanent canine is the most common tooth found to be impacted followed by lower premolar and less frequently central teeth, this is the same finding reported in the literature.

Supernumerary teeth mean extra teeth, their shape and size may resemble the group of teeth at the site where they are found in the jaws or there may be little or no resemblance at all. They may occur impacted or erupted, singly or multiple, unilateral or bilateral and in one or both jaws. The prevalence of supernumerary teeth in a population ranging from 0.1 percent to 3.6 percent, the result of this study showed that the prevalence of supernumerary teeth impaction fall within this range. For mesiodens, in 7 patients the tooth was single, while the supernumerary teeth resembled the premolar morphology were found in 14 patients either single or multiple.
In several studies\textsuperscript{9,10} where eruption of the supernumerary teeth in the permanent dentition was evaluated, around 25\% of the supernumerary teeth were erupted while the rest were impacted. In this study all of the supernumerary tooth/teeth recorded were impacted without any associated dental anomalies.

Several researchers\textsuperscript{16,17} reported that mesiodens is the most common supernumerary tooth in the premaxilla between the two central incisors; it could resemble the morphology of the permanent teeth or has unusual morphology. The direction of the crown of the mesiodens may be normal, inverted or horizontal. The result of this study did not support their findings where supernumerary tooth/teeth that resemble premolar morphology recorded more commonly than the mesiodens, however, supernumerary teeth found more commonly in male patients than female patients, which is the same finding reported by Acikgoz et al\textsuperscript{13}.

Multiple impacted supernumerary teeth are not common occurrence, although a single or a few supernumerary tooth/teeth in each case have been widely reported in the literature\textsuperscript{18,19}. Yuosf\textsuperscript{7} in 1990 reviewed many cases reported in the English literature from 1969 to 1990, he reported a predilection of non-syndrome multiple supernumerary teeth to occur in the mandible at the premolar area, which is the same finding reported in this study, since there was one case belong to male patient with no history of any systemic disease or known syndrome with multiple impacted supernumerary teeth that resemble premolar morphology found in the premolar area of both arch.

Dentigerous cyst formed around supernumerary teeth account for 5\% of all dentigerous cysts formed around impacted tooth. It has been reported in the literature\textsuperscript{19,20} that most of the cyst formed around a mesiodens in the anterior maxilla, however none of the supernumerary teeth in this study demonstrated cystic transformation, as well as displacement and resorption of the adjacent teeth were not evident. This finding is in agreement with Acikgoz et al\textsuperscript{13} therefore, close follow up of the patients with impacted supernumerary as well as with permanent teeth is required to prevent further complication formed by cystic transformation or resorption of the adjacent teeth root.

There was one case where the patient had impacted canine and supernumerary teeth in the anterior maxilla. The presence of the supernumerary tooth could be the cause of the impaction of the permanent canine. Early diagnosis of impacted supernumerary tooth and treatment by extraction of the supernumerary tooth may prevent such complication.

In this study the radiographic examination was carried out with panoramic radiograph as screening for the patients seeking dental treatment. From the findings reported in this study it seems that panoramic radiograph is considered good for detection of impaction. If detailed examination is needed to evaluate the exact location of the impacted teeth in the dental arch and its proximity to the vital structures or the adjacent teeth in either dental arches panoramic radiograph is not enough. Therefore, cone beam computed tomography (CBCT) is recommended for more detailed examination. CBCT has many advantages over simple panoramic film such as accurate visualization of head and neck structures. The compact size and relatively low radiation dosage as well as the short scanning time with CBCT scanner make it suitable for imaging the craniofacial region, including dental structures\textsuperscript{21}.

**CONCLUSIONS**

- Most of the impacted teeth were diagnosed coincidentally during radiographic examination.
- Permanent tooth impaction is more common than supernumerary tooth.
- Complication like cystic transformation resulting from impaction more common with permanent teeth impaction.
- Extraction of the asymptomatic supernumerary impacted teeth is not recommended unless complication is present.
- Follow up of the patients with impacted teeth through periodic radiographic examination.
- CBCT is recommended for detailed examination.

**REFERENCES**


