ABSTRACT
Temporomandibular joint (TMJ) ankylosis is interference in the mobility of the jaws which varies from slight to complete inability to open the jaw. This study was conducted to determine the morphological and cephalometric characteristics in patients diagnosed with TMJ ankylosis. A total of 25 (13 male/12 female) patients of TMJ ankylosis, with age range of 5-20 years referred via OPD or Oral and Maxillofacial Surgery Department, Khyber College of Dentistry Peshawar were evaluated for period of 1 year. All variables obtained were entered in SPSS version 10.0 and frequencies were calculated. Most common etiology for TMJ ankylosis was trauma (n=22, 88%). The onset of mouth opening limitations began when the patients were younger than 10 years age. Unilateral ankylosis was found in 17 patients (68%). Antero-posterior Cephalometric findings demonstrated SNA 3° to 10° below norm, showed retrognathic maxilla. SNB was 2° to 19° below the norm also showed mandible in severe retrognathia (n=25). Total mandibular length (Go-Gn) was severely decreased in both the affected and non-affected sides in 76.47% patients. Five (62.5%) patients with bilateral TMJ ankylosis were presenting even with more disharmonious linear jaw relationships.

Keywords: Temporomandibular Joint (TMJ), TMJ Ankylosis. Extra-articular, Intra- articular, Cephalometry, Anterior point (a.p) point of Maxilla and Mandible

INTRODUCTION
Temporomandibular joint (TMJ) ankylosis is interference in the mobility of the jaws which varies from slight to complete inability to open the jaw. The movement of jaw is also restricted in protrusion and lateral excursion. The ankylosis is either extra articular (false ankylosis) or intra articular (true fibrous or bony ankylosis). Extra articular ankylosis results from pathologic conditions not directly related to the joint like fibrosis of masticatory muscles, neurological disorders, coronoid impingment, facial scars etc). while intra articular ankylosis results from true bony or fibrous adhesion between the articular surfaces of the mandibular condyle and glenoid fossa due to trauma, local or systemic infection, tumors and systemic diseases (ankylosing spondylitis, rheumatoid arthritis, psoriasis). The diagnosis is established clinically with limitation of mandibular movement, deviation of jaw, reduced ramus height, flattened mandibular body etc. Other clinical characteristics include secondary changes in maxilla affecting its size, shape, and position. Radiographically, there is condylar deformation, obliteration of joint spaces and abnormal bone formation in and around the TMJ. The cephalometric characteristics include, maxilla and mandible retruded in posterior and superior direction and hyoid bone displaced posteriorly and inferiorly. This study was conducted to determine the morphological and cephalometric characteristics in patients diagnosed with TMJ ankylosis.

METHODOLOGY
A total of 25 (13 male and 12 female) patients of TMJ ankylosis, with age range of 5-20 years referred via OPD or Oral and Maxillofacial Surgery Department, Khyber College of Dentistry Peshawar were evaluated for period of one year. Patients with unilateral and bilateral (true bony or fibrous) ankylosis were included, while those representing with false ankylosis due to scar, coronoid impingment, tumor etc were excluded from this study. All relevant information were obtained on specially designed Performa which included the patient demographic data, etiology of TMJ ankylosis, intra/ extraoral features of maxilla and mandible, diagnostic radiographs (panoramic films, lateral/ frontal cephalograms) etc. Cephalometric analysis for TMJ ankylosis included skeletal and dental landmarks and reference planes are demonstrated in Figure 1.
The sagittal, vertical and linear relation of jaw bases were recorded for every patient which included the following:

**Sagittal analysis**
- CBA (cranial base angle)
- SNA (Sella nasion to point A on maxilla)
- SNB (sella nasion to point B on mandible)
- ANB (Point A-nasion–point B)

**Vertical analysis**
- Y axis
- INCLINATION angle
- Gonial angle
- Upper gonial
- Lower gonial

**Linear analysis of jaw bases**
- Ramus height (Gonion-ramus ascending)
- Maxillary length (PNS-a.p Maxilla)
- Mandibular length (Gonion-a.p Mandible)
- Witts value

All variables obtained were entered in SPSS version 10.0 and frequencies were calculated represented via charts and figures.

**RESULTS**

Among 25 study patients, majority represented during 6-10 years age range (n=16; 64%). (Figure I) Male to female ratio was 1.5:1. Most common etiology for TMJ ankylosis was trauma (n=22, 88%) while 2 cases (8%) were having history of birth trauma (forceps delivery), and one case (4%) was diagnosed with chronic arthritis (Table 1).

The onset of mouth opening limitations began when the patients were younger than 10 years in all of the 25 patients. Twenty four patients (96%) had convex profile. Asymmetry was found in 17 patients (68%). Midline shift was recorded in 16 patients (64%). Orthopantomogram was assessed, bony ankylosis found in 20 patients (80%) while rest of 5 patients (20%) had fibrous ankylosis. (Figure II) Unilateral ankylosis was found in 17 patients (68%) while 32% patients had bilateral ankylosis. Antero-posterior Cephalometric findings demonstrated SNA 3° to 10° below norm, showing maxilla in retrognathic relation with cranial base (12 patients, 48%). Orthopantomogram was assessed, bony ankylosis found in 20 patients (80%) while rest of 5 patients (20%) had fibrous ankylosis. (Figure II) Unilateral ankylosis was found in 17 patients (68%) while 32% patients had bilateral ankylosis. Antero-posterior Cephalometric findings demonstrated SNA 3° to 10° below norm, showing maxilla in retrognathic relation with cranial base (12 patients, 48%). Orthopantomogram was assessed, bony ankylosis found in 20 patients (80%) while rest of 5 patients (20%) had fibrous ankylosis. (Figure II) Unilateral ankylosis was found in 17 patients (68%) while 32% patients had bilateral ankylosis. Antero-posterior Cephalometric findings demonstrated SNA 3° to 10° below norm, showing maxilla in retrognathic relation with cranial base (12 patients, 48%). Orthopantomogram was assessed, bony ankylosis found in 20 patients (80%) while rest of 5 patients (20%) had fibrous ankylosis. (Figure II) Unilateral ankylosis was found in 17 patients (68%) while 32% patients had bilateral ankylosis. Antero-posterior Cephalometric findings demonstrated SNA 3° to 10° below norm, showing maxilla in retrognathic relation with cranial base (12 patients, 48%). Orthopantomogram was assessed, bony ankylosis found in 20 patients (80%) while rest of 5 patients (20%) had fibrous ankylosis. (Figure II) Unilateral ankylosis was found in 17 patients (68%) while 32% patients had bilateral ankylosis. Antero-posterior Cephalometric findings demonstrated SNA 3° to 10° below norm, showing maxilla in retrognathic relation with cranial base (12 patients, 48%). Orthopantomogram was assessed, bony ankylosis found in 20 patients (80%) while rest of 5 patients (20%) had fibrous ankylosis.
Figure I: Age distribution

Table 1: Etiology of TMJ ankylosis

<table>
<thead>
<tr>
<th>Etiology of TMJ ankylosis</th>
<th>Frequency (n)</th>
<th>%age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trauma</td>
<td>22</td>
<td>88</td>
</tr>
<tr>
<td>Birth trauma</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>Inflammation</td>
<td>1</td>
<td>4</td>
</tr>
</tbody>
</table>

Table 2: Skeletal antero-posterior analysis

<table>
<thead>
<tr>
<th>Angular measurements</th>
<th>SNA</th>
<th>SNB</th>
<th>ANB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum</td>
<td>68</td>
<td>59</td>
<td>3</td>
</tr>
<tr>
<td>Maximum</td>
<td>85</td>
<td>77</td>
<td>19</td>
</tr>
<tr>
<td>Mean</td>
<td>78.0</td>
<td>68</td>
<td>10.0</td>
</tr>
<tr>
<td>SD</td>
<td>4.27</td>
<td>4.27</td>
<td>3.68</td>
</tr>
<tr>
<td>Comments</td>
<td>Maxillary retrognathism</td>
<td>Mandibular retrognathism</td>
<td>Convex profile</td>
</tr>
</tbody>
</table>

Table 3: Linear measurements

<table>
<thead>
<tr>
<th>Linear Maxillo-mandibular dimensions</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of Maxilla (PNS-a.p Maxilla)</td>
<td>35</td>
<td>53</td>
<td>40.0</td>
</tr>
<tr>
<td>Length of Mandible (GO-a.p Mandible)</td>
<td>33</td>
<td>72</td>
<td>50.2</td>
</tr>
</tbody>
</table>

DISCUSSION

The most common traumatic sequale to facial skeleton is TMJ ankylosis\textsuperscript{1,2}, it not only results in interference to oral function but also affects craniofacial growth with gross cephalometric changes\textsuperscript{4}. Among 25 patients of TMJ ankylosis, both genders have reported above the age of 6-10 years (64%). The number gradually reduced after that. The study of Malik\textsuperscript{8} and Manganello\textsuperscript{9} has also emphasized upon similar results as young patients are more prone to direct and indirect trauma. The most common etiology for TMJ ankylosis resulted from trauma (direct, indirect). Again the study of Manganello\textsuperscript{9} and Shashikiran\textsuperscript{10} has revealed trauma as most common cause for TMJ ankylosis.

In this study, majority of patients has developed gross morphological changes in facial skeleton with asymmetry (68%), midline shift (64%), limited mouth opening (96%), and convex profile (100%). Shashikiran and his colleagues\textsuperscript{10} also have similar findings. Majority of patients has developed unilateral TMJ ankylosis (68%). Eighty percent has true bony ankylosis. The study of Reha\textsuperscript{11} and Iram\textsuperscript{12} has documented same findings in correspondence to our study.
Antero-posterior skeletal analysis showed maxillary retrognathism (48%), mandibular retrogenia (100%) and class II maxillomandibular relation (96%). Wing and his colleagues emphasized that cephalometric changes govern more with mandible than in maxilla. In this study gross developmental change affects mandible more than maxilla and cranial base.

Vertical analysis showed severe clockwise rotation of mandible (96%) and was found more exaggerated in patients with bilateral TMJ ankylosis. Again the study of Wing and his colleagues has reflected same findings.

Linear maxilla-mandibular length measurements have shown more severe changes in mandible than in maxilla. It was even more exaggerated in bilateral TMJ ankylosis than unilateral type. Staburn and Kjellberg with his colleagues have carried extensive study to determine maxilla-mandibular changes which is not different from this study.

CONCLUSION

TMJ ankylosis results from trauma either bony or fibrous ankylosis at age of 6-10 years. Morphologically the mandible and maxilla are severely affected in all dimensions. There is gross asymmetry, midline shift, of affected side of mandible. Cephalometric changes occur both in mandible and maxilla especially affecting antero-posterior and linear dimensions.

REFERENCES