INTRODUCTION

Ankylosis of the Temporomandibular joint (TMJ) is a disfiguring condition.\(^1\) The unfortunate patient experiences problems in food intake, speech and maintaining oral hygiene due to limited mouth opening. The facial deformity resulting from ankylosis also has a psychosocial impact.\(^2\) TMJ ankylosis is an intracapsular fibrous or bony fusion of the mandibular condyle, joint disc and the glenoid fossa complex.\(^3\)

It most likely occurs due to disruption of the meniscus and organisation of haematoma within the joint with or without a related intracapsular fracture of the condyle.\(^4\) TMJ ankylosis is relatively common in developing countries especially in the South-Asian population. Previous trauma, especially to the chin area in young age, has been documented as the most common etiological factor.\(^5\) The management of TMJ ankylosis is mainly surgical, followed by early physiotherapy and functional rehabilitation but differs according to the age of the patient and the extent and duration of ankylosis.\(^4\) During the past 150 years since the first condylectomy for the relief of ankylosis there has been a gradual evolution of the techniques employed for its management.\(^6\) However, so far no single method has produced uniformly successful results to avoid the major problems of limited range of motion and recurrence of ankylosis.\(^7\)

The most frequently used procedures include Gap arthroplasty, interpositional arthroplasty, excision and joint reconstruction with grafts (autogenous and alloplastic), and total TMJ replacement with joint prosthesis.\(^8,9\) Recently, distraction osteogenesis has become a popular method for correction of the mandibular deformity and relief of upper airway obstruc-

ABSTRACT

The objectives of the study were to evaluate the outcome of Gap arthroplasty and Interpositional arthroplasty in terms of mouth opening for management of TMJ ankylosis.

This Quasi experimental study was carried out in Oral & Maxillofacial Surgical unit, Khyber College of Dentistry, Peshawar from May 2006 to August 2007. Sixty patients of TMJ ankylosis seeking treatment for the first time, irrespective of age and gender were included in the study. Thirty patients were treated by gap arthroplasty (group A), while thirty patients by disc interpositional arthroplasty (group B). A postoperative jaw opening exercise regimen was followed and interincisal distance /mouth opening was measured at each follow up visit. Both groups were evaluated for difference in mouth opening. Descriptive statistics and Independent samples T-test was applied with significance level at $P < 0.05$. After 6-months postoperative follow up, mean interincisal distance was 30.80 mm (± 3.17 mm) for group A, and 32.20 mm (± 4.14 mm) for group B. Difference between the two groups was not significant ($p = 0.147$). Postoperative jaw opening exercises are crucial for lasting success.

Key Words: TMJ ankylosis, Condylar fracture, Disc repositioning, Gap arthroplasty.
tion due to ankylosis. In interpositional arthroplasty, a variety of materials including skin grafts, temporalis muscle, temporalis fascia, homologous cartilage, and silastic, silicone or acrylic implants have been used as interpositioning materials. The interpositioning material of choice is the one which is easily available, has the same operative field, causes minimal donor site morbidity and postoperative complications. Both the dislocated native disc if present intact, and the pedunculated temporalis myofascial flap have these properties. Early postoperative jaw mobilization and aggressive physiotherapy are an integral part of a treatment protocol for TMJ ankylosis.

Amongst the procedures used primarily for the relief of ankylosis, some researchers have advocated in favour of Gap arthroplasty whereas others have concluded that Interpositional arthroplasty is a better option. The purpose of this study was to evaluate and find the results of Gap and Interpositional arthroplasty, in order to standardize the management of TMJ ankylosis among patients reporting at Khyber College of Dentistry, Peshawar.

METHODOLOGY

This Quasi experimental study was carried out at Oral & Maxillofacial Surgical Unit, Khyber College of Dentistry, Peshawar from 20th May 2006 till 20th August 2007. Sixty patients of TMJ ankylosis were included in the study. They were divided into two treatment groups (group A and B). Each group had 30 patients. Patients managed by Gap arthroplasty were assigned group A, while patients who had undergone Interpositional arthroplasty were included in group B. Only Diagnosed patients of TMJ ankylosis, irrespective of age and gender, recommended for surgery were included in the study, while recurrent cases of ankylosis were excluded. A detailed history was taken and thorough clinical examination was carried out with the consent of the patient. Orthopantomogram (OPG) was the standard radiograph and when required was supplemented by postero-anterior (PA face) view and lateral oblique view of the mandible for confirmation of diagnosis. Computed Tomography scan was advised for two patients.

The patients were recalled on preset appointments after the surgical planning. Before the procedure, the risks and benefits associated with the treatment were explained and a written informed consent of all the patients or parents (for child patients) was taken. All the 60 patients were operated under general anesthesia with blind nasotracheal intubation. Surgical approach to the TMJ was same in all the patients i.e., the modified preauricular incision by Al-Kayat and Bramley, with temporal extension shaped like a question mark (Popowich’s modification of Al-Kayat & Bramley’s incision). The joint capsule was divided by a T-shaped incision. Inter-incisal distance (IID)/mouth opening was noted at the operating table immediately following completion of the surgical procedure. Postoperatively, patients were routinely administered antibiotics for 7-10 days. All patients were advised and demonstrated the same mouth opening exercises. On the 2nd post-operative day only active mouth opening was started and on the 5th post-operative day passive jaw movement exercise with wooden spatulas was started. Patients were discharged on the 7th post-operative day after removal of the skin sutures, with instructions of active and passive physiotherapy. The wooden spatula exercise was advised 5 times a day for 15 minutes, a spatula was added per day to the previous count up to insertion of 30-35 spatulas. The exercise was continued at least for 6 months. Each patient was monthly reviewed for a period of 6 months; mouth opening/IID was measured on each visit and at the end of six months follow-up.

The data collected from the two groups were entered into SPSS version 10 and analyzed by applying descriptive statistics, and Independent-samples T-test. For comparison of treatment outcome, Independent-samples T-test was used to compare the means of IID of the two groups at the end of 6 months follow-up. The level of significance was set at p < 0.05.

RESULTS

The mean age of the patients at the time of presentation in this study was 13.33 (± 4.85) years. In group A, the mean age was 16 (± 3.8) years while in group B it was 10.5 (± 4) years. Maximum number of patients presented in 5-10 years (n=20, 33.3%), followed by 11-15 years (n=19, 31.6%). In group A, maximum number of patients presented in 16-20 years (n=14, 46.6%), followed by 11-15 years (n=10, 33.3%). In group B, maximum number of patients presented in 5-10 years
(n=17, 56.6%), followed by 11-15 years (n=9, 30%). The detailed age distribution is given in Table No.1. Gender distribution of the study showed that 60% patients were male (n=36), while the remaining 40% were female (n=24), with a male to female ratio of 1.5:1. Group A had 53.3% males while group B had 66.6% males.

The mean pre-operative mouth opening/interincisal distance (IID) was 7.45 mm (± 4.26 mm). In group A, the mean mouth opening/ IID was 6.47 mm (± 4.23 mm), while in group B was 8.43 mm (± 4.12 mm), as shown in Tables 2 and 3. 60 patients of TMJ ankylosis were treated in this study. Patients in group A were treated by gap arthroplasty (n=30) while patients in group B with interpositional arthroplasty.

The mean mouth opening of group A, just after completion of surgery was 25.5 mm (± 3.7 mm), while in group B, it was 27.10 mm (± 3.42 mm), as given in Tables 4 and 5. The difference is not significant statistically (p= 0.082). At the end of 6 months post-operative follow up, the mean IID/mouth opening of group A was 30.80 mm (± 3.17 mm), while of group B, it was 32.20 mm (± 4.14 mm). The difference is not significant statistically (p= 0.147).

DISCUSSION

TMJ ankylosis is a relatively common condition of the younger age, the frequency of TMJ ankylosis in developing countries including Pakistan, India, China, and Africa is much more than in the developed ones. Not often seen in the west, but facial trauma remains the major factor in TMJ ankylosis in this part of the world. In this study, the mean age of the patients was 13.33 (± 4.85) years. The most common age group came out to be 11-20 years. The result is similar to studies conducted by Sawhney and Li. Involvement of the lesser age group is due to the fact that fractures of condyles are more common in children as compared to other sites of the mandible. Regarding gender distri-

### TABLE 1: AGE DISTRIBUTION OF PATIENTS (n=60)

<table>
<thead>
<tr>
<th>Age in Groups</th>
<th>Group A</th>
<th>Group B</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-10 years</td>
<td>3 (10%)</td>
<td>17 (56.6%)</td>
<td>20 (33.3%)</td>
</tr>
<tr>
<td>11-15 years</td>
<td>10 (33.3%)</td>
<td>9 (30%)</td>
<td>19 (31.6%)</td>
</tr>
<tr>
<td>16-20 years</td>
<td>14 (46.6%)</td>
<td>4 (13.3%)</td>
<td>18 (30%)</td>
</tr>
<tr>
<td>21-25 years</td>
<td>2 (6.6%)</td>
<td>0</td>
<td>2 (3.3%)</td>
</tr>
<tr>
<td>Above 25 years</td>
<td>1 (3.3%)</td>
<td>0</td>
<td>1 (1.6%)</td>
</tr>
<tr>
<td>Total</td>
<td>30 (100%)</td>
<td>30 (100%)</td>
<td>60 (100%)</td>
</tr>
</tbody>
</table>

### TABLE 2: STATISTICS OF GROUP A (n=30)

<table>
<thead>
<tr>
<th>Age</th>
<th>Pre-op Inter-incisal distance</th>
<th>Period of Ankylosis (years)</th>
<th>IID after Completion of surcal procedure (mm)</th>
<th>IID 6 months Post-op (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>Valid</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Mean</td>
<td>16.13</td>
<td>6.47</td>
<td>7.43</td>
<td>25.47</td>
</tr>
<tr>
<td>Std. Deviation</td>
<td>3.88</td>
<td>4.23</td>
<td>4.58</td>
<td>3.73</td>
</tr>
</tbody>
</table>

### TABLE 3: STATISTICS OF GROUP B (n=30)

<table>
<thead>
<tr>
<th>Age</th>
<th>Pre-op Inter-incisal distance</th>
<th>Period of Ankylosis (years)</th>
<th>IID after Completion of surcal procedure (mm)</th>
<th>IID 6 months Post-op (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>Valid</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Mean</td>
<td>10.53</td>
<td>8.43</td>
<td>3.77</td>
<td>27.10</td>
</tr>
<tr>
<td>Std. Deviation</td>
<td>4.08</td>
<td>4.12</td>
<td>3.39</td>
<td>3.42</td>
</tr>
</tbody>
</table>
distribution, in the present study 60% patients were male (n=36) and 40% were female (n=24) with male to female ratio was 1.5:1. In a study by Vasconcelos patients were equally distributed in both sexes. However, in studies by Cheema and Tanrikulu the number of female patients was more than the male. Though a definite reason could not be ascertained, the relatively high number of male to female patients in our study may be due to the fact that male children are more active and involved more in outdoor activities.

Among patients treated by Gap arthroplasty (group A) at the end of 6 months post-operative follow up, the mean IID was measured. Anterior open bite was encountered in 4 cases after bilateral gap arthroplasty. Thirty patients of group B were treated by Interpositional arthroplasty of whom, 26 patients had the natural disc repositioning while in the remaining 4 patients pedunculated temporalis myofascial flap was used for interpositioning, as the disc was unable to be repositioned because it was severely damaged or missing. Recurrence was observed in only one case. Statistical evaluation of the difference in IID between the two groups was insignificant. In a study on disc repositioning by Zhang and He recurrence occurred in a patient 6 months postoperatively. In the single re-ankylosis case in this study too, displacement of the repositioned disc may be the reason but a definite cause could not be ascertained due to the time limitation of the study.

Roychoudhury emphasized that gap arthroplasty supplemented with vigorous jaw opening exercises have good long term functional results. The IID after gap arthroplasty in the present study is almost the same as in this study. Topazian compared gap and interpositional arthroplasties, reported 53% recurrence in patients treated by gap arthroplasty but no recurrence was observed when autogenous tissue was interposed. However, other studies on gap arthroplasty and the present study show better results of gap arthroplasty. This may be due to complete removal of the medial ankylosic mass and having carried out postoperative physiotherapy strictly.

Recurrence is of major concern in all methods of treatment of TMJ ankylosis. Gap arthroplasty is widely reported to be associated with re-ankylosis if a sufficient gap is not produced. The effort to increase the gap leads to unstable occlusion and anterior open bite thus interpositioning of an autograft or allograft is a good means of limiting resection and preventing recurrence.

A variety of materials have been used but the most widely used and reported interpositioning material is temporalis myofascial flap. In a study by Chossegros, good results were obtained with full thickness skin graft and disc repositioning, while homologous cartilage gave poor results. Though little has been reported about the status of use of the dislocated disc, recent studies on disc repositioning arthroplasty provide more direct evidence that disc interpositioning is an ideal approach for the treatment of TMJ ankylosis as it restores normal structure of TMJ and prevents recurrence. Moreover, it will not present problems such as cost, risks of graft harvesting and immunologic risk. In a comparative statistical study by Tanrikulu, eight cases were treated by gap arthroplasty, nine by interpositional soft tissue arthroplasty and seven by joint reconstruction with costochondral graft. Recurrence was observed in only one case in whom bilateral interpositional soft tissue arthroplasty was done. Statistical evaluation otherwise showed that postoperative mouth opening achieved was the greatest with interpositional arthroplasty. The results of that study are consistent to that of the present study, when only gap and interpositional arthroplasty are considered.

Surgery is not the end point of treatment of TMJ ankylosis. Postoperative rehabilitation is equally important and neglect here is often a reason for failure. Early postoperative jaw-opening exercises are essential and should be supplemented by analgesic and anti-inflammatory medications to reduce the pain, which is a major factor for noncompliance of patients to postoperative physiotherapy.

REFERENCES