

# Temporomandibular Joint Arthroplasty Comparison of Autogenous Versus Alloplasts as Interpositional Material

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## ABSTRACT

**Aim:** To compare the post operative improvement in the opening of jaws after two procedures following, TMJ gap arthroplasty and to compare early and late complications of the two procedures.

**Methods:** Total forty patients were included in the study. 20 patients (Group A) were treated with gap arthroplasty and temporal fascia graft while 20 patients (Group B) were treated with gap arthroplasty and silastic graft. Pre and post-op jaw movements and interincisal openings of the two groups were noted with Vernier calipers. 1,3 and 6 months follow ups were conducted.

**Results:** Group A consisted of 13 males and 7 females while group B consisted of 12 males and 8 females. Twenty-two out of forty patients had ankylosis of left side. Mean pre-op interincisal distance was 4.65+/- 1.595 mm in 40 patients. The net increase in interincisal distance was 31.127 mm in group A and 31.260 mm in group B. Both groups showed minimal complications but 4 patients from group A showed transient weakness of frontal branch of facial nerve while one showed frontal nerve injury on permanent basis. In group B 3 patients had infection post operatively, among these two patients recovered, where as one patient had rejection of alloplastic implant after one month.

**Conclusion:** The interposition of alloplastic graft (silastic) following arthroplasty of the TMJ is less morbid than temporalis fascia interpositioning and gives equally good functional and aesthetic results.

**Keywords:** Ankylosis, Temporal fascia, Silastic graft, Interpositional gap arthroplasty,

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## INTRODUCTION

Temporomandibular joint ankylosis is a very common condition developed mainly after damage to mandibular condyles or temporomandibular joint (TMJ) at a growing age<sup>1</sup>. There are multiple causes of TMJ ankylosis, trauma being the most common cause<sup>2</sup>. Other etiological factors are inflammatory (e.g. rheumatoid arthritis, osteoarthritis, septic arthritis), neoplastic (e.g., osteochondroma) and neurogenic (e.g. epilepsy and brain tumor). Trauma (direct or indirect) leads to hemarthrosis i.e., (extravasation of blood into the joint space) and clot organization takes place. Calcification and obliteration of joint space occurs where immobility of the joint is maintained for a long time. Initial fibrous bands are formed and it leads to bony consolidation and ossification that ultimately results in fusion/ankylosis. It is a highly distressing condition in which the joint space is obliterated by scar tissue and

the patient has an inability to open the mouth<sup>3</sup>.

Extra-articular and intra-articular types of TMJ ankylosis have been described depending mainly on the anatomic site of fusion or union. Intra-articular or true ankylosis indicates the union between the articular surfaces of TMJ while extra-articular or false ankylosis results from pathologic conditions involving extra articular structures. Ankylosis may be fibrous or bony depending on the nature of tissue<sup>4</sup>.

TMJ ankylosis which develops in childhood in particular has its own characteristics with regard to individual's appearance and functions<sup>5</sup>. In this condition since the growth and development of the mandible are affected, a bird-face appearance forms in bilateral cases and deviation towards the affected side appear in unilateral cases. As a result of insufficient patients nutrition, the child's physical development remains behind that of his/her contemporaries. This condition is relatively very common in Pakistan<sup>6</sup>. Other effects of TMJ ankylosis in children are physiological stress and emotional disturbance, speech impairment, difficulty in mastication, malocclusion, airway compromise and poor oral hygiene<sup>7</sup>.

The imaging diagnosis is essential in differentiation and proper evaluation of TMJ ankylosis<sup>8</sup>. Commonly required radiographs are, O. P. G, Lateral oblique view, Cephalometric radiograph, CT scan with 3.D reconstruction, Common

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radiographic findings are: decreased ramus height on the affected side, obliterated joint space with dense sclerotic bone. The condyle is replaced by shapeless mass of bone, prominent antegonial notch on the affected side and elongation of coronoid process.

Surgical options for treatment include condylectomy, gap Arthroplasty and interpositional arthroplasty<sup>9</sup>. Condylectomy is indicated in case of fibrous ankylosis where joint space is obliterated with fibrous bands but there is not much deformity of condylar head. Gap arthroplasty involves creation of an anatomical gap of about 1-1.5cm in the ankylosed segment to form an artificial joint space.<sup>10</sup> In this procedure no material is interposed to the site after the arthroplasty. Interpositional arthroplasty involves the creation of the gap along with placing an interpositional material (autogenous/alloplastic) b/w the two cut ends .It minimizes the chance of recurrence (reankylosis)<sup>11</sup>. Surgical approaches used for these procedures include preauricular approach, temporal approach, postauricular approach, endural approach, retro mandibular approach (post ramus), submandibular, coronal and sub facial approach<sup>12</sup>.

Satisfactory surgical correction of temporomandibular joint ankylosis (TMA) is limited by a high recurrence rate, particularly in those patients who underwent surgery without use of interpositional material<sup>13</sup>. Different autogenous and alloplastic interpositioning materials have been used after the resection of the ankylotic bone to achieve desirable and long lasting results. A range of autogeneous materials is used for interpositioning including temporalis fascia, temporalis muscle, costochondral graft, cartilage grafts and dermis. But in comparison with other materials the temporalis fascial flap has advantages of its autogenous nature and close proximity to the joint. The disadvantages of temporalis facial flap include donor site morbidity and other postoperative complications. Similarly alloplastic materials include: titanium, gold, vitallium, acrylic, silastic, ceramic implants, teflon and acrylic spacer. But the use of silastic implant with less volume and proper fixation prevents reunion of bone; fixation of the sheet prevents its movement and thus extrusion. Additional advantages include lack of donor site and immediate return to function but this material does have some complications like foreign body reaction and suboptimal post operative range of motion<sup>14</sup>.

## **MATERIAL AND METHODS**

The study design was prospective comparative study. It was conducted in the Department of Oral and Maxillofacial Surgery, Children Hospital and The Institute Child Health, Lahore between January 2012 to January 2014. Total forty patients were included in

this study and they were divided in two groups A and B. All patients underwent surgery (Gap Arthroplasty with interpositioning) .Twenty patients (Group A) were treated with (gap arthroplasty + interpositioning of autogenous i.e., temporalis fascia) and twenty patients (Group B) were treated with (gap arthroplasty + interpositioning of alloplastic graft i.e., silastic).The treatment allocation was done using simple random sampling. The following inclusion and exclusion criterias were considered. Clinically and radiologically proven TMJ Ankylosis, cases of unilateral ankylosis, age 10-15 years, no gender predilection, medically fit to undergo surgical intervention, patient's consent to participate were included in the study. Patients with bilateral ankylosis, patients below 10 yrs of age, recurrent ankylosis, congenital ankylosis or birth injury, mentally disable patients were excluded.

For surgical procedures modified pre auricular incision extending to the temporal region was followed as a standard incision in all the cases. This incision is preferred because of adequate exposure and good cosmetic results. Gap arthroplasty was carried out by creation of an anatomical gap in the ankylosed segment to form an artificial joint space. The gap is created at a level lower than the original joint space. It involves liberal resection of the ankylotic bone thus creating a gap of about 1-1.5cm and interpositional materials were placed between the two cut ends i.e. temporalis fascia for group A and alloplastic graft for group B.

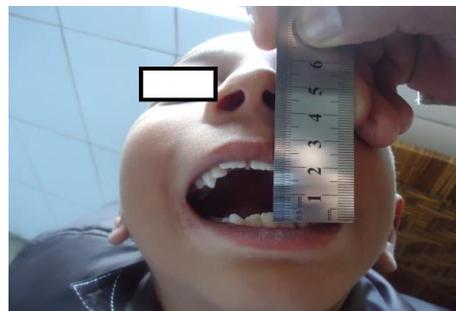
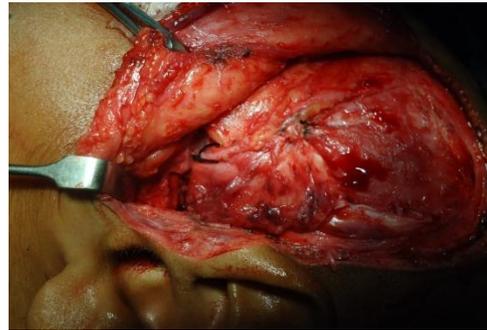
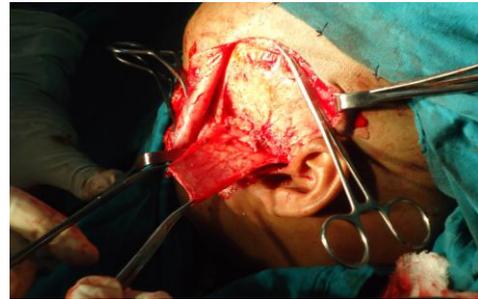
Postoperative course include uneventful recovery, antibiotic coverage and analgesics (7 days), drain and bandage. Follow up includes regular visits and assessment of wound healing, signs of infection and status of oral hygiene. Patient was advised, to perform mouth exercises with sticks and to start solid diet (both started after 72 hr post operatively). Prevention of recurrence is by early post op mobilization of newly constructed joint, from 6<sup>th</sup> post op day for at least 6 months. Post op Rehabilitation includes: chewing gums, acrylic carrot, wooden spatulas, exercises with monoblock mouth prop for atleast 6 months postoperatively. Orthodontic treatment and Orthognathic surgery may be required at later stages of rehabilitation. The data of this study was presented as proportions. The proportions in two groups were compared using the chi-square test with one degree of freedom and at an alpha level at 0.05 level.

## **RESULTS**

In Group A 13(65%) were males and 7(35%) were female patients while group B consisted of 12(60%) males and 8(40%) female patients. In total sample of

40 patients 22(55%) cases had ankylosis of left side where as 18(45%) cases had ankylosis of right side. In total sample 33(82.5%) patients were new cases of ankylosis, while the remaining 7(17.5%) had history of previous operations. Duration of ankylosis ranged from 9 months to 12 years. Mean pre-op interincisal distance was  $4.65 \pm 1.595$  mm in 40 patients. Immediately follow up was carried out at first post op week followed by first, third and six month follow up visits. Immediate postoperative interincisal distances ranged from  $28.10 \pm 3.344$  mm in group A and  $28.20 \pm 2.894$  mm in group B. At first post op month this range was  $30.96 \pm 2.689$  mm in group A and  $31.14 \pm 3.316$  mm in group B. At third post op month mean interincisional distance was  $32.40 \pm 3.441$  in group A whereas  $32.60 \pm 2.978$  in group B. At sixth post op month this range increased to  $33.05 \pm 2.452$  in group A and  $33.10 \pm 2.535$  in group B. The net increase in interincisal distance was 31.127 mm in group A and 31.260 mm in group B. All patients had an uncomplicated outcome with minimal complications. In group A 4 patients showed transient weakness of frontal branch of facial nerve at immediate post op while one patient showed frontal nerve injury on permanent basis. In group B 3 patients had infection post operatively, among these 2 patients recovered where as 1 patient had rejection of alloplastic implant. At late post op follow up 3 patients in group A whereas 2 patients in group B developed reduced mouth opening due to parental noncompliance with mouth exercises.

TMJ gap arthroplasty with temporalis fascia interpositioning (Group A)



TMJ gap arthroplasty with silastic interpositioning (Group B)

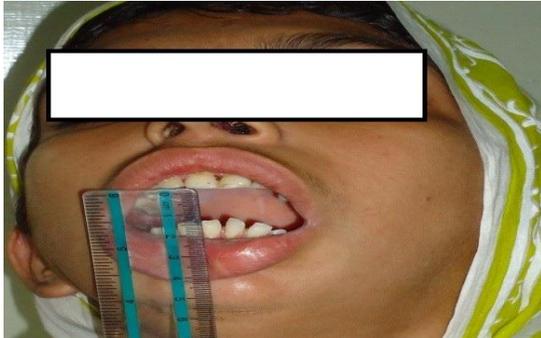


Table: Comparison of interincisal distance between 2 groups

Period	Group A	Group B
Preop	4.65+/-1.595	
Immediate postop	28.10+/-3.344	28.20+/-2.894
1 <sup>st</sup> post op month	30.96+/-2.689	31.14+/-3.316
3 <sup>rd</sup> post op month	32.40+/-3.441	32.60+/-2.978
6 <sup>th</sup> post op month	33.05+/-2.452	33.10+/-2.535
Net increase	31.127	31.260

P value: >0.05



## DISCUSSION

Ankylosis is a Greek Terminology meaning “Stiff Joint”. It refers to the partial or complete inability to open the mouth which results in functional and growth deformation of the mandible<sup>15</sup>. The treatment of temporomandibular joint ankylosis is aimed at achieving adequate mouth opening, restoration of masticatory function, enhancement of speech and maintenance of desired oral hygiene. There is no literature consensus on a standard protocol to correct Ankylosis, but three modalities are in common use: Condylectomy, gap arthroplasty and interpositional arthroplasty. Humphrey performed the first condylectomy for these situations<sup>16</sup>. Until the use of interpositioning materials, treatment results showed a high index of recurrence. Interposition of autogenous or alloplastic material at the osteotomy site is a mechanism to prevent recurrence. Verneuil A, (1860) was the first to use temporalis flap as an interpositional material in the treatment of TMJ ankylosis<sup>17</sup>. The use of alloplast (silastic) as



interpositioning material has almost similar attributes as of autogenous bone grafts.

The main purpose of this study was to compare the post operative improvement in the opening of jaws after two procedures [interpositioning of autogenous i.e., temporalis fascia and interpositioning of alloplastic graft i.e., silastic] following TMJ gap arthroplasty and to compare early and late complications of the two procedures. Both procedures showed equally good functional and aesthetic results with no patient having reankylosis. Regarding morbidity, temporalis fascia after interposition was found more morbid than silastic as injury to facial nerve was noted.

It appears from our study that trauma is the major cause of TMJ ankylosis 80-96% followed by infection and other causes. Thus, early treatment of condylar fractures, post injury physiotherapy and regular follow up is mandatory to prevent TMJ ankylosis. The majority of our patients were males, possibly due to society in which female patients are not presented for treatment. Mansaur<sup>18</sup> and Kazanjian<sup>19</sup> conducted a study in Jordanaian children and they also reported that males are more prone to develop TMJ ankylosis. Postoperatively, establishment of at least 30mm of passive mouth opening was considered successful. Care was taken to open the mouth downward by light pressure on the chin without the help of any apparatus. It excludes any lack of opening due to minimal fibrosis of contralateral joint or contraction of temporalis muscle of the other side. In case of young joint active mouth opening may lead to rupture of the fibrosis or temporalis musculature and subsequent scaring may cause decreased mouth opening or ankylosis of contralateral side.

The post operative phase is very important and any negligence in this regard can lead to a failure. Analgesics and anti-inflammatory medications are indicated to prevent post-op morbidity. The single reason of concern is the post operative rehabilitation including physical therapy with mouth opening exercises plus lateral and protrusive jaw movements in case of this surgery. Tanrikulu, Gorgun 2006, explained the importance of early post op exercises in preventing reankylosis<sup>20</sup>. Chidzonga found in his study that failing to do jaw exercises was the main cause of relapse<sup>21</sup>.

Our study has some limitations and consequently it does not answer all questions concerning treatment of TMJ ankylosis. However by keeping reasonable sample size, long duration of study and follow up we tried to conclude success rate of two different interpositional materials, etiology, early & late complications and recurrence in these patients.

## CONCLUSION

Both techniques have their own merits and demerits with acceptable immediate and long term outcome but the interpositioning of alloplastic graft following arthroplasty of the TMJ is less morbid than temporalis fascia interpositioning and gives equally good functional and aesthetic results. Temporal fascia works as excellent interpositioning material but comparatively with more surgical morbidity and complications.

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