ORIGINAL RESEARCH

Temporalis Myofacial Flap for Interpositional Anthroplasty in Temporomandibular Joint Ankylosis

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ABSTRACT

Introduction: Temporomandibular joint (TMJ) ankylosis is a distressing structural condition that denies the victim from the benefit of a normal diet and opportunities in careers that require normal speech ability. Ankylosis is a Greek word meaning "A stiff joint".The most common surgical procedure includes aggressive resection of the ankylotic segment, ipislateralcoronoidectomy, contralateral coronoidectomy when necessary, interposition with lining the joint with temporalis myofascial flap, and early mobilization and aggressive physiotherapy.

Material and method: 10 patients of Temporomandibular Joint bony Ankylosis of which five unilateral and five bilateral underwent interpositionalarthroplasty by temporalis myofascial flap, to evaluate mouth opening preoperative, intraoperative and postoperatively for a duration of minimum 6 months to maximum 2 years to assess recurrence.

Result: Mean post-operative mouth opening in all operated TMJ ankylosis cases were 35.0 ± 3.80 mm after 1 week, 34.1 ± 3.66 mm after 1 month, 32.1 ± 5.21 mm after 3 months, 30.2 ± 6.88 mm after 6 months, 26.2 ± 8.2 mm after 1 year, 22.0 ± 9.93 mm after 2 year.

Concluson: The temporalis myofascial flap is effective in treating TMJ ankylosis due to its reliability, versatility, autogenous nature, resilience, adequate blood supply, proximity to the joint, ease of access to the condyle area, minimal risk of nerve damage, and ability to alter the arch of rotation by basing the flap inferiorly or posteriorly, allow for a pedicled transfer of vascularized tissue into joint area.

Keywords: Temporomandibular joint (TMJ), Ankylosis,Pre-operative, Mouth opening, Temporalis myofascial flap, Post-operative, Interpositionalarthroplasty

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INTRODUCTION

Temporomandibular Joint is vital for efficient mastication in all subjects and its importance becomes self-explanatory when one considers its functional capabilities and status due to its complex – anatomical and physiological uniqueness. It is a ginglymodiarthodial joint that differs from other joints of the body.

Temporomandibular joint (TMJ) ankylosis is a distressing structural condition that denies the victim from the benefit of a normal diet and opportunities in careers that require normal speech ability. It also causes severe facial disfigurement that aggravates psychological stress. Temporo-mandibular joint ankylosis during early childhood may lead to disturbances in growth which leads to facial asymmetry, serious difficulties in eating and breathing during sleep. Studies have shown that temporomandibular joint ankylosis creates not only functional and aesthetic problems but also interferes with adequate nutrition and oral hygiene measures.[1,2]

The incidences of Temporomandibular Joint Ankylosis have been reported from the prehistoric times. Ankylosis is a Greek word meaning "A stiff joint". It is an intra capsular condition resulting from fusion of bony articulating surface of the joints. The fusion may be Fibrous or Bony.

The clinical manifestations of this condition depends to a large extent on age at time of onset, duration, anatomical location and involvement of one or both joints (uni-lateral or bilateral). However it ranges from limited mouth opening to severe morpho-logical and incapacitating anatomical alternations in facial appearance of affected individuals.[3]

A variety of techniques for treatment of temporomandibular joint ankylosis have been described in literature. The most common surgical procedure includes aggressive resection of the ankylotic segment, ipislateralcoronoidectomy, contralateral coronoidectomy when necessary, interposition with lining the joint with temporalis myofascial flap, and early mobilization and aggressive physiotherapy.[1-7,10,11]

Advantage of Interpositionalarthroplasty with temporalis myofascial flap over other Interpositionalarthroplasty procedures is that temporalis myofascial flap is an ideal interpositional material due to its autogenous origin, close proximity to the temporomandibular joint, good vascular supply, ease of access to the condyle area, reduced re-ankylosis rate,minimal risk of nerve damage, and successful clinical results.[2,12,13]

Result from interpositionalarthroplasty with temporalis myofascial flap of longest duration of follow-up of 8 to 10 years concluded that temporalis myofascial flap in interpositionalarthroplasty represents the gold standard surgery for Temporomandibular Joint Ankylosis.[14,15]

In this study, ten patients of Temporomandibular Joint bony Ankylosis of which five unilateral and five bilateral underwent interpositionalarthroplasty by temporalis myofascial flap in department of Oral and Maxillofacial Surgery, Rama Dental College and Hospital, Kanpur, to evaluate mouth opening preoperative, intraoperative and postoperatively for a duration of minimum 6 months to maximum 2 years to assess recurrence.

MATERIALS AND METHODS

After confining the criteria, the patients who were presented with Temporo-Mandibular Joint bony Ankylosis and lots were drawn. The simple random technique were used to assign the patients into two groups, five unilateral and five bilateral and underwent general anesthesia using fiber-optic naso-tracheal intubation Al-Kayat Bramley incision, aggressive resection of ankylotic mass, ipislateral/contralateral coronoidectomy, interpositional arthroplasty by temporalis myofascial flap, with early mobilization and aggressive physiotherapy to evaluate functional outcome by pre-operative, intra-operative and post-operative mouth opening for a duration of minimum 6 months to maximum 2 years.[7,20,21,27-29]

Selection Criteria

Inclusion criteria: Bony Temporo-Mandibular Joint Ankylosis

Exclusion criteria: Systemic compromised patients and patients with Fibrous temporo-mandibular joint ankylosis.

Method of collection of data

Patients with Temporo-Mandibular Joint Ankylosis were subjected to thorough pre-operative history, age, gender, etiology, pre-operative mouth opening, clinical examination, radiological examination (OPG, TMJ open and closed mouth view), and Computer Tomography (coronal, axial, and 3-D CT). Intraoral and extraoral photographs were taken preoperatively and postoperatively of all the patients. Patients were subjected to routine hematological investigations and pre-anesthetic evaluation for difficulty in opening of mouth and post-operatively with OPG, TMJ open and closed mouth view, and Computer tomography (coronal, axial, and 3-D CT) for minimum period of 6 month and maximum period of 2 years.

SURGICAL PROCEDURE

Routine surgical instruments were required for performing the technique. The patient were anesthetized via fiber-optic naso-tracheal intubation.[20] Surgical skin preparation of the face, and temporal region was performed using cetrimide, standard normal saline and povidine iodine respectively.

Al-kayat and Bramley incision line with a pre-auricular extension above the tragus were marked using methylene blue. Then local infiltration of 2 % Lignocaine with 1:200000 adrenaline was administrated along the proposed line of incision. And skin incision were given in a question mark shaped and began about a pinna's length away from the ear, antero-superiorly just within the hair line and then curves were followed backwards and downwards well posterior to the main branches of the temporal vessels, till it meets the upper attachment of the ear. The incision then follows the attachment of the ear and just endaurally. The temporal incision must be carried through the skin and the superficial fascia to the level of the temporal fascia. The nerve filaments run in the superficial fascia and full length of this fascia were reflected with the skin flap. Blunt dissection carried downwards to a point about 2 cm above the malar arch where the temporal fascia splits. The pocket

formed by the division contains fatty tissue which were easily visible through the thin lateral layer. Beyond this point there should be no attempt at further dissection of the superficial fascia from the temporal fascia.[21,7]

Starting at the root of the malar arch, an incision running at 45˚upwards and forwards were made through the superficial layer of the temporal fascia. The bifurcation of the facial nerve were not nearer than 2.4 cm in an inferio-posterior direction from the post-glenoid tubercle. Care was needed not to extend deep dissection below the lower attachment of the ear. They concluded that Al-kayat and Bramley incision had following advantages, minimal bleeding and less sensory loss, easily identification of fascial planes, excellent visibility, avoidance of muscle herniation and fibrosis, remarkably little postoperatively discomfort or swelling, with good cosmetic result.[21]

After exposure and identification of the site of the ankylosis, aggressive excision of bony ankylotic mass were carried out.[7]

A coronoidectomy, dissection and stripping of muscle (temporalis, masseter and medial pterygoid) were performed on ipsilateral side. Interincisal mouth opening were measured after excision of ankylotic mass and ipsilateral coronoidectomy.[7]

Contralateral coronoidectomy were performed via intraoral approach if interincisal mouth opening was less than 35 mm. After optimal interincisal opening i.e. 35 mm to 50 mm were achieved, and joints were reconstructed.[7]

Temporalis myofascial flap were harvested due to its availability at the operative site with well vascularized. The flap were passed through zygomatic ring and it was fixed to the lateral side of condylar head and fixed to the medial side of the condylar head with transcondylar suture.[22-25]

A suction drain were placed at donor site and activated after achieving a two layer primary using 4-0 vicryl cutting sutures.

All patients received preoperative and post operative antibiotics for a minimum of seven days for the surgical procedure. Intraoral irrigation with normal saline, chlorhexidine and regular donor site dressing were carried out for all patients on a routine basis. Active mouth opening exercises were started for all patients from 4th postoperative day.

Early physiotherapy were important to disrupt adhesions and prevent subsequent soft tissue contraction. At 6 weeks postoperatively, the maximal incisal opening must be equal to or demonstrate signs of increasing to the intraoperative maximal incisal opening. If this does not occur, the joint were stretched under general anesthesia to break any fibrous adhesions. Aggressive physiotherapy were continued for 1 year to maintain optimal results.[7,26-29]

Postoperative radiographic evaluation by OPG, TMJ open, closed mouth view and CT scan of the joint space was done after 1 year.

STATISTICAL ANALYSIS

The data collected were Grouped, tabulated and statistically analyzed according to Chi-square test.

RESULTS

Ten patients who presented with Temporo-Mandibular Joint bony Ankylosis of five unilateral and five bilateral underwent general anesthesia using fiber-optic naso-tracheal intubation Al-Kayat Bramley incision, aggressive resection of ankylotic mass, ipislateral coronoidectomy, contralateral coronoidectomy when necessary, interpositional arthroplasty by temporalis myofascial flap, early mobilization and aggressive physiotherapy using Shekhar's appliance, Heister jaw opener, wooden ice-cream sticks, and acrylic cone (figure-1,2).

Mean pre-operative mouth opening in all TMJ ankylosis cases was 3.0 ± 3.65 mm.

After resection of ankylotic mass and ipislateralcoronoidectomy (bilateral coronoidectomy indicated when mouth opening ≤ 35 mm achieved), mean intra-operative mouth opening in all operated TMJ ankylosis cases were 40.4 ± 4.29 mm.

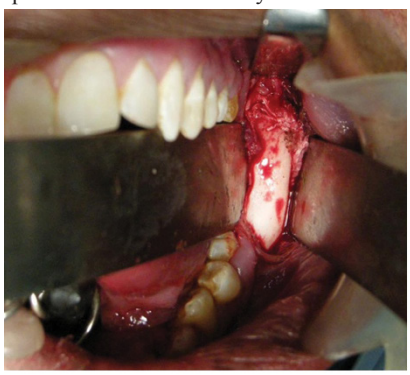
Duration of follow-up ranges from minimum of 6 months to maximum of 2 years.

Mean post-operative mouth opening in all operated TMJ ankylosis cases were 35.0 ± 3.80 mm after 1 week 34.1 ± 3.66 mm after 1 month, 32.1 ± 5.21 mm after 3 months, 30.2 ± 6.88 mm after 6 months, 26.2 ± 8.2 mm after 1 year, 22.0 ± 9.93 mm after 2 year. (Table 1,2)

DISCUSSION

The temporomandibular joint ankylosis were applied to any disorder resulting in permanent mandibular dysfunction due to bony union occurring unilaterally or bilaterally. Its management often poses the dual challenges of restoring mandibular function and associated deformities. This condition were rarely painful, most patients either consult for restricted mouth opening followed by eating or speaking problems were identified at dental treatment.[5] Ignorance, economic difficulties,

Ipsilateral Coronoidectomy

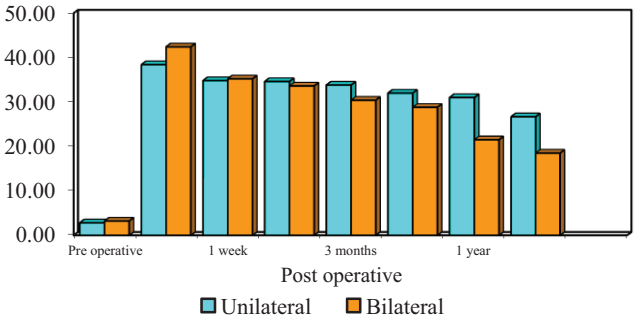


Follow up

Mouth Opening

Pre-operative Post operative after 2 yr

Figure-1: Sugical Procedures



Graph-1: Comparison of Mouth Opening (Mm) in Unilateral and Bilateral TMJ Ankylosis

poor utilization of dental services and distance to referral centers were some of the reasons that probably account for late reporting of the patients for treatment thereby obscuring the evaluation of the etiological factors causing ankylosis. Various authors Adekeye and Kaban listed that trauma and infection are the main causes of ankylosis of temporomandibular joint and were similar to our study.[6,7] Most patients presented with mouth opening caused occlusal de-arrangement, poor oral hygiene, rampant caries, generalized gingivitis, periodontal disease and gross calculi. Those patients who had unilateral ankylosis presented with mandibular asymmetry. The appearance was that of flatness and elongation on the unaffected side with roundness and fullness of the face of affected side, with the midpoint of the chin and the mandibular midline were deviated to the ankylosed side. The maxillary and mandibular incisors were played forward because of pressure of the tongue. Those patients with bilateral ankylosis had classical bird face deformity. These clinical features reported in our study correlates with those of Kaban.[7]

In our study, mean pre-operative mouth opening in all ten TMJ ankylosis cases were 3.0 ± 3.65 mm as compared to 3.5 ± 1.7 mm. Temporomandibular joint ankylosis presents a serious problem for airway access. All patients were managed surgically under general anesthesia using fiber-optic naso-tracheal intubation.[20,4] The current standard for surgical correction were to operate when the ankylosis was recognized by Kaban.[7] We had done Al-Kayat Bramley incision in all patients.[24] Advantages of Al-KayatBramley incision over other pre-auricular incisions were minimal bleeding and less sensory loss, easily identified fascial planes, excellent visibility, avoidance of muscle herniation and fibrosis, little post-operative discomfort or swelling, good cosmetic result achieved and easily teachable and speedily executed technique. We followed Kaban's protocol in all patients, consisting; Aggressive resection of ankylotic mass not less than 1.5 cm is crucial, taking care not to injure the internal maxillary artery or any of its branches behind and deep to the ankylosed mass.[5,7,21] A pre-operative CT scan is helpful to delineate the boundaries of the ankylotic mass. Ipsilateral/Contralateral coronoidectomy (mouth opening ≤ 35mm achieved) recommended, to prevent inadequate intra-operative inter-incisal opening.[7]

Temporalis myofascial flap is interpositional tissue after resection of a bony ankylosis above zygomatic arch at 45˚ and it is secured with sutures to medial pterygoid on medial aspect of the mandibular condyle. It was securely sutured so that it is able to resist the forces adequately at the operative site during movements of the jaw, so helping to fulfill its role as an autologous interpositional material in break the joint.[25]

Advantages of temporalis myofascial flap over other interpositional materials were its reliability, versatility, autogenous nature, resilience, adequate blood supply, close proximity to the site, minimal risk of nerve damage and ease of access to the condyle area, and ability to alter the arch of rotation by basing the flap inferiorly or posteriorly, allow for a pedicled transfer of vascularized tissue into joint area.[2,12,24]

Early mobilization and aggressive physiotherapy were important to disrupt adhesions and prevent subsequent soft-tissue contraction. It was continued for atleast 6 months to 1 year to maintain optimal results.[7]

Radiographic assessment were carried out using OPG, TMJ open and closed mouth view, and CT scan. Generally, Routine radiographs as OPG and TMJ open and closed mouth view showed that there were joint deformity, with complete loss of joint space and abnormal bone formation in and around the joint,but did not reveal the nature and extent of the pathology, in particular the medial and lateral extension of the ankylosed bone mass, and its relation to surrounding vital structures.[9]

During post-operative period, CT scan were taken from a period of 6 months to 1 year after surgery.[1] The post-operative CT scans in 8 patients showed an increased interarticular space due to interposed tissue without signs of recurrence of ankylosis.[1]

Rigorous mouth opening exercise were commenced in every patient 24 hours post-operatively and were continued for 12 months.[6] The exercise was done four times daily to the limit of tolerance.[6] In addition, the co-operation and perseverance of the patients irrespective of the age and pain from the operative site was highly instrumental to level of the mouth opening achieved. All patients in our series had interpositional arthroplasty, the overall outcome were satisfactory in the interincisal mouth opening at 6 months into post-operative period.[14] This may be attributed to the intense instruction and motivation of the patients towards the need of aggressive physiotherapy and also to the direct supervision of the jaw exercise using Shekhar's appliance, Heister jaw opener, wooden ice-cream sticks, and acrylic conein the immediate postoperative period.[6,21,26]

In our study, duration of follow-up was from 6 months to 2 years when compared to Kaban- 6 months to 1 year, Iram Abbas- 2.5 years, and Q.G.Ahmad- 10 years.[7,14,15]

Mean post-operative mouth opening after 1 week was 35.0 ± 3.86 mm in all patients and after 1 month was 34.1 ± 3.66 mm in all patients and then after 3 months was 32.1± 5.21 mm again after 6 months was 30.2± 6.88 mm in all patients andafter 1 year was 26.2 ± 8.2 mm in 8 patients and 37.5 mm in Kaban and 36.1 mm in Kim Su Gwan[1] finally after 2 years was 22±9.9 mm in 7 patients and results as compared to 20 to 40 mm in 27 cases and > 40 mm in 33 cases in Ahmad.[7,15]

According to Chi-square test ($p < 0.09$), there was significant increase in mouth opening postoperatively in our study ($p < 0.05$).

In our study, excellent results were achieved in 90% of cases as compared to 41.1% of cases in Ramezanian and 83% of cases in Chossegross.[10]

For the follow-up observations lasting from 6 months to 2 years, the success rate which were based on increased mobility of the mandible and no interference with eating[40] was 80 %, nearly similar to the study of Kim Su Gwan.[1]

This study concluded that the temporalis myofascial flap were effective in treating TMJ ankylosis[1] due to its reliability, versatility, autogenous nature, resilience, adequate blood supply, proximity to the joint, ease of access to the condyle area, minimal risk of nerve damage, and ability to alter the arch of rotation by basing the flap inferiorly or posteriorly, allow for a pedicled transfer of vascularized tissue into joint area.[2,12,13,24]

CONCLUSION

This study concluded that the Interposition alarthroplasty using temporalis myofascial flap is most reliable method to avoid recurrence of ankylosis and were ffective in treating TMJ ankylosis due to its reliability, versatility, autogenous nature, resilience, adequate blood supply, its close proximity to the joint, ease of access to the condyle area, minimal risk of nerve damage and ability to alter the arch of rotation by basing the flap inferiorly or posteriorly, allow for a pedicled transfer of vascularized tissue into joint area.

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