

Efficacy of Temporalis Myofascial Flap as an Inter-Positional Material in Gap Arthroplasty in Temporomandibular Joint Ankylosis: Analysis of 10 Cases

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Abstract

Temporalis myofascial flap holds great promise as an interposing tissue, for the treatment of ankylosis in gap arthroplasty, for its dependable blood supply through the middle and deep temporal arteries, proximity to the maxillofacial region, possibility to mobilize it to the oral cavity through the under surface of zygomatic arch and its fanned out nature permitting the surgeon to use this flap as inter-positional tissue. The present paper reviews the surgical anatomy, vascular pattern and our clinical experience in ten patients who underwent surgical treatment for ankylosis with inter-positional arthroplasty. It fared well all 10 cases proving that temporalis myofascial flap is a versatile option for inter-positional arthroplasty with minimal complication rate.

Keywords: Temporo Myofacial Flap, Temporomandibular joint, Ankylosis, interpositional arthroplasty

Introduction

Ankylosis of TMJ (temporal mandibular joint) involves fusion of mandibular condyle to glenoid fossa by bone or fibrous tissue (Ankylosis = stiff joint, Greek word). TMJ ankylosis is more commonly associated with trauma (13-100%), local or systemic infection, and (10-49%) systemic diseases (100%) such as ankylosing spondylitis, rheumatoid arthritis and psoriasis. It can also occur congenitally or secondary to rheumatoid arthritis or tumours in area of TMJ. An ankylotic block causes a decrease in mandibular mobility which hindering mouth opening, as well as anterior and lateral movements¹. It causes severe facial disfigurement that exacerbates psychological stress. TMJ ankylosis during early childhood may cause disturbances in growth/ cause facial asymmetry and difficulty in eating and breathing during sleep.

The management of TMJ ankylosis is challenging to maxillofacial surgeons because of technique difficulty and high incidence of recurrence. Treatment includes gap arthroplasty (resection without interpositional material); joint reconstruction (resection of bony mass with reconstruction by bone grafts of joint prosthesis) or interpositional arthroplasty (resection of bony mass with interposition of biological material /non biological material)². The most commonly used interpositional material is temporalis myofacial flap. The present study explains effectiveness of interpositional arthroplasty with temporalis myofascial flap in treatment of unilateral TMJ ankylosis in 10 patients.

Materials and Methods

A retrospective evaluation of ten patients who underwent surgical treatment for ankylosis with interpositional arthroplasty at our institute was conducted. Out of 10 patients 7 were female 3 were male with mean age of 19.5 years (range 16-23). Data regarding patients age, gender, etiology of ankylosis, side of joint affected, pre and post-operative mouth opening and follow up periods were recorded (table 1). Radiographic assessment was carried out using CT scan and orthopantomograph (fig4). Maximum follow up period was 5 years and the minimum was 1 year. Mean preoperative mouth opening was 1.97cm.

Table 1: Summary of temporomandibular joint Ankylosis cases

S.No	Sex	Age	Etiology	SITE	MO Pre-Op (cm)	MO Post-Op (cm)	Interpositional Material	Follow-up Period
1	F	20	Trauma	RT	2.3	3.9	TF	4
2	F	19	Infection	RT	1.2	3.2	TF	5
3	F	21	Trauma	LT	2.6	4.4	TF	4
4	F	21	Trauma	LT	1.5	4	TF	3
5	M	16	Trauma	RT	2.1	3.6	TF	3
6	M	19	Trauma	LT	2.2	3.8	TF	3
7	F	23	Trauma	LT	1.4	4	TF	2
8	F	17	Trauma	RT	1.8	4.2	TF	3
9	F	19	Trauma	RT	2	3.9	TF	2
10	M	20	Trauma	RT	2.6	4.2	TF	1

M: male, F: female, MO: mouth opening, preop: preoperative, postop: postoperative



Fig. 1: CASE 1 Preoperative Photograph

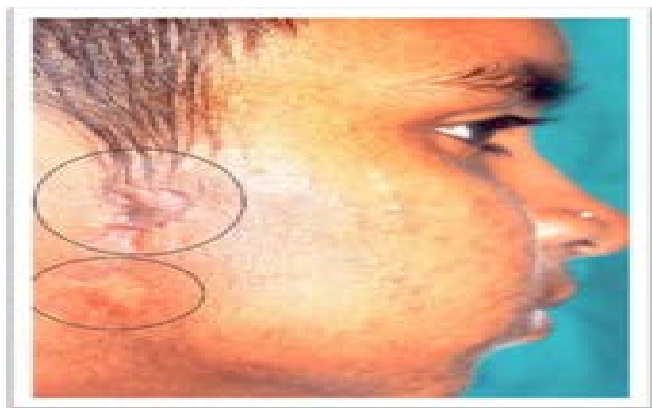


Fig. 2: Healed Sinus Tracts



Fig. 3: Preoperative mouth opening 1.2cm



Fig. 4: Preoperative OPG showing Ankylosis of right TMJ.



Fig.: 5 Preauricular Al-Kayat Barmely incision

All the patients were operated under GA using Awake Naso-endotracheal intubation. A Preauricular Al-Kayat Barmely incision (Fig: 5) was made in the region of the involved side. The incision involves skin, subcutaneous tissue and temporoperital fascia (suprazygomatic SMAS layer). Care is to be taken not to injure superficial temporal vessels along superior aspect of temporoperital fascia and facial nerve temporal branch deep to temporoperital fascia. Undermining of superior portion of incision is carried out above zygomatic arch and flap retracted anteriorly and an incision is made through superficial (outer) layer of temporal fascia beginning at root of zygomatic arch anterosuperiorly. Sharp end of

periosteal elevator is inserted into fascial incision and swept back and forth cleaving the attachment of periosteum on surface of zygomatic arch. Dissection carried inferiorly to TMJ capsule and intervening tissue is sharply released posteriorly along the initial incision and retracted anteriorly containing the facial nerve branch. An incision was then made directly onto the bone over palpable ankylosed TMJ.

Excision of ankylotic bony mass was carried out using chisel and bur creating a gap of 1-1.5cm between glenoid fossa and mandible joint space (fig 6&9). Following excision of bone mass ipsilateral coronoidectomy was done and if maximal mouth opening was less than 3.5cm then contralateral coronoidectomy was done. The glenoid fossa was lined with temporalis myofascial flap rotated over the arch into the joint (fig 7&8). Layer wise closure done and surgical drain was placed (fig10). Aggressive postoperative physiotherapy was carried out within 24 hrs.

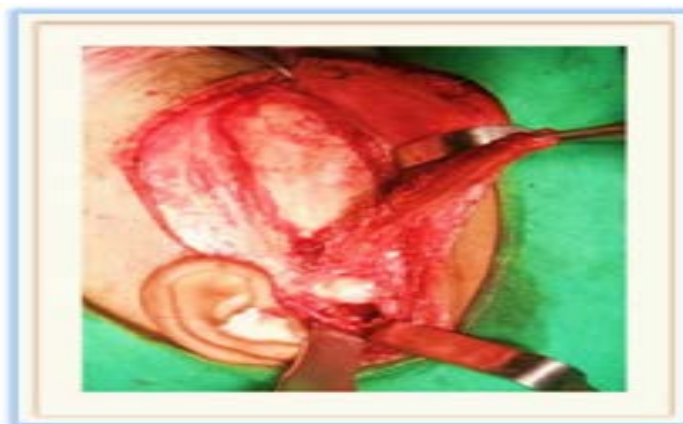


Fig. 7: Elevation of Temporalis myofascial flap



Fig. 8: TMF rotated and interposed

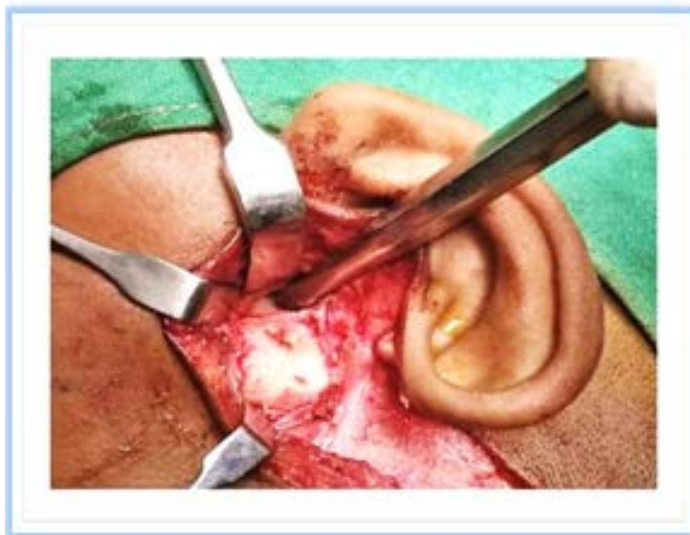


Fig. 6: Intraoperative resection of Ankylosis mass

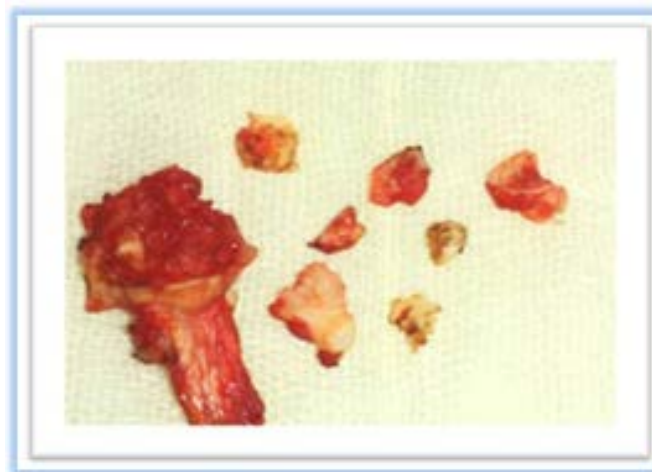


Fig.9 : Resected ankylotic mass



Fig. 10: Closure and Drain Placement

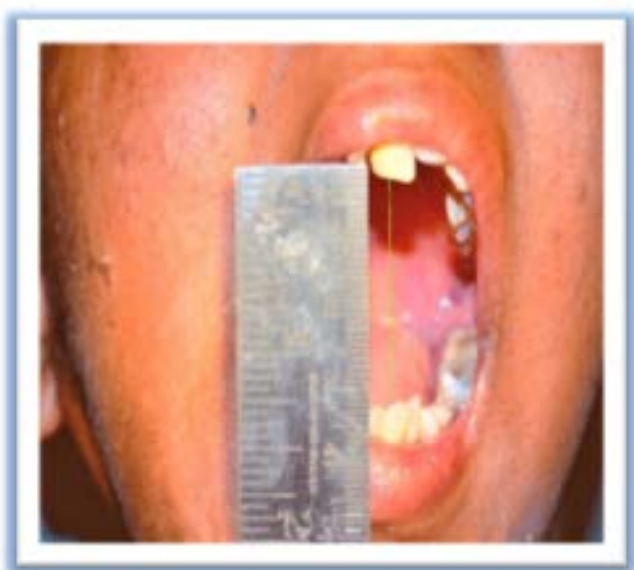


Fig.11: Postoperative mouth opening 3.3cm

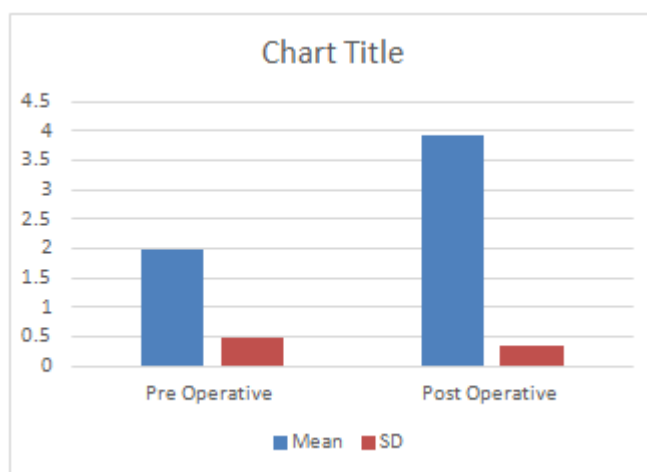


Fig.12: Postoperative OPG

SAS 9.4 was used to analyse the data. A paired t-test was used to statistically compare the mean difference between pre-operative and post-operative mouth opening.

Results

The surgical outcome of 10 patients who underwent interpositional arthroplasty for unilateral ankylosis was reviewed; 6 right sided and 4 left sided, 7 females and 3 males with age range from 16 to 23 years (mean 19.5years); trauma was most common cause of ankylosis 90%; were as in one patients the cause was infection 10%. Pre-operative mouth opening ranged from 1.2-2.6cm with average mouth opening being 1.97cm. Post-operative mouth opening ranged from 3.2-4.4cm with average of 3.92cm. Postoperative follow-up period ranged from a minimum of 1 year to maximum of 5 years. No patients showed any signs of facial nerve palsy. By periodic examination with OPG showed no signs of reankylosis seen during follow-up period. Healing was uneventful in all patients and there was marked improvement in their mouth opening postoperatively. The summary of the results is shown in graph 1.



Graph 1: comparison of mouth opening (cm) in TMJ Ankylosis.

The paired-test suggests a strong evidence ($t= 14.98$, $p = <0.001$) that the post-operative mouth opening is more

than pre-operative mouth opening with an average increase of 1.97 cm. The “mean paired difference” was 1.97 cm (95% CI: 1.65, 2.24) at a significance level of $\alpha = 0.05$.

Discussion

TMJ ankylosis is a pathological condition where the mandible is fused to fossa by bony fibrotic tissues. This interferes with speech, mastication, oral hygiene and normal life activities and can be life threatening when struggling to acquire an airway in an emergency⁴ Trauma to TMJ has been cited as the most common underlying reason responsible for true ankylosis; however local infections and systemic disorders also cause true TMJ ankylosis in some case.

Ankylosis can be classified into true (intracapsular) and pseudoankylosis (extracapsular). True ankylosis of TMJ results from trauma, infection, rheumatoid arthritis, neoplasm, local surgical complication, chemical burns. Whereas, pseudoankylosis results from neurological, osseous, muscular or psychiatric disorders.

Chandra and Dave reported 258 cases with unilateral TMJ ankylosis and found 67.8% associated with trauma and 17% with infection. In the present study, trauma (90%) was major cause of unilateral TMJ ankylosis and infection (10%) was the aetiology in one patient².

The management goal in TMJ ankylosis is to increase the patient’s mandibular function, correct facial deformity, decrease pain and prevent reankylosis of joint. Surgical modalities for treatment include gap arthroplasty, interpositional arthroplasty and total joint reconstruction to prevent reankylosis. After arthroplasty various interpositional materials have been used including temporalis muscle and fascia, fascia lata, fat, dermis, articular cartilage, lyodura, silastic, silicone and various metals. The most commonly used interpositional material

at present is temporalis muscle and facial flap²Temporalis facial flap was described by Golovine in 1898. He used it for orbital reconstruction. Murphy in 1912 used it for TM joint surgery⁵.

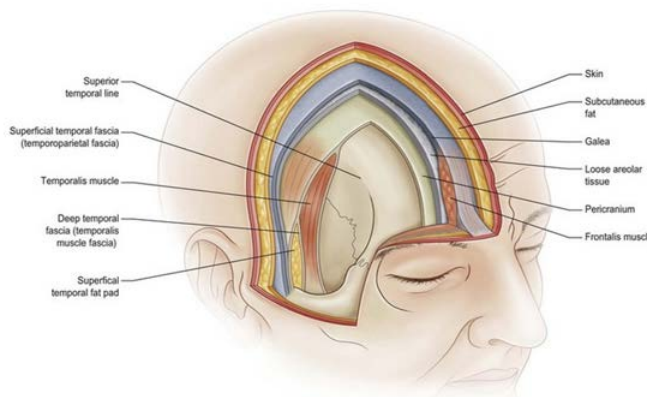


Fig13: Anatomy Of Temporal Region

(Reproduced From Terkonda Rp, Sykes Jm. Concepts Of Scalp And Forehead Reconstruction. Otolaryngology Clin North Am. 1997;30:519–539.)

The temporalis muscle lies deep to the temporoparietal fascia and is separated from it by a distinct, subaponeurotic plane. It is a fan shaped bipennate muscle. The superficial muscle fibres arise from the periosteum (pericranium) of the temporal fossa and the overlying temporalis fascia. The deep fibre of the temporalis muscle arises from the roof of the infratemporal fossa and the infratemporal crest. The layers of TMF is shown in (fig13). The thickness of the muscle varies from to 5 mm at its peripheral boundaries to 15 mm at the level of zygomatic arch⁶. The main vascular supply to TMF is derived from anterior and posterior deep temporal arteries, which originates from pterygoid portion of internal maxillary which enter deep surface of muscle in the inferior third of muscle within its posterior one half. Middle temporal artery branch of superficial temporal artery supplies mainly to temporal fascia and posterior part of muscle. Once harvested, the TMF spans a length of 12-16cm, and

thickness of 0.5-1.0cm .It tolerates an arc of rotation up to 135 degrees⁷.

Temporomandibular joint ankylosis presents a serious problem for airway access. All the patients were managed surgically under general anaesthesia using awake- naso endotracheal intubation/fibre-optic intubation. We have given Al-Kayat Bramley incision in all patients and followed Kabans protocol: Aggressive resection of ankylotic mass not less than 1.5 cm, taking care not injure the internal maxillary artery or any of its branches. Ipsilateral /contralateral coronoidectomy recommended for adequate intra-operative inter-incisal opening. In all 10 cases temporalis myofascial flap is used as an interpositional tissue after arthroplasty and the overall outcome were satisfactory. There was outstanding improvement in relation to mouth opening post-operatively.

The temporalis myofascial flap is classified as type III axial pattern flap, based on two dominant arterial pedicle that is anterior and posterior deep temporal arteries⁶. It has been widely used for the reconstruction of the TMJ. Their principal advantages are their autogenous nature, adequate blood supply, resilience and proximity to the joint, allowing for a pedicled transfer of vascularized tissue into the joint area³.

POGREL & KABAN described a flap that may include only fascia or both fascia and muscle, and is rotated inferiorly over the zygomatic arch and into the joint space. They suggested reducing the thickness of the zygomatic arch, if necessary, to avoid bulkiness⁸

CLAUSTER et al. in 182 cases carried out reconstruction with the temporalis myofascial flap specifically for reconstructive cranio-maxillofacial surgery: trauma, deformities, tumours, TMJ ankylosis, and facial paralysis. No major complications were observed in all of the cases⁹.

Recurrence is a major problem that occurs after the release of TMJ ankylosis. RAVEH et al proposed that the radical removal of the TMJ bone is essential to avoid recurrence¹⁰. CHOSSEGROS et al on the other hand, reported that early physiotherapy and choice of interpositional material are important in preventing recurrence¹¹. Early mobilization and aggressive physiotherapy were important to disrupt adhesions and prevent subsequent soft-tissue contraction post-operatively. In all of our patients post-operative physiotherapy was carried out within 24 hours and was done four times daily to the limit of tolerance

P.C.SALINS proposed a new technique for most effective means for the management of ankylosis and also in cases of recalcitrant ankylosis in which a horizontal osteotomy was performed inferior to bony mass below sub sigmoid notch. The two margins of osteotomy cut are distracted to create a space and to free mandible. Temporalis muscle and fascia can used for interposition, it is rotated and downwards and fixed on medial aspect of the ramus¹².

CHIDZONGA reported that the main cause of relapse was failure to carry out jaw-opening exercises. Therefore, postoperative exercises play a crucial role in ensuring lasting success¹³.

Conclusion

According to paired t test, there was significant increase in mouth opening postoperatively in our study ($p < 0.05$). The results of this study indicate that the use of temporalis muscle and fascia flap is an excellent choice of interpositional material in treating TMJ ankylosis with minimal postoperative morbidity.

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