

Efficacy of interpositional arthroplasty with temporalis myofascia flap in treatment of TMJ ankylosis

Abstract

Aims and objective: The present study was done to evaluate the efficacy of interpositional arthroplasty with temporalis muscle and fascia (myofascia) flap in preventing the re-ankylosis, to evaluate the growth of mandible, and to assess Al-Kayat and Bramley's incision for its versatility in allowing muscle transfer and excellent exposure of the joint.

Materials and Methods: Fifteen patients with ankylosis were treated with interpositional arthroplasty with temporalis myofascia flap. Maximum Interincisal Opening (MIO) was measured at different periods, i.e. preoperative, intraoperative, immediate post operative, 1 month post-operative, 6 month post-operative, 1 year post-operative. Pain was measured using Visual analogue scales in closed mouth position (spontaneously) & on mouth opening. Six cephalometric points were taken for evaluating the mandibular growth

Results: A statistically significant difference of 30.73mm ($p < 0.001$) was obtained between pre-operative and post-operative interincisal opening after a period of one year follow up. The pain score at different periods of time revealed that the pain incidence significantly reduced to almost zero post-operatively ($p < 0.5$ for closed mouth, $p < 0.01$ for open mouth).

Conclusion: The temporalis myofascia flap is an efficient interpositional material that acts as a barrier and prevents the chances of reankylosis to a greater extent.

Keywords: interpositional arthroplasty, temporomandibular joint, temporalis myofascia flap

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Abbreviations: MIO, Maximum Interincisal Opening; SMV, Submentovertex

Introduction

Ankylosis of temporomandibular joint is an affliction which occasions much misery for the unfortunate victim, interfering with the mastication and digestion of food, denying the body the benefits of a balanced diet, and preventing participation in the pleasures traditionally associated with the culinary arts. If the condition develops in childhood, facial deformity brings psychological stress which adds to the physical handicap, thus disturbing family life and creating emotional disturbance^{1,2}

Trauma is well proven to be the predominant cause of temporomandibular joint ankylosis. The other causes that could lead to TMJ ankylosis are local or systemic infections (like otitis media in the childhood), tumors, systemic diseases like ankylosing spondylitis, rheumatoid arthritis and psoriasis, and a complication of previous TMJ surgery.³

TMJ ankylosis may be unilateral or bilateral. According to the type of tissue involved it is classified as bony or fibrous ankylosis. Sawhney offered a lucid classification of ankylosis which is helpful in selecting an appropriate, corrective operation.⁴

Whatever may be the type, early surgical correction of the deformity soon followed by jaw mobility exercises should be encouraged in order to get good results out of surgery and also prevent future reankylosis.²

Surgical intervention by resection of the ankylotic mass through gap arthroplasty alone resulted in reankylosis. Attempts have been made to prevent such reankylosis with interpositional arthroplasty. Numerous materials have been interposed between the resected bone surface and articular fossa at the base of the skull. Alloplastic materials such as silicone, silastic, proplast, Teflon, rubber prosthesis, metals, methyl methacrylate; and autogenous material such as full thickness skin, dermis, fascia, auricular cartilage, fat, Lyodura, costochondral graft, metatarsals, metacarpophalangeal joint transfer, sternoclavicular joint transfer and temporalis muscle and fascia have been used.^{5,6}

Non-biologic materials like acrylic though cost effective and less time consuming present the risk of foreign body reactions, hypersensitivity and slippage. Silicone also has a tendency to slip from the implanted position. Lyodura is abandoned due to the possible transmission of Creutzfeldt-Jakob disease.^{7,8} Autogenous materials present problem of a second surgical site. Temporalis Myofascial flap due to its proximity to the joint and high vascular supply has been considered as one of the best interpositioning materials used.⁹

The aim of this study was to carry out retrospective and prospective assessment to evaluate the efficacy of interpositional arthroplasty with temporalis muscle and fascia (myofascia) flap in preventing the re-ankylosis, to evaluate the growth of mandible, and to assess Al-Kayat and Bramley's¹⁰ incision for its versatility in allowing muscle transfer and excellent exposure of the joint.

Materials and methods

This retrospective and prospective study was conducted in the Department of Oral and Maxillofacial Surgery, Govt. Dental College, Srinagar. Fifteen patients with TMJ ankylosis were included in the study, of which 7 were males and 8 were females with a mean age of 14.2 years (ranging from 5 years to 26 years).

Patients who reported to the Department with a chief complaint of inability to open the mouth were included in the study on the basis of clinical examination and only those patients who presented with a restricted mouth opening secondary to ankylosis were selected for the study (Figure 1).



Figure 1 Showing restricted mouth opening.

During this two and a half years period of study (June 2007 to Nov 2010) 15 patients with ankylosis were treated with interpositional arthroplasty with temporalis myofascia flap (Figure 2).



Figure 2 Management of ankylosis with temporalis myofascia flap.

The information that was collected mainly focused on the age at which patient reported to the department and age of occurrence of the condition. A diagnosis of unilateral / bilateral TMJ ankylosis was mainly obtained with the help of extraoral and intraoral examinations and OPG. Rarely PA view and special views like submentovertex (SMV) were used to assess coronoid. CT scan (axial and coronal views) was done in all patients in order to know the medial extent of the ankylotic mass. 3D-CT was used for one patient. Lateral cephalograms were also taken to assess the mandibular growth.

The parameter taken was Maximum Interincisal Opening (MIO) taken at different periods, i.e. preoperative, intraoperative, immediate post operative, 1 month post-operative, 6 month post-operative, 1 year post-operative. Pain was measured on the basis of grades using Visual analogue scales as No pain (0), mild pain (1) VAS 1-4, moderate pain (2) VAS 5-7, and severe pain (3) VAS 8-10. Preoperative pain

was measured in closed mouth position (spontaneously) & on mouth opening, followed by 6 months and 1 year later both in closed mouth position & on mouth opening.

Six cephalometric points were taken for evaluating the mandibular growth. Articulare (Ar) to Gonion (Go) for vertical growth of ramus. Gonion (Go) to Pogonion (Pg) for anteroposterior growth of mandible. Point B to Menton (Me) for vertical growth at symphysis region.

Informed consent for difficult intubation and emergency tracheostomy was obtained from all patients/guardians in case of minors. Tracheostomy was done for all patients except one in whom blind nasal intubation was successful.

The operative protocol consisted of

- Resection of ankylotic mass through an extended preauricular approach as described by Al-Kayat and P. Bramley (Figure 3).

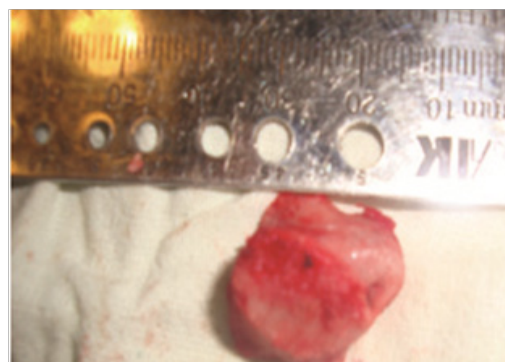


Figure 3 Resection of ankylotic mass by Al-Kayat & P Bramley.¹⁰

- Intraoral ipsilateral coronoidectomy. Removal of the ankylotic mass was performed to create a minimum gap of 1-1.5cms, until the maximum mouth opening ranging from 30-35mm was achieved on the table
- Contralateral coronoidectomy when required
- Harvesting and rotation of the temporalis myofascial flap beneath the zygomatic arch into the glenoid fossa
- Physiotherapy was continued for several months if deemed necessary. Regular checkups were carried out for one year. The data collected was tabulated and subjected to appropriate statistical analytical tests.

Results

The study evaluated 15 patients with ankylosis of the temporomandibular joint. Seven (46.66%) patients had only one TMJ involved and 8 (53.33%) patients showed bilateral ankylosis, making a total of 23 joints. Maximum patients (13) reported in first two decades of life. 4 patients reported in the age groups of 1-10 years (26.66%), 9 patients reported in the age group of 11-20 years (60%) and 2 in the age group of 21 to 30 years. Out of the total, 7 (46.66%) were males and 8 (53.33%) were females. All the patients showed etiologic factors with trauma responsible for all the cases of TMJ Ankylosis.

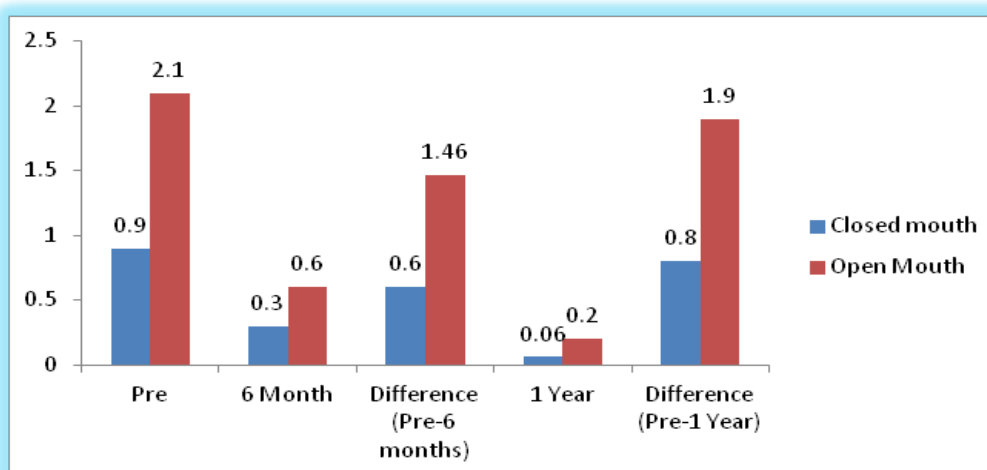
Mean difference of 30.73mm ($p < 0.001$) between pre-operative and post-operative interincisal opening after a period of one year follow up. The results were statistically significant using paired t-test (Table 1).

Chart 1 shows pain score at different periods of time. In the closed mouth position the spontaneous pain scores were 0.9 preoperatively, 0.3 and 0.06 at six months and 1 year respectively. When the

patient tends to open his mouth, the score was 2.1, 0.6 and 0.2 for preoperative, 6 months and 1 year respectively. This shows that pain incidence has significantly reduced to almost zero post-operatively ($p<0.5$ for closed mouth, $p<0.01$ for open mouth).

Table 1 Maximum interincisal opening (in mm)

Time of Assessment	Mean \pm SD	Difference from Pre-Operative	p-value
Pre-Operative	4.2 \pm 2.9	-	-
Intra-Operative	39.0 \pm 3.0	34.800	<.001
Immediate Post-operative	26.06 \pm 3.3	21.867	<.001
1 Month	33.33 \pm 2.5	29.133	<.001
6 Months	35.06 \pm 2.2	30.867	<.001
1 Year	34.93 \pm 2.2	30.733	<.001



Graph 1 Pain score (vas) at different periods of time. Paired t- test; $P<0.05$, $P<0.01$ Significant changes

Table 2 shows the mean cephalometric measurements comparing the growth changes of mandible in anteroposterior and vertical directions. Mean growth change in vertical ramus height from Ar-Go in 6 months and 1 year was 0.4 ± 0.5 mm and 0.93 ± 0.8 mm respectively ($p<0.01$, significant). Similarly, in anteroposterior direction from

Go-Pg it was 0.26 ± 0.4 mm in six months and 1.00 ± 0.8 mm in 1 year ($p<0.01$, Significant). Also at symphyseal region between Point B and Me there is significant change of 0.06 ± 0.2 mm in six months and about 0.53 ± 0.5 mm in 1 year ($p\leq0.33$, $p<0.01$).

Table 2 Cephalometric measurements for mandibular growth (in mm)

Measurement		Pre	6 months	Difference (Pre – 6 Months)	1 year	Difference (Pre – 1 year)
	Mean \pm SD	39.20 \pm 4.4	39.60 \pm 4.3	0.4 \pm 0.5	41.33 \pm 3.9	0.93 \pm 0.8
Ar – Go	t	-	-	3.45	-	7.79
	P	-	-	<.008	-	<.001

Table Continued...

Measurement				Difference		Difference
		Pre	6 months	(Pre – 6 Months)	1 year	(Pre – 1 year)
Go – Pg	Mean±SD	54.26±5.2	54.53±5.1	0.26±0.4	55.26±5.1	1.00±0.8
	t	-	-	2.25	-	4.58
	P	-	-	.0406	-	.004
Point B-Me	Mean±SD	18.86±1.7	18.93±1.7	0.06±0.2	19.33±1.4	0.53±0.5
	t	-	-	1.00	-	4.00
	P	-	-	0.33	-	.0013

Discussion

Ankylosis of the temporomandibular joint makes mastication impossible, deteriorates oral hygiene, and impairs speech. It may also give rise to psychological problems.¹¹

Ankylosis might occur at any age. The reported age distribution ranges from 2 to 63 years, the highest incidence being in the 10-19 year age group.¹² In present study 15 patients, about 13 patients reported the onset of ankylosis before 10 years of age; two patients had it at the age of 10 years and 12 years respectively. Thus, about 86.66% of the patients had the onset of ankylosis before the age of 10.

The cases selected were only of intra articular ankylosis for this study and all patients had bony ankylosis. There is unanimous agreement that surgery is the treatment of choice for ankylosis of the temporomandibular joint. The principal surgical procedures are gap arthroplasty, interpositional arthroplasty and joint reconstruction with autogenous or alloplastic materials.

The technique of gap arthroplasty has been supported by various authors like Rajgopal et al.¹³ & Roychoudhary et al.¹⁴ They state that excision of an adequate amount of bone is imperative and if done in that way, interposition of any material becomes unnecessary. Although advantages of gap arthroplasty are its simplicity and short operative time, clinical experience and the literature on ankylosis suggest that in spite of creating a wide gap, the recurrence rate is quite high.¹⁵

Hence the concept of interpositional arthroplasty was born, in which an interpositional medium is placed between the severed ends of the bone to act as an obstacle to reunion. A variety of interpositional materials have been used including alloplastic and autogenous materials.

Alloplastic materials have not been very successful in preventing reankylosis. This is because of the fact that although the bone surfaces are prevented from contacting each other, bone can form on both sides and eventually bridge the gap. There is a possibility of rejection of the foreign material also. The use of alloplastic materials also may result in severe degenerative changes and possible systemic release of particles.^{16,17} To avoid these complications, a variety of autogenous materials are advocated.

We have used Al-Kayat and Bramley¹⁰ incision which gives wide exposure with adequate visibility, prevents damage to the nerves and at the same time allows raising a pedicled flap of temporalis myofascia flap. Similar incision has been used by Chidzonga,¹⁸ Mehrotra et al.¹⁹ & Danda et al.²⁰ in TMJ ankylosis patients in their respective studies.

Su-Gwan determined the efficacy of interpositional arthroplasty with temporalis myofascia flap in the treatment of unilateral temporomandibular joint ankylosis in adults. Patients had a mean preoperative maximal interincisal opening of 15mm. During the last follow up observation after surgery the patients had a mean maximal interincisal opening of 36.1mm. Pre operatively all patients had some degree of pain in the joint involved which significantly decreased after the operation.²

Brusati et al used the temporalis muscle flap to treat the severely damaged TMJ structural components. Using this surgical technique 13 TMJ yielded positive functional results without any complication.²¹ In the present study, the temporalis myofascia flap was evaluated to be efficient in preventing the reankylosis. Preoperatively the mean interincisal opening was 4.2mm and post-operatively after a period of 1 year follow-up it remained as 34.93mm (P<0.001). Only in one patient the mouth opening was reduced to less than 30mm. This is because the patient did not follow the post operative regimen of mouth exercises and physiotherapy which play an important role in preventing the post-operative adhesions. In this study, preoperatively almost all patients had some degree of pain in joint spontaneously or on opening the mouth. But after the interpositional arthroplasty with temporalis myofascia flap, the pain incidence was significantly reduced. This is in conformity with the findings of Su-Gwan² who reported a general decrease in pain ratings after the operation.

Sorensen and Laskin²² explained the mandibular growth after ankylosis treatment on the basis of functional matrix theory. Restoration of normal function is therefore mandatory for restoring normal growth. In this data, according to cephalometric measurements, mean growth change in vertical ramus height from Ar-Go in 6 months and 1 year was 0.4mm and 0.9mm respectively (p<0.01, significant). Similarly the body growth in anteroposterior direction from Go-Pg was 0.2mm in six months and 1.0mm in 1 year (p<0.01, significant). Similarly at symphyseal region between Point B and Me there is a change of 0.2mm in six months and about 0.5mm in 1 year. Thus after the release of ankylosis, the mandibular growth continued corresponding to the normal population, but the growth deficit already occurred, could not be made up. There was no accelerated growth spurt as such.

Conclusion

The temporalis myofascia flap is an efficient interpositional material. It is a biologic, autogenous tissue, so there is no question of any rejection. It is a pedicled flap, so it maintains its viability. It can be procured by the same incision used for exposure of the joint. It is

easily mobilized and made to cover the complete area of the glenoid fossa. Thus it acts as a barrier and prevents the chances of reankylosis to a greater extent. Also the mandibular growth continues as normal after the temporalis myofascia interposition.

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None.

Conflicts of interest

The authors declare that there is no conflict of interest.

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