Review Article

Use of Temporalis Fascia Flap in the Treatment of Temporomandibular Joint Ankylosis: A Clinical Audit of 5 Years

Suday G. Rajurkar, Rushabh Makwana[1], Pallavi Ranadive, Mohan D. Deshpande, Anand Nikunj, Dhanashree Jadhav[2]

Department of Oral and Maxillofacial Surgery, Nair Hospital Dental College, Mumbai, [1]Department of Oral and Maxillofacial Surgery, Government Dental College, Mumbai, [2]Department of Dentistry, Sasoon Hospital, Pune, India

Abstract

Aim: Restoration of normal function and jaw movements in patients with temporomandibular joint (TMJ) ankylosis has been a challenge. Various techniques have been provided for its treatment; but the results have been variable. The purpose of this paper is to present an easy and versatile method for the treatment of TMJ ankylosis and to decrease postoperative complications such as reankylosis. **Materials and Methods:** This paper is a review of surgical outcome of interposition arthroplasty with temporalis fascia in 17 patients of unilateral TMJ ankylosis who underwent the above procedure. The review is based on the pre-, intra- and post-operative evaluation of these seventeen patients who were treated between 2008 and 2013. The follow-up time was 1–5 years. **Results:** Reankylosis was seen in only one of the patients; the remaining patients had satisfactory mouth openings. **Conclusion:** Surgical treatment of TMJ ankylosis with interposition of temporal fascia is an effective and easy procedure for prevention for reankylosis. The autogeneous nature and proximity to the joint are the main advantages of the temporal fascia flap when compared with other interpositional materials.

Keywords: *Interpositional arthroplasty, temporal fascia flap, temporomandibular joint ankylosis*

Introduction

Temporomandibular joint (TMJ) ankylosis is a condition associated with stiffening of the joint due to disease process resulting in fibrous or bony fusion of the mandibular condyle to the skull base. The resultant significant reduction in the mouth opening manifests primarily as impaired speech, difficulty in mastication, facial deformity (bird face deformity)[1] and associated features viz-poor oral hygiene and periodontal disease, occlusal and growth disturbances involving maxilla and mandible, difficulty in breathing, and compromised airway characterized by sleep apnea.

TMJ ankylosis may be classified as false or true,[2] extra- or intra-articular, fibrous or bony, unilateral or bilateral, partial or complete.

The most common etiological factor is trauma followed by infections, inflammatory conditions, and systemic diseases. Laskin[3] in1978 outlined various factors that may be implicated in the genesis of ankylosis following trauma to mandible. Miyamoto *et al.*[4] emphasized that hemarthrosis alone does not lead to ankylosis. It is hypothesized that intra-articular hematoma with scarring results in hypomobility of the joint and subsequent bone formation which leads to ankylosis. Treatment of TMJ ankylosis and its associated complications along with its high recurrence rate,[5,6] pose a significant challenge to the clinician.

Treatment aims at restoring joint function, improving patient's esthetics, quality of life (as many TMJ ankylosis patients are malnourished), and also to prevent recurrence. The treatment of TMJ ankylosis is always surgical. Gap arthroplasty and interpositional arthroplasty are the treatment of choice. Various autologous interpositional graft materials such as temporalis and masseter muscle, temporalis fascia, fascia lata, dermis, fat, auricular cartilage, and costochondral graft have been used for the above purpose. Nonbiological options comprise insertion of silastic,[7] silicone,[8] materials, and T-plates.

Yolovine in 1898 first described the use of temporalis fascia flaps. Temporalis fascia flaps were first used in TMJ surgery by Murphy in 1912,[9] and there have been other advocates of its use over the years.[10]

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Address for correspondence:
Dr. Suday G. Rajurkar, Nair Hospital Dental College, Dr. A. L Nair Road, Mumbai Central, Mumbai - 400 008, Maharashtra, India.
E-mail: suday.rajurkar@gmail.com

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The present review aims to examine the efficacy of the surgical procedure, namely, –interpositional arthroplasty with temporalis fascia flap in 17 patients with unilateral TMJ ankylosis.

Materials and Methods

In the 5-year period from 2008 to 2013, 17 patients underwent surgical treatment – interpositional arthroplasty with temporalis fascia – for ankylosis at our institute. Pre- and post-operative assessment included detailed history and a thorough clinical examination. Data concerning patients' age, gender, etiology of ankylosis, joints affected, preoperative and postoperative mouth openings, and follow up periods were recorded [Table 1]. Radiographic assessment was carried out for all patients using orthopantomogram (OPG) and computed tomography [Figures 1 and 2]. Maximum follow-up period was 5 years while minimum was 1 year. Mouth opening has been assessed with callipers pre-, intra- and post-operatively. Preoperative maximum inter incisal mouth opening ranged from 0 to 25 mm (with an average of 1.5 mm) [Figures 3 and 4].

In all these patients who underwent surgical management of ankylosis, a pedicled deep temporalis fascia flap based on middle temporal branch of superficial temporal artery was used as an interpositioning material. All surgical procedures were carried out under general anesthesia administered through nasotracheal intubation using fiberoptic bronchoscope.

Al-Kayat Bramley incision was used in all these patients. Dissection was carried through subcutaneous plane down to deep temporal fascia. This fascia was carefully dissected taking care to preserve superficial temporal artery, vein, and superficial temporal branch of the facial nerve. Dissection was further carried inferiorly to reach the zygomatic arch. Deep temporal fascia was then divided, and inverted L-shaped incision was taken on zygoma, distal to articular eminence, and anterior to external auditory meatus. Ankylotic mass was exposed and excised to create a gap of 8–10 mm [Figure 5]. Recontouring of the glenoid fossa was done as required. Maximum mouth opening was measured and recorded. Ipsilateral coronoidectomy was performed in all the cases through the same extraoral approach. Contralateral coronoidectomy was done through intraoral approach only in cases where mouth opening achieved was lesser than 35 mm. An inferiorly based Temporalis fascia flap was adequately mobilized with the base of the flap lying above the zygomatic arch and interpositioned in the gap between zygomatic arch and ramus stump [Figure 6]. This flap is based on the middle temporal branch of superficial temporal artery.[11] It was secured to the posterior edge of the preauricular incision with 3-0 vicryl sutures. Drains were placed before primary closure of both preauricular and intraoral incisions. Minimal infection and hematoma formation were seen in immediate postoperative period. Patients were given physiotherapy in the form of jaw exercises from the third postoperative day.

Results

Surgical outcome of a total number of 17 patients who underwent interpositional arthroplasty for unilateral TMJ ankylosis has been reviewed; 9 left sided and 8 right sided; 10 females and 7 males; with age ranging from 5 to 30 years (mean age 14 years). Trauma (88%) was the most common cause of ankylosis in the patients reviewed. Preoperative mouth opening ranged from 0 to 10 mm (with the mean mouth opening

Table 1: Summary of results

Patient	Age (years)	Gender	Etiology	Joint involved	Mouth opening (mm)			Coronoid ectomy	Interpositional material	Duration of follow-up (years)
					Preoperative	Postoperative day 1	Last follow-up			
1	9	Female	Trauma	Left	1	35	38	Yes	TF	6
2	18	Female	Trauma	Right	5	45	42	No	TF	6
3	8	Female	Trauma	Left	7	40	40	Yes	TF	6
4	5	Female	Trauma	Right	3	40	38	Yes	TF	6
5	8	Male	Trauma	Left	10	40	36	No	TF	5
6	20	Male	Trauma	Right	2	31	19	Yes	TF	4
7	11	Female	Premature delivery	Left	3	36	38	Yes	TF	3
8	12	Female	Trauma	Right	2	36	40	Yes	TF	3
9	22	Male	Trauma	Left	4	45	38	Yes	TF	2
10	6	Female	Trauma	Right	4	32	40	No	TF	2
11	15	Male	Trauma	Right	3	36	32	Yes	TF	2
12	30	Female	Trauma	Right	6	38	34	Yes	TF	2
13	16	Female	Trauma	Left	4	40	38	Yes	TF	1
14	18	Male	Trauma	Left	2	44	34	Yes	TF	1
15	14	Male	Ear infection	Left	3	42	40	Yes	TF	1

TF: Temporalis fascia

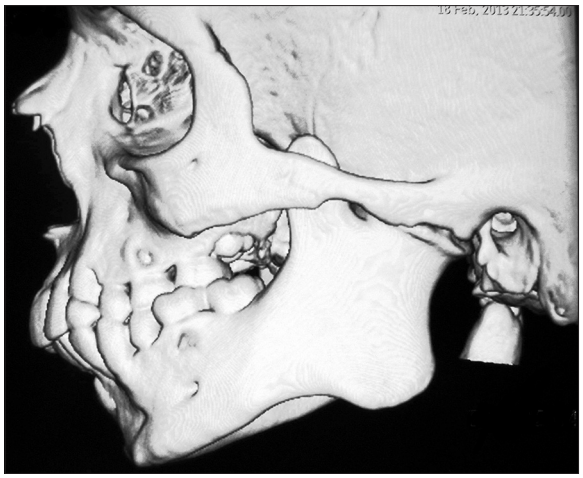

Figure 1: Three-dimensional computed tomogram showing left temporomandibular joint ankylosis

Figure 2: Coronal section of three-dimensional computed tomogram showing ankylotic mass

Figure 3: Preoperative mouth opening and facial asymmetry

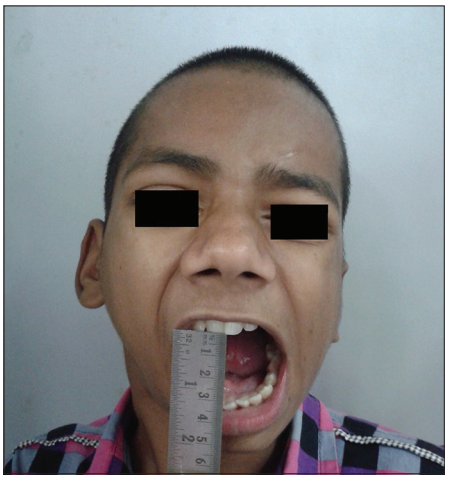

Figure 4: Postoperative mouth opening

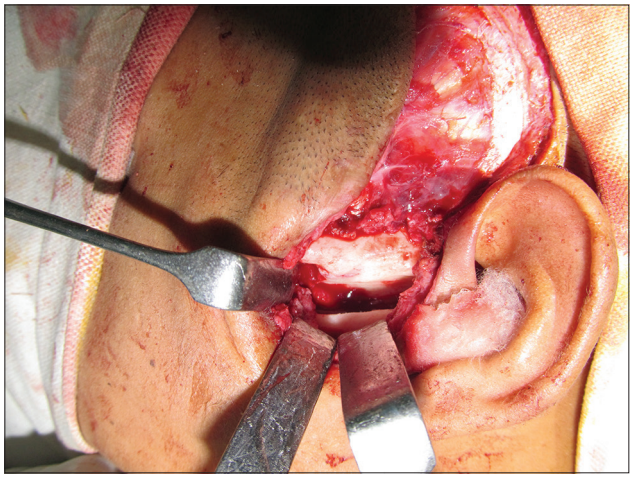

Figure 5: Gap arthroplasty

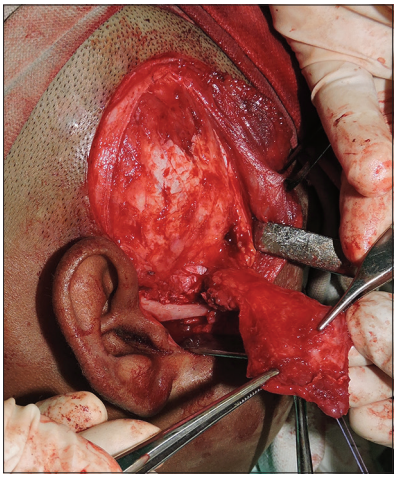

Figure 6: Temporalis fascia being harvested

being 4 mm). Maximum mouth opening achieved post operatively ranged from 32 to 42 mm (with an average of 37 mm). Postoperative follow-up period ranged from a minimum of 1 year to a maximum of 5 years. No patients showed signs of facial nerve palsy. Deviation to the affected side was seen in almost all the cases. Reankylosis was seen in one patient. Periodic radiographic examination with OPG showed no signs of reankylosis in the joint

and the intra-articular space was well maintained in other sixteen cases.

Discussion

The high recurrence rate and the technical difficulties involved in the TMJ surgery makes it a challenging task for the surgeon. One of the surgical procedure is gap arthroplasty without interposition. Arthroplasty without interposition requires a gap of 10–20 mm.[12] Topazian reported a recurrence rate of 53%[13] for gap arthroplasty without interposition. Gap arthroplasty is not only a relatively simple procedure with short-operating time but also has disadvantages such as creation of pseudo articulation with a short ramus and an increased risk of reankylosis. Hence, interpositional gap arthroplasty is preferable. The main function of an interpositional material is to eliminate contact between two bony surfaces of the joint and avoid recurrence. Moss and Salantijn in 1969 pointed out that the muscular matrix around the mandible may affect the results of the treatment. Early treatment will restore mandibular mobility and subsequently improve facial growth and remodeling to reduce the possibility of the future facial asymmetry or retrognathia.[14]

Various interpositioning materials have been proposed and used, but none has proved to be an ideal one.

In the present review, we have evaluated surgical results of 17 patients of unilateral TMJ ankylosis. Temporalis fascia was used as an interpositional material. The flap is based on middle temporal artery which is a branch of superficial temporal artery, and we found the following advantages.

1. Autologous nature; therefore least immunoreactive.
2. Proximity to the joint, enabling excellent mobility and coverage of the arthroplasty gap, minimal donor site morbidity both cosmetically and functionally
3. Minimal damage to the temporal branch of the facial nerve
4. Good resilience and blood supply
5. Hollowing in the temporal region is not evident
6. Minimal intraoperative blood loss
7. Low degree of friction and good positional stability.

Although studies have shown that temporalis fascia lacks bulk, we found excellent long-term results for a follow-up period of 5 years with almost no recurrence (1 out of 17 patients).

The surgical protocol followed was the one proposed by Kaban, 1990 which included ankylotic mass resection, ipsilateral coronoidectomy, interposition of temporalis fascia, early mobilization with aggressive physiotherapy.[15]

Long-standing ankylosis may result in temporalis muscle atrophy and fibrosis. Ken *et al.* and Guralnick and Kaban recommended ipsilateral coronoidectomy to enhance intraoperative interincisal opening.[16,17]

Early active and long-term physiotherapy in the form of jaw exercises and a long-term follow-up is of greatest importance to prevent reankylosis.

Our experience with the temporalis fascia flap used as an interpositioning material in the surgical management of TMJ ankylosis produced good results in mouth opening, jaw function, and prevention of recurrence. In addition, temporalis fascia remains biologically viable and serves as a satisfactory TMJ lining.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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