



INTERPOSITION ARTHROPLASTY USING AUTOGENOUS AURICULAR CARTILAGE GRAFT AFTER TEMPOROMANDIBULAR JOINT ANKYLOSIS RELEASE- A RELIABLE METHOD TO PREVENT RECURRENCE WITH LESS DONOR SITE MORBIDITY

Plastic Surgery

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ABSTRACT

AIM- Ankylosis of the temporomandibular joint (TMJ) is a disabling affliction that causes difficulties in mastication, speech, cosmesis, and maintenance of oral hygiene. It can also cause growth disturbances of bony skeleton of face and breathing difficulty, which invariably results in physical and psychological disability.

Temporomandibular joint ankylosis is very common among young children. Surgery of TMJ ankylosis needs careful evaluation and planning to yield predictable results. The aim of treatment is not only to provide mobility to joint but also to prevent recurrence.

Material and methods- In this case series, 15 cases of TMJ ankylosis were operated at our institute from September 2018 to January 2020 with osteo-arthrectomy and interposition arthroplasty with conchal cartilage graft for functional yield. One of the patients underwent secondary procedures for facial asymmetry.

Results- With a mean follow-up period of 12 months good mouth opening from 28 to 34 mm was achieved in all the patients. For all of our patients we advise aggressive physiotherapy for a minimum of 6 months.

Conclusion- Interpositional arthroplasty using conchal cartilage graft is a very reliable method to prevent recurrence of ankylosis. It has benefits of using autogenous tissue, reducing donor site morbidity and avoids the drawbacks of alloplastic implants.

KEYWORDS

Temporomandibular joint ankylosis, Autogenous tissue graft, Conchal cartilage, Interpositional arthroplasty.

INTRODUCTION-

In Temporomandibular joint ankylosis (TMA), the joint is replaced by scar tissue. TMA most commonly results from trauma and local infection from middle ear. Other causes like systemic infections, tumors like osteochondroma, systemic diseases like rheumatoid arthritis, osteoarthritis, ankylosing spondylitis; Intraarticular injections, forceps delivery and complication of previous TMJ surgery have also been described. Post-traumatic ankylosis is common in young age mostly under 10 years [1]. The hypothesis proposed for trauma cases is that intra-articular hematoma, scarring, and the formation of excessive bone gives rise to hypomobility.

TMA is classified using involved anatomical site (intra-articular or extra-articular), type of tissue (bony, fibrous, or fibro-osseous), and extent of fusion (complete or incomplete)[2]. In true ankylosis there is bony or fibrous adhesion between the surfaces of the joint within the capsule, whereas in false ankylosis the problems lie in the surrounding tissues[3]. Ankylosis of the TMJ usually develops before the age of 10 years, but can be found at any age. It is slightly more common in boys than girls. Unilateral ankylosis has been reported to be more common than bilateral.

Patients present with limited mouth opening and a maximal interincisal distance of between 0 and 20 mm. The condition causes difficult eating, malnutrition, poor oral hygiene, mal-occlusion, facial asymmetry particularly when it develops in early age.

A number of surgical approaches have been designed to restore normal joint functioning and prevent re-ankylosis. The basic techniques used are: (a) gap arthroplasty, where a resection of bone between the articular cavity and mandibular ramus is created without any interposition material; (b) interpositional arthroplasty, which adds interpositional material between the new sculptured glenoid fossa and ramus; (c) joint reconstruction, when the TMJ is reconstructed with an autogenous bone graft or total joint prosthesis; and (d) restoring the ramal condylar unit by distraction—neo-condylogensis[4].

Appropriate interposition materials after Gap arthroplasty between the mandibular ramus and glenoid fossa include: (1) autogenous tissues: meniscus, muscle, fascia, skin, cartilage, fat or a combination of these tissues[9]; (2) allogeneic tissues: cartilage and dura; (3) alloplastic: silastic materials, acrylic, Proplast and silicone; and (4) xenograft tissues: usually of bovine origin (collagen and cartilage).

The primary aim of treatment in temporomandibular joint ankylosis is not only to re-establish joint mobility but also to prevent it from

recurrence. Achieving normal occlusion and minimizing the facial asymmetry in children are equally important, which may be achieved by secondary procedures. In adults, however, due to the failure of adaptation of occlusion to the abnormal situation, corrective surgery to realign the chin point may leave a large lateral open bite on the affected side. Camouflaging procedures such as genioplasty may produce an acceptable result[7].

MATERIALS AND METHODS-

This study was conducted on 15 patients (10 males, 5 females) with true TMJ ankylosis. Almost all of the cases were post traumatic except 3 were congenital. Age of the patients ranged from 6 to 20 years. Five bilateral and 10 were unilateral cases. None of the patients had history of prior TMJ surgery. All were informed regarding the study and written consent was obtained. Ethical clearance was taken from institutional ethical committee.

History was taken including age, sex, aetiology, side of involvement, duration of symptoms, and local physical examination included recording of maximum interincisal distance. We evaluated all patients with radiological examinations (three-dimensional, axial and coronal CT scans of TMJ and panoramic radiographs).

Mouth opening (maximal interincisal distance) was recorded pre-op, intra-op, early post-op (at discharge) and late post-operatively (at 12 months to 18 months after surgery).

Based on aetiology (trauma or congenital), average period of complaints was 3 years. Three patients also had unilateral facial deformity due to hypoplastic mandible.

The procedure started in general anaesthesia through fibre-optic bronchoscope-assisted naso-endotracheal intubation. A classic curvilinear pre-auricular incision was made to approach the region (Fig. 1). The fibrous and bony ankylotic mass (Fig. 2) was resected aggressively using micro-saw, thus ramus was completely separated from the cranial base. A gap of about 2 cm was created (Fig. 2). The irregular surfaces were smoothed by round edged burr. The cross section of the condyle was shaped into an area no larger than 1-2 cm². This allowed the newly formed condyle process to be fitted to the auricular cartilage grafts.

Coronoidectomy was performed only ipsilaterally in 8 patients through the same approach after temporal extension of incision (Fig.1), while bilateral coronoidectomy was done in 7 cases. Two of unilateral ankylosis cases required contralateral coronoidectomy

through an intraoral approach to achieve adequate mouth opening.

The conchal cartilage was harvested through a separate 3-4 cm posterior auricular incision (Fig. 3) Along the rim of the auricular concha, the proximal "boat-like" portion of the concha cartilage was removed with the ante-helical rim maintained. The perichondrium was left attached to the convex surface of the graft. This was thought to be advantageous because the grafts theoretically maintain chondrogenic potential, and leaving 1 layer of perichondrium at the donor site could also conceivably lead to regeneration. The removed cartilage graft is convex and fits the fossa well. A piece measuring 1-2 cm² is adequate to line the fossa. The grafts were inserted into the appropriate position between the condyle and fossa and firmly sutured to anterior, lateral, and posterior peripheral soft tissues with 4 to 6 resorbable sutures. (Fig. 4). Vacuum suction drain was placed in all the cases and pressure dressing applied over the surgical site.

Jaw opening exercises with mouth gags, active chewing movements were started within 7 days of surgery, and we advised to continue the same for 6 months. During the follow-up period, the patients were evaluated clinically and by panoramic radiographs.

RESULTS-

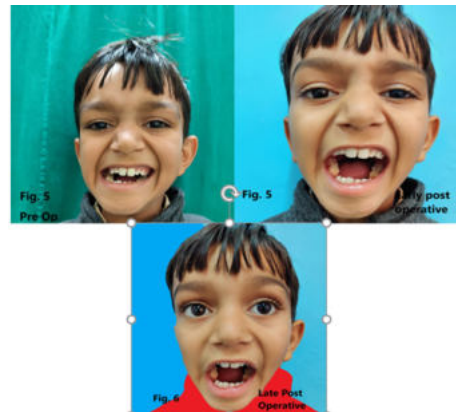
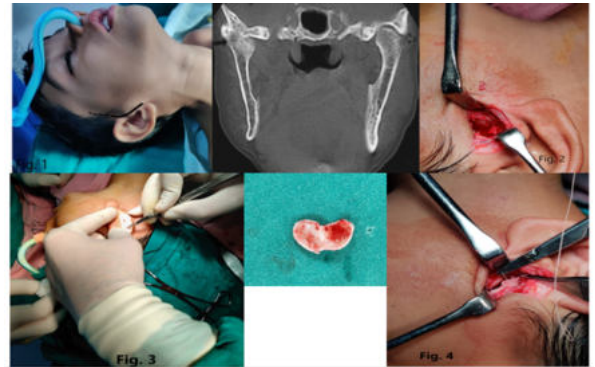
The early postoperative mouth opening achieved from 32 to 40 mm (Fig. 5). A minimum of 6-month vigorous physiotherapy was advised. On follow up, late post-operative (12-18 months) mouth opening ranged from 28 to 34 mm (Fig. 6).

No morbidity was noted in the late post-operative periods. Early temporal facial palsy was observed that lasted 3 weeks postoperatively and resolved spontaneously and completely at 2-3 months. Most of the bilateral cases had an anterior open bite in the initial phase due to the sudden loss of the masticatory muscle influence. Mouth opening and occlusion was satisfactory in all patients during late follow up.

Table 1 comprises features and results of patients.

Patient	Age (years)	Sex	Aetiology	Affected side	Mouth opening (mm)			Early Morbidity
					pre-op	early post-op	late post-op	
1	7	M	Trauma	Unilateral	8	40	34	Facial Palsy/Anterior Open Bite
2	12	F	Trauma	Unilateral	4	32	30	Facial Palsy
3	16	M	Trauma	Unilateral	10	40	34	Anterior Open Bite
4	9	F	Trauma	Bilateral	5	35	30	Facial Palsy/Anterior Open Bite
5	11	M	Trauma	Bilateral	3	32	28	Facial Palsy/Anterior Open Bite
6	15	M	Trauma	Unilateral	7	39	34	Facial Palsy
7	6	M	Congenital	Unilateral	6	33	32	Facial Palsy/Anterior Open Bite
8	8	F	Congenital	Bilateral	3	32	28	Facial Palsy
9	9	F	Trauma	Unilateral	9	38	30	Anterior Open Bite
10	10	M	Trauma	Unilateral	8	38	32	Facial Palsy/Anterior Open Bite
11	8	M	Trauma	Unilateral	9	38	34	Facial Palsy
12	19	M	Trauma	Bilateral	7	36	30	Anterior Open Bite
13	15	F	Trauma	Unilateral	10	38	32	Facial Palsy
14	6	M	Trauma	Bilateral	8	32	28	Facial Palsy/Anterior Open Bite
15	20	M	Congenital	Unilateral	6	32	28	Facial Palsy/Anterior Open Bite

Three patients also had an obvious facial deformity. Only one of these agreed for further surgery to correct the condition. He underwent body distraction in the sagittal plane along with advancement genioplasty to correct the deformity and achieve facial symmetry. This procedure was done 6 months after release of ankylosis.



DISCUSSION-

TMJ ankylosis is most commonly seen after trauma. In intracapsular fractures, the condylar head splits in a sagittal plane and the lateral fragment passes upwards over the outer rim of the glenoid fossa. The associated disruption and displacement of the interarticular cartilaginous disc together with the inevitable loss of mobility may lead to ankylosis.

The normal mouth opening in adults ranges from 40 to 56 mm but varies in children depending upon the age and structure of the child. Ankylosis causes hypomobility of jaw movement and affects daily functions of speech, mastication and oral hygiene. In a growing child, it affects the development of the mandible, resulting in facial deformity, malocclusion and obstructive sleep apnoea- hypopnoea syndrome[6].

Treatment is always surgical, and the various methods include simple resection of the bony fusion or resection plus interposition of alloplastic or autologous material. Another method is resection plus reconstruction of the condyle. Gap arthroplasty without interposition reported recurrence rate as high as 53% [7].

A 7-step protocol developed by Kaban, Perott and Fisher [5] for the treatment of TMJ ankylosis has been the mainstay of treatment for quite sometime. It includes (1) aggressive resection of the ankylotic segment, (2) ipsilateral coronoidectomy, (3) contralateral coronoidectomy when necessary, (4) lining of the joint with temporalis fascia or cartilage, (5) reconstruction of the ramus with a CCG, (6) rigid fixation of the graft and (7) early mobilization and aggressive physiotherapy. With this protocol, they achieved a mean maximum post-operative interincisal opening at 1 year of 37.5 mm.

Rajgopal et al. have suggested radical condylectomy as well as coronoidectomy, but the vertical ramus height becomes greatly reduced [6]. Alloplastic materials like Proplast, Teflon, silastic, methyl methacrylate or autogenous tissue like fascia lata or muscle, full thickness skin into the defect have also been tried.

In addition to intra and post-operative chest morbidity, in costal cartilage for the treatment of TMA, late resorption of graft due to antigen antibody reaction may lead to recurrence of ankylosis in the end. The grafted cartilage does evoke transplantation antigens, and the rejection response is merely delayed by the physical barrier that the matrix interposes between the chondrocytes and the cells of immune surveillance system of the recipient host.

The attractiveness of auricular cartilage in TMJ arthroplasty is obvious. It is readily available autogenous tissue within the same operative field and is much more convenient than that harvested from other sites of the body, such as the graft from the costochondral cartilage. In the 15 patients, the harvested auricular cartilage measured more than 1-2 cm², and no deformities were seen at the donor sites in the immediate postoperative period and later. The contour of the cartilage fit the condyle process well. On the basis of clinical observation, the size of the condylar processes in the ankylotic joint is increased, but during the operation, the condyle can be easily shaped into a smaller anatomic form. Then, the raw surface of the condyle can be covered conveniently by the harvested auricular cartilage. We have used this technique in most of our patients and found that follow up of patients has shown no relapse and recurrence of ankylosis in the long run[11].

CONCLUSION-

The main aim of treatment of temporomandibular joint ankylosis is not only to achieve adequate mouth opening but also to prevent recurrence of ankylosis[13]. Interposition arthroplasty using conchal cartilage graft is a very reliable method to prevent recurrence of ankylosis with less donor site morbidity, and it also avoids the disadvantages of alloplastic materials as well as other autogenous tissues with more morbidity.

Moreover success of the meticulous surgical reconstruction is dependent on aggressive physiotherapy and with regular follow-up for at least one year.

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