

Management of Pediatric Temporomandibular Joint Ankylosis: Use of Costochondral Rib Graft with Interpositional Temporalis Myofacial Flap

M U AKHTAR A A SHAH I ABBAS*

Department of Oral & Maxillofacial surgery, de' Montmorency College of Dentistry, Lahore. & Oral Surgery, Department., *Ayub Medical College, Abbottabad

Correspondence to Dr. Muhammad Usman Akhtar alateeb@hotmail.com

Background: The posttraumatic ankylosis of the temporomandibular joint (TMJ) is frequently seen in children in Pakistan. The factors which favour in the development of this condition are; the children exhibit much more liability to emergency management, greater difficulty in clinical and radiological examination, state of mixed dentition, faster rate of healing, non-availability of specialists and low socioeconomic status of the patient. Different autogenous and alloplastic interpositional materials have been attempted after the resection of the ankylotic bone to achieve desirable results. **Method:** All patients were presented at Punjab Dental and Children Complex Hospitals Lahore. Twenty-three children (age 1 to 15years) with 28 joints underwent costochondral arthroplasty with interpositional temporalis myofacial flap, out of which 6 were of re-ankylosis after surgery at other centres. The costochondral graft was fixed by tripod screws with remaining ramus condylar unit. The surgery was planned after careful examination and final radiographic confirmation. The preoperative CT scan was also performed in few patients. **Results:** The surgical protocol is used to achieve the desirable interincisal jaw opening (>30mm) that was also the postoperative criteria for successful surgery. Five patients with bilateral ankylosis were operated and one patient with additional ipsilateral coronoidectomy. Less than 30mm interincisal opening was considered as unsatisfactory jaw opening. The overall success rate was 96% with only one patient was observed with less than 30mm opening. The lateral and protrusive jaw movements were assessed as excellent, good and poor. The immediate postoperative complications were transient. **Conclusion:** The ankylosis develops mainly after damage to mandibular condyles or TMJ at a growing age. Results with the procedure were encouraging without noticeable complications during an average follow up of one year.

Key words: Ankylosis, arthroplasty, costochondral graft, myofacial flap and jaw movements.

The temporomandibular joint ankylosis of children is common in Pakistan¹. The cause is frequently a mismanaged temporomandibular joint trauma and a less common is the infection¹. The resultant inability to open the jaw impairs the speech and leads to poor oral hygiene, dental caries, periodontal diseases and even facial deformity. The childhood facial bone trauma results in post-traumatic temporomandibular joint ankylosis and facial asymmetry in the patients¹⁻⁴. The factors which favors in developing this condition include; the more liability of the children to emergency, greater difficulty in clinic and radiological examination, state of mixed dentition, faster rate of healing, non-availability of specialists, low socioeconomic status and improper management of the patients at the time of injury. The diagnosis of the TMJ ankylosis patient is relatively simple by history, clinical examination and radiographs.

The treatment of the temporomandibular joint ankylosis is an aggressive surgery. The extent of the surgical intervention is directly dependent on the type of ankylosis, the duration of the disease and age of the patient. The temporomandibular joint arthroplasty alleviates this dilemma, leading to adequate mouth opening and re-establishment of the jaw movements in these patients. Many authors have recommended a number of techniques to correct this miserable condition

and different interpositional materials and grafts have been recommended for the successful management of temporomandibular joint ankylosis⁵⁻¹¹. The costochondral myofacial interpositional graft is an addition in preventing the possible relapse^{12, 13}.

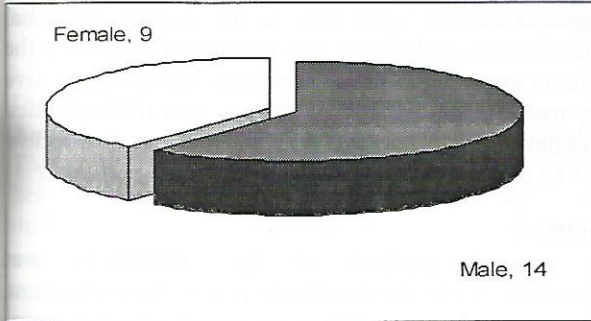
The children have been frequently reported with traumatic ankylosis in our centers and we managed with a technique that follows fixation of costochondral graft by tripod screws with remaining ramus condylar unit along with interpositional autogenous temporalis myofacial flap. The study determines not only the effectiveness of the interpositional temporalis myofacial flap arthroplasty but also the fixation of the costochondral graft by rigid tripod screws to successfully treat the most re-occurring condition of temporomandibular joint ankylosis.

Materials and methods:

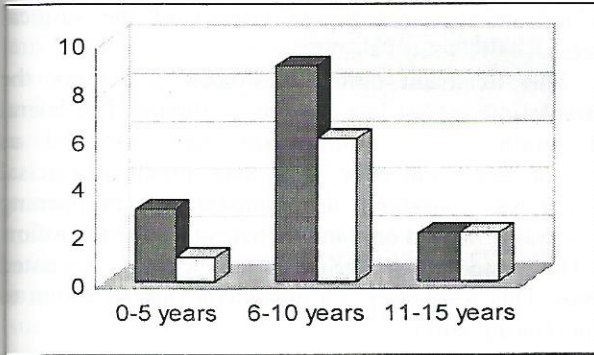
All patients were presented at Punjab Dental and Children Hospitals Lahore. Twenty-three patients (28 joints) with TMJ ankylosis were treated over a period of approximately two years, out of which, six patients were operated re-ankylosis at different centers. The age of the patients ranged from 1year to 15years. The etiology of the ankylosis in these patients was childhood trauma except two patients that were not able to recall the reason of the ankylosis. The diagnosis was made by history and

clinical examination and was confirmed by orthopantomograph (OPG) X-rays and CT scan. The male to female ratio and presenting age of the patients are shown in graphs I & II respectively.

Graph 1: Male to female ratio (n=23)



Graph II: Age of presentation



The joint was exposed by a standard pre-auricular incision, extended up to 2 to 3 centimeters towards eyebrow from upper limits of the incision. The resection of ankylotic mass was achieved with surgical high cool drill and the vernier caliper was used to measure the created (10mm) gap.

An adequate size myofacial flap from temporalis was raised along with middle and deep temporal vessels and was sutured with 2/0 coated vicryl to the medial side tissues to cover created joint socket. The required size costochondral graft was taken from contralateral 5th or 6th rib with about 2mm chondral part. The tripod

fixation of graft was performed, keeping chondral part towards the socket, with 9mm long and 2mm thick self tabbing titanium screws to the remaining ramus condylar unit.

The maxillomandibular fixation was performed in all bilaterally operated cases for 5days to avoid permanent anterior open bite. In one patient additional ipsilateral coronoidectomy was performed to achieve the desirable intra-operative jaw opening. The postoperative early mobilization and physiotherapy was recommended for initial 3 months with an average postoperative follow up of 12 months.

Results:

The surgical protocol of the arthroplasty was encouraging while the functional results were excellent. The success rate was 96% whereas, the postoperative interincisal jaw opening range and lateral / protrusive jaw movements were set as criteria of the surgical success.

This treatment option was used to achieve the desirable interincisal jaw opening (>30mm). The lateral and protrusive jaw movements were assessed as excellent, good and poor. Less than 30mm interincisal opening was considered as unsatisfactory jaw opening which was observed only in one patient during the follow up. The preoperative interincisal jaw opening was noted ≤5mm. This was improved postoperatively to 29mm to 44mm (mean 38mm).

The lateral and protrusive jaw movements were improved from good to excellent in subsequent time on the operated side. Five patients were operated bilaterally and additional in one patient ipsilateral coronoidectomy was performed during surgery to achieve the desirable interincisal jaw opening. The bilaterally operated patients had improved their lateral / protrusive movements from poor to good in subsequent period. The immediate complications were minor and transient without any failure during follow up. Two bilaterally operated patients had moderate anterior open bite. The table 1 shows the statistics of the postoperative results.

Table 1: Statistics

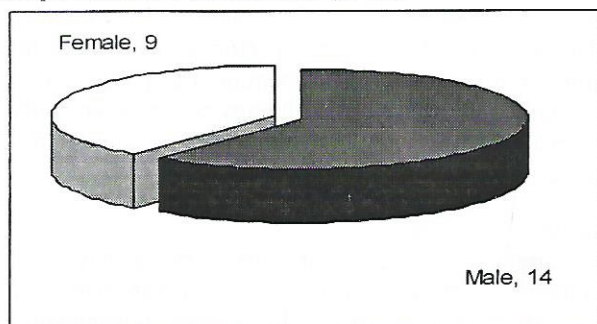
Immediate and late postoperative interincisal jaw opening

Interincisal opening (cm)	N		Mean	Std. Deviation
	Valid	Missing		
Immediate	23	0	2.98	0.4004
Late	23	0	3.80	0.4358

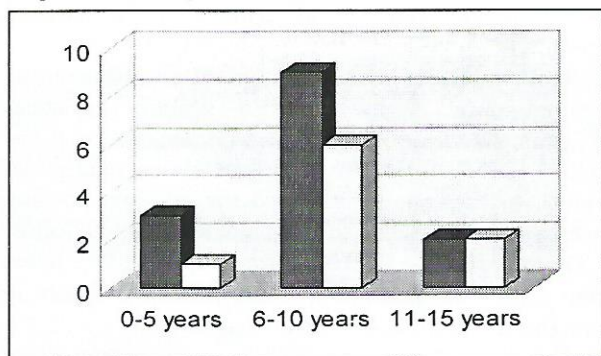
Immediate (cm) Interincisal Opening					Late (cm) Interincisal Opening (3 months)				
Valid	Frequency	Percent	Valid %†	Cumulative %	Valid	Frequency	Percent	Valid %	Cumulative %
2.2	1	4.3	4.3	4.3	2.9	1	4.3	4.3	4.3
2.5	2	8.7	8.7	13.0	3.4	1	4.3	4.3	8.7
2.8	2	8.7	8.7	21.7	3.5	1	4.3	4.3	13.0
2.9	3	13.0	13.0	34.7	3.6	3	13.0	13.0	26.0
3.0	2	8.7	8.7	43.4	3.7	2	8.7	8.7	34.7
3.1	2	8.7	8.7	52.1	3.8	3	13.0	13.0	47.7

clinical examination and was confirmed by orthopantomograph (OPG) X-rays and CT scan. The male to female ratio and presenting age of the patients are shown in graphs I & II respectively.

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2.8	2	8.7	8.7	21.7	3.5	1	4.3	4.3	13.0
2.9	3	13.0	13.0	34.7	3.6	3	13.0	13.0	26.0
3.0	2	8.7	8.7	43.4	3.7	2	8.7	8.7	34.7
3.1	2	8.7	8.7	52.1	3.8	3	13.0	13.0	47.7

3.2	3	13.0	13.0	65.0	3.9	3	13.0	13.0	60.0
3.3	3	13.0	13.0	78.0	4.0	2	8.7	8.7	68.7
3.4	1	4.3	4.3	82.3	4.1	4	17.4	17.4	86.1
3.6	4	17.4	17.4	99.7	4.4	2	8.7	8.7	94.8
-	-	-	100	100	4.5	1	4.3	4.3	99.1
Total	23	100	100	100	Total	23	100	100	100

Discussion:

Ankylosis of temporomandibular joint due to childhood TMJ trauma is common in Pakistan. This is exclusively because of ignored or mismanaged growing age injury to the joints. The socioeconomic status of the patient and unavailability of trained specialists in the area also contribute in the development of this pellagrous condition. The condition ultimately results in impairment of the orofacial functions such as limited chewing ability, impaired speech, compromised oral hygiene, restricted airway problems and impeded mandibular molar eruption^{1,14,15}. Mandibular trauma and local infection arising from the middle ear are the two most common causes of TMJ ankylosis^{4, 16-18}.

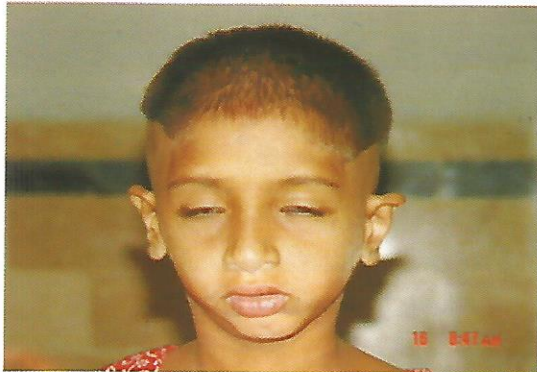
TMJ ankylosis should be treated as soon as the condition is recognized and the main objectives of treatment are surgical removal of the ankylosis together with reestablishment of joint function and a harmonious jaw relationship. Many authors have described steps for successful management of this condition.^{14, 15, 18, 20} The autogenous and alloplastic materials have been utilized for the successful management TMJ ankylosis. The costochondral graft, temporal fascia, temporal muscle, ear cartilage, silastic, proplast and metals have been used as the interpositional materials in TMJ arthroplasty.^{14, 15, 21-25}

The costochondral graft (CCG) has been advocated widely as condylar replacement after surgical removal of ankylotic bone. The advantages of the CCG include biologic and anatomic similarity to the mandibular condyle, low morbidity of the donor site, ease in obtaining and adapting the graft, and its regenerative and growth potential. The CCG also has the characteristics of

primary and secondary cartilage similar to those of the mandibular condyle. The usage of a CCG to reconstruct the TMJ in children provides a growth potential that, it is hoped, can keep pace with growth of the non-affected side and maintain mandibular symmetry throughout the growth period. However, excessive and unpredictable growth of the CCG has been reported^{8,14,25,26}. The rigid tripod fixation with titanium self tabbing screws is an additional feature to be highlighted in this article.

The use of temporalis muscle and fascia (myofacial) as an interpositional flap to the remodeled TMJ fossa has an edge in preventing the most commonly occurring complication of re-ankylosis in these patients. The versatility of the temporalis myofacial flap in maxillofacial surgery is well recognized. It has been used to support and replace orbital contents and to reconstruct the oral cavity after ablative surgery^{12,15, 27,28}. This flap has been described in earlier TMJ surgeries. The first available report is from Verneuil²⁹ (1872) who used the temporalis muscle flap (TMF) as an interpositional material after ankylosis release. In 1912, Murphy³⁰ described a series of similar cases in which the TMF was inferiorly based and rotated over the zygomatic arch to line the glenoid fossa after ankylosis release.

The management of the TMJ ankylosis needs to deal with aggressive surgical approach using CCG and an interpositional myofacial flap after resection of ankylotic bone and at times additional ipsilateral coronoidectomy, and early postoperative mobilization of the joint. The surgical procedure described in this article ensures not only in satisfactory mouth opening and jaw function, but also reduction of subsequent re-ankylosis.



Preoperative chin deviated on left



Lateral profile before surgery

Conclusion:

In summary, this is a very effective and practical article that provides additional information regarding the prevention of re-ankylosis after surgical intervention of TMJ ankylosis in children. Based on the available

results, I would continue to recommend the use of CCG with an interpositional myofacial flap for reconstruction of the remaining ramus condylar unit for the successful treatment of ankylosis.



Incision Design



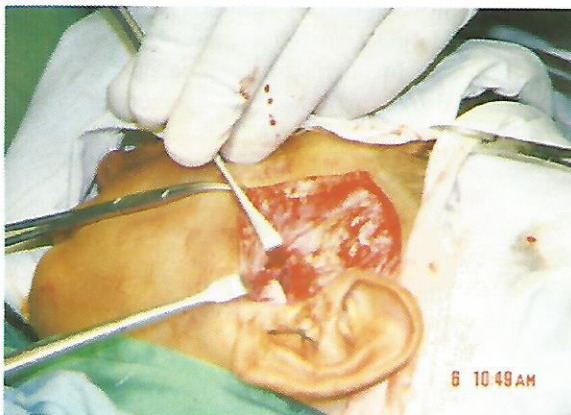
Tripod holes on ramous condylar unit



Gap and Myofacial flap



Exposure of costochondral graft



Reposition of myofacial flap



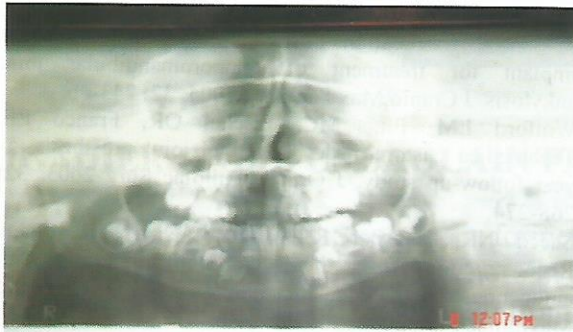
Costochondral graft prepared



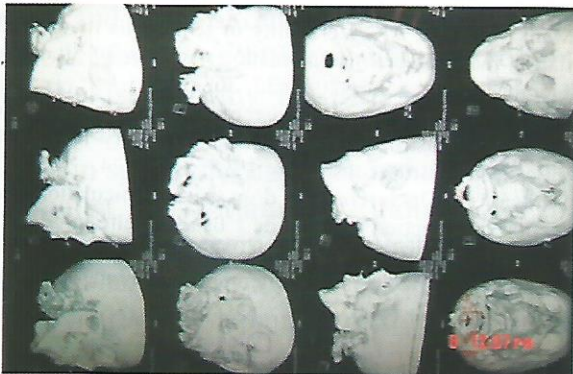
Rigid tripod screwing of graft



Complete closure of the wound



Preoperative OPG X-rays



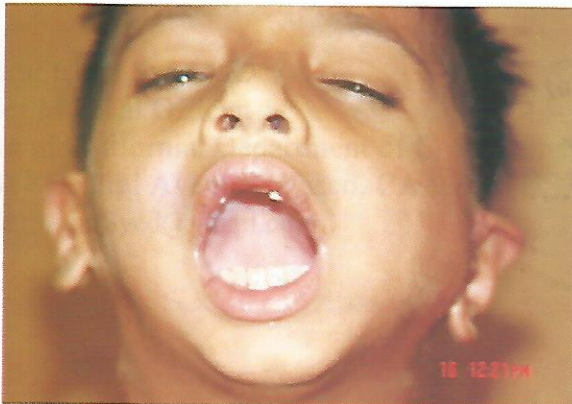
CT scan image of the joints



Immediate postoperative view



Lateral profile after 5 days



Front profile interincisal opening after 10 days

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