

Comparison of gap arthroplasty versus creating a pseudoarthrosis – modified technique for surgical management of temporomandibular joint ankylosis: a new approach

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Abstract: *Objectives:* To compare the postoperative results like vertical ramus height, vertical facial height, anterior open bite, unilateral cross bite and reankylosis in patients with TMJ ankylosis after doing gap arthroplasty versus creating a pseudoarthrosis by this modified technique. *Background:* This surgical study done on 10 patients with TMJ ankylosis were 5 patients had unilateral ankylosis and 5 had bilateral ankylosis. Pseudoarthrosis was created by this modified technique in all 10 patients. *Methods:* In this technique, a pseudoarthrosis is created by two oblique osteotomies and resection of triangular shaped bony wedge between the articular cavity and subcondylar region involving ankylotic bony mass and sub-ankylotic normal bone and a surgical gap is created without interposing any material with gap of 1cm anteriorly and gap height decreasing posteriorly resulting in pseudoarthrosis at posterior border without any loss of vertical ramus height. *Results and conclusion:* The postoperative results show that this new approach of creating a pseudoarthrosis is effective and convenient method of treating TMJ ankylosis and has many advantages over conventional gap arthroplasty. **Keywords:** Ankylosis, Gap arthroplasty, Pseudoarthrosis.

Introduction

The treatment of TMJ ankylosis possesses a significant challenge to the maxillofacial surgeon because of its high incidence of complications. Failure to alleviate the ankylosis can result in speech impairment, difficulties with mastication, poor oral hygiene, and facial and mandibular growth disturbance in children [1]. A number of surgical approaches have been devised to restore normal joint functioning and prevent reankylosis. Three basic techniques used are-Gap arthroplasty, Interpositional arthroplasty and Condylectomy with joint reconstruction [2-3].

Treatment usually requires adequate excision of the involved ankylotic block (arthroplasty). This arthroplasty may be gap arthroplasty which was first described by Abbe in 1880 were resection of bone between the articular cavity and subcondylar region is done and a surgical gap is created without interposing any material, but the

width and extent of bone removal is crucial, with a minimum distance of 1 cm to prevent reankylosis [4-5]. If interposing any material either autogenous or alloplastic between the new sculptured glenoid fossa and condyle is known as interpositional arthroplasty [6-11]. Sometimes condylectomy is done followed by joint reconstruction where TMJ is reconstructed with an autogenous bone graft or total joint prosthesis. In adults, the main objective of condylar reconstruction is to restore lost function and symmetry of the TMJ. In children, there is an added objective of using a graft (costochondrial) that has an adequate growth potential [12].

Material and Methods

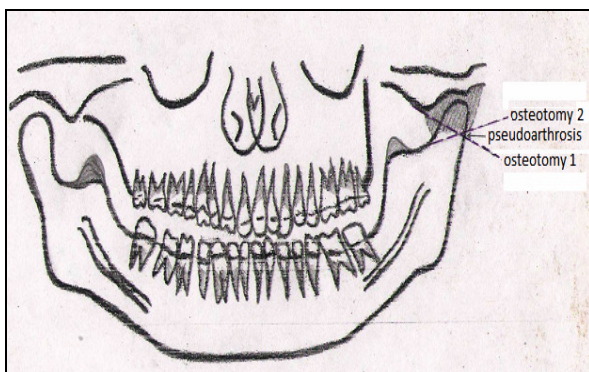
Patients: After obtaining the informed consent from the patients, they were subjected to a thorough anamnesis. A total of 10 patients with TMJ ankylosis were operated by the

same surgeon with this innovative approach of creating a pseudoarthrosis at posterior border. 5 patients had unilateral and 5 had bilateral joint involvement and were followed up retrospectively for 18 months. All the patients were in the age group of 12-25 years from both male and female sex.

Preoperative evaluation consisted of a detailed case history, clinical assessment, routine investigations, orthopantomogram, CT scan and preanesthetic evaluation. All the patients selected were operated by the same surgeon under general anesthesia with naso-endotracheal intubation.

Surgical technique: The lateral side of temporomandibular joint and ankylotic mass is exposed through Al-Kayat & Bramleys incision [13]. Subperiosteal blunt dissection with cotton padgets is performed anterior, posterior and medial to ankylotic and sub-ankylotic region to completely expose it and its entire width so that a condylar retractor is placed medial to the site of osteotomy to prevent internal maxillary artery. First superior oblique osteotomy is done in antero-superior and postero-inferior direction and second inferior oblique osteotomy is done in antero-inferior and postero-superior direction involving ankylotic / subankylotic bone and creation of gap of 1cm anteriorly with gap height decreasing posteriorly resulting in pseudoarthrosis at posterior border without any loss of vertical ramus height. Both these osteotomies meet at posterior border and are placed through and through from lateral to medial aspect and a triangular wedge shaped bony block is removed from the site. The directions of these osteotomies have been illustrated in Fig-1.

Fig-1: Illustrates the superior and inferior oblique osteotomies for creation of pseudoarthrosis at posterior border.



Risdon's incision is placed and pterygomasseteric sling is incised and reflected from the inferior border of mandible which is further extended laterally and medially over angle of mandible and subperiosteal dissection of muscles of mandibular ramus (masseter and medial pterygoid) is done. Heister's jaw stretcher is used to distract the lower segment during surgical procedure by placing the instrument at the site of osteotomy which causes superior repositioning of these dissected muscles.

Postoperatively mouth opening exercises also cause superior repositioning of these muscles dissected from mandibular ramus and help in distracting the bare bony surfaces at the site of osteotomy. Thus finally decreasing the muscle pull on temporomandibular joint region which further increases mouth opening and prevents reankylosis. Physiologically, these muscles on severe postoperative exercises along with gravitational forces have the tendency to start completely relaxing which further increases mouth opening and prevents reankylosis.

Satisfactory results are always achieved with mouth opening of more than 3.5cm postoperatively after a month. In all the patients, ipsilateral and/or contralateral coronoidectomy was done to achieve satisfactory maximal interincisal mouth opening.

Results and Discussion

The result of patients with this innovative technique of creating pseudoarthrosis is highly effective and safe and is acceptable both clinically and physiologically. Postoperatively mouth opening is adequate and none of the cases had temporary or permanent facial nerve damage. Reduced vertical ramus height, decrease in vertical facial height, facial asymmetry, anterior open bite, posterior gagging, reankylosis and unilateral cross bite was not found in any of the cases postoperatively as commonly seen in conventional gap arthroplasty. This technique is more effective as ankylotic bony mass remains undisturbed and both the bare bone edges at osteotomy site form a pseudoarthrosis at posterior border.

In gap arthroplasty two horizontal osteotomies are performed parallel to each other and bone is resected between the articular cavity and subcondylar region through the ankylotic mass and a surgical gap of 1cm is created equidistant superio-inferiorly which has equal dimensions both laterally and medially. This complete extensive removal of this ankylotic bony mass in the site of previous joint space can cause following complications which are not seen with this new approach.

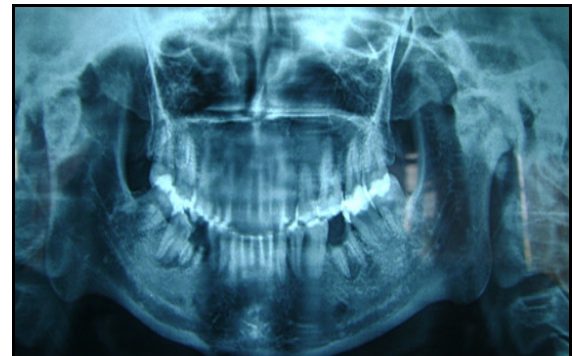
1. Extensive radical excision of this bony mass offers more bare bleeding bony surfaces which increase chance for reankylosis due to massive bony growth. [14]
2. On creation of gap of equal height and width superio-inferiorly and medio-laterally, temporalis muscle tends to pull the mandible superiorly as posterior teeth are usually decayed which makes these flat bony bleeding surfaces to unite again resulting in reankylosis. [14-17]
3. On extensive removal of this bony mass, loss of vertical ramus height occurs. [18]
4. Due to action of temporalis muscle and loss of vertical ramus height posteriorly, there is premature contact of posterior teeth causing anterior open bite. [14]
5. Extensive radical excision of this ankylotic bony mass results in loss of vertical ramus height and vertical facial height causing midline shift to the involved side in unilateral TMJ ankylosis which becomes quite obvious as facial asymmetry. [19]
6. This massive ankylotic bony mass is highly variable and during extensive radical excision, it may pose the considerable risk involving middle cranial fossa. [20-21]
7. Between the two opposing flat raw bleeding bony surfaces, there is always a chance of surrounding tissues being interposed in between which likely gets fibrosed and restricts mandibular movements which causes reankylosis. [22]
8. On extensive removal of ankylotic mass from surrounding joint space there is more free bleeding tissue which goes for fibrosis and scar formation leading to decrease in mandibular movement which causes reankylosis. [22]

Fig-2: Illustrates modified technique and creation of pseudoarthrosis in a patient with bilateral TMJ ankylosis.

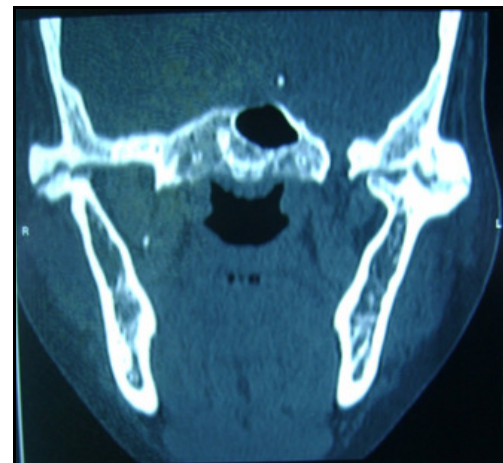
a) Pre-operative nil mouth opening.



b) Pre-operative OPG showing bilateral TMJ ankylosis.



c) CT scan showing bilateral ankylosis.



d) Intra-operative mouth opening and superior repositioning of muscles done with heisters jaw stretcher.



e) Post-operative mouth opening.



So to overcome these problems we treat TMJ ankylosis by this new approach of creating a pseudoarthrosis at posterior border which is effective, easier and convenient, reduces operating time and decreases the risk of reankylosis as usually seen with gap arthroplasty. Fig-2 illustrates a case of bilateral TMJ ankylosis where pseudoarthrosis was created by this technique.

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