

MANAGEMENT OF TEMPOROMANDIBULAR JOINT ANKYLOSIS: LITERATURE REVIEW

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ABSTRACT

Temporomandibular joint ankylosis is a debilitating condition. It is comparatively more common in the developing world. Main cause of occurrence is trauma to TMJ in childhood. Three main surgical modalities are described in literature for its management. They include gap arthroplasty, interpositional arthroplasty and joint replacement. Recurrence remains the main problem after surgery. Aggressive resection and intensive post-operative physiotherapy are recommended to prevent re-ankylosis.

Key words: Temporomandibular Joint Ankylosis, Debilitating.

INTRODUCTION

Temporomandibular joint ankylosis is increasingly becoming rare in the western world. It remains however a common condition in the developing countries¹. We have come a long way in the management of TMJ ankylosis in the last fifty years. The purpose of this paper is to present an overview of this condition and current thinking in its management.

Normal growth and development

Traditional concept of growth

Growth takes place at sutural interfaces of skull and facial bones especially at sphenio-occipital junction, vomer and condyle of the mandible, which produces downward and forward projection of the facial skeleton. Condyle is analogous to primary growth center of the long bone. Injury to condylar growth center causes interference in normal growth thus producing mandibular deformity.

Functional matrix theory

Embryologically investing tissue and functional spaces of head and neck precede the appearance of supporting skeletal structure. They form the functional matrix whose operational volumetric demands are the primary force in the growth and development. Thus skeletal development is secondary to these changes.

ing requirements. According to this theory deformity following TMJ ankylosis is due to the irreparable damage to remodeling capacity rather than its growth potential.

TMJ ankylosis can be classified;

- 1 Anatomically: intra-capsular or extra-capsular ankylosis
- 2 Functionally: complete or incomplete ankylosis
- 3 Type of tissue involved: fibrous, fibro-osseous or osseous

TMJ ankylosis should be differentiated from similar conditions like trismus and pseudo-ankylosis

Trismus is described, as limited mouth opening due to the tonic spasm of the muscles responsible for jaw closure, it is a protective reflex initiated by proprioceptive nerve endings in the periodontium, muscle spindles and mechanoreceptors in the joint capsule mediated via brain stem to the muscle responsible for jaw closure. It is initiated by the stimuli e.g. infection, trauma, neoplasia etc. The purpose of this reflex is to prevent further damage to the tissue by e.g. preventing further spread of infection or further injury to tissue by an existing fracture or spread of tumor. As soon as stimulus is removed condition disappears.

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Pseudo-ankylosis is defined as pathological state, which indirectly effects TMJ mobility, by mechanical interference. The most common cause known in clinical practice is fracture Zygomatic bone or arch impinging upon the coronoid process of the mandible. Other conditions include fibrosis caused by mechanical, chemical or thermal injury, submucous fibrosis and coronoid hyperplasia.

Extracapsular ankylosis or false ankylosis involves peri-articular tissue. Most common cause of this condition is peri-articular fibrosis, occurring as a squeal of trauma, infection or radiotherapy. Neoplasia involving peri-articular tissue can also cause this condition.

Intra-capsular ankylosis or true ankylosis is a condition in which there are pathological changes in the anatomical and physiological integrity of TMJ. There is bony or fibrous union between the joint surfaces as a result of trauma, infection or arthritis. However, the differentiation between the intra-capsular and extra-capsular ankylosis remains arbitrary because if intra-capsular ankylosis remain untreated, it leads to extra-capsular ankylosis.

Etiology of TMJ ankylosis

Trauma and infection remain major cause of ankylosis^{1,2,3,4}. Other causes include systemic conditions such as ankylosing spondylitis, rheumatoid arthritis and psoriasis. The onset of this condition is usually before the age of 10³.

In children the anterior wall of external auditory meatus is deficient and is closed by cartilage, which is prone to lysis by enzymes produced by bacteria involved in otitis media, hence causing intra capsular infection of TMJ. Otitis media occurs commonly in children as squeal of nasopharyngeal infection and nasopharyngeal infections are in turn encouraged by the presence of abundant adenoid tissue in children.

Shape and structure of condyle also contributes to increase incidence of ankylosis in children. The cortex is thin while the neck of condyle is broad in children. Any vertical impact on the chin can cause comminuted fracture of the head of condyle and haemarthrosis. Haemarthrosis in children have high osteogenic potential thus forming fibro-osseous mass. In contrast in adults cortical bone of the condyle is thicker while, the

neck of condyle is thinner, thus vertical impact upon the chin usually breaks condyle at its neck.

Clinical features

TMJ ankylosis is a severely debilitating condition. It effects mastication, digestion, speech and facial appearance and can cause long-term psychological problems. The degree of deformity depends upon two factors:

- 1 Age of onset
- 2 Unilateral or bilateral involvement

Unilateral TMJ ankylosis

- 1 Chin is deviated to the effected side and posteriorly displaced
- 2 Body and ramus of the mandible is short and there is prominent and high antegonial notch on the effected side
- 3 Intra orally dento-alveolar segment is adapted to bring teeth in functional position, however, teeth usually remain in cross bite on the effected side

Bilateral TMJ ankylosis

- 1 The chin is posteriorly displaced and under developed, which produces double chin effect (birds deformity)
- 2 Mandible, incisors and floor of mouth are anteriorly inclined

Management

Historically Esmarch was said to be the first one to perform osteotomy for TMJ ankylosis in 1851 whilst Humphrey performed the first condylectomy in 1854. Gap arthroplasty was first advocated by Abbe in 1880 and interpositional material was first used by Risdon in 1934. There is growing evidence that TMJ ankylosis should be treated as soon as recognized⁵. The objectives for surgical correction are as follows:

- 1 To restore function
- 2 To restore appearance
- 3 To prevent relapse
- 4 To achieve growth in children

Operative options

- 1 Gap Arthroplasty
- 2 Interpositional Arthroplasty
- 3 Joint Replacement

Gap Arthroplasty

Gap arthroplasty involves resection of bone distal to the ankylosed TMJ and allowing pseudoarthrosis to develop in between the two ends of bone. Historically this procedure is associated with high incidence of re-ankylosis. However, there are studies in literature, which have shown high level of success with gap arthroplasty. These studies agree that amount of bone removed should be at least 15mm and the procedure should be followed by vigorous postoperative physiotherapy^{2,6}. The results of two such studies are given in table 1.

Interpositional arthroplasty

The rationale for using interpositional graft in the osteotomy site is to prevent re-ankylosis. A variety of tissue has been used for this purpose in the past.

Popescu and Vasiliu⁷ observed that using full thickness interpositional skin graft from abdominal wall reduced rate of recurrence in their cases.

Glen Leilo⁸ in his case series of 13 patients (17 joints) used composite skin and chonchal cartilage interpositional graft. He demonstrated that in all but one instance he achieved satisfactory postoperative mandibular movement and mouth opening over a period of 1.5 to 5.5 years.

Zhou Lei⁹ in a case series of 7 patients used autologous auricular cartilage as interpositional graft.

At 6 year follow up no relapse had resulted and no deformity had occurred in the ear from which cartilage had been harvested.

Smith et al¹⁰ subjectively and objectively assessed 23 consecutive patients who under went 28 temporalis myofascial flap procedures in previously operated temporomandibular joints. They concluded that temporalis myofascial flap has the advantages of close proximity to the temporomandibular joint, minimal surgical morbidity and successful clinical results. It was found to be a valuable option for TMJ reconstruction in joints in which previously alloplastic, allogenic, or autogenous material had been used unsuccessfully.

Raveh et al¹¹ published case series of 26 surgically operated temporomandibular joints. Lyophilized costochondral cartilage was used in 20 cases. This cartilage was obtained postmortem and lyophilized. At least 3 layers of 1mm thick layers were interpositioned between condyle and articular fossa. Sialastic was used in other 4 patients. This material was only used in children and was replaced at age of 16 to 17 by lyophilized cartilage. 2 patients were treated by insertion of titanium-coated hollow-screw and reconstruction plate condylar prosthesis. This prosthesis was used only when resection of joint was unavoidable. In all these cases good functional results were obtained. There was no case of recurrence except 1 year postoperatively in one of the two cases treated with condylar prosthesis.

Chossegros et al¹² in a 22 years retrospective study compared different material used for interposition arthroplasty. A total of 25 patients (32 joints) with at least 3 years follow up were included in the study. A good result was defined as final inter-incisal distance of 30 mm or more with out recurrence. Based on this definition good result was obtained in 12 of 13 cases

TABLE 1

Author	Year	No. of cases	Range of movement MIO (mm)	Post op. movement MIO (nun)	Follow up	Recurrence
Roychoudhury et al ²	1998	50	0-10	10-40	36	2%
Rajgopalan et alb	1983	15	0-9	.28-34	12-30	0%

(MIO: Median Incisal opening)

potential 17,19ickness skin graft (92.3%), 5 of 6 cases (83.3%) using temporalis muscle flap with or with out disc repositioningchildren18,19.%) using disc repositioning with out temporal flap, 1 case using fascia lata, 1 of 2 (50%) cases using homologous cartilage, and 1 of 3 cases (33%) using prosthesis.

Long et al¹³ has shown satisfactory post-surgical results with use of autogenous coronoid process grafts for lengthening the ramus in patients with long standing TMJ ankylosis and severe mandibular retrognathia.

Artificial materials like T shape silicone interpositional implant have been used with varying degree of success^{14,15}.

Rationale for replacing TMJ⁶

- 1 Re- ankylosis after a costochondral graft is rare
- 2 Condylar reconstruction restores the altered biomechanics arising from condylectomy or gap arthroplasty
- 3 A costochondral graft provides growth capacity similar to the normal mandibular condyle in children

Autogenous Replacement of TMJ

Various methods of autogenous reconstruction have been described in literature. They include Costochondral graft, metatarsal graft, fibular graft and sternoclavicular graft. However, it's the costochondral graft, which has gained the most popularity in last two decades.

Cestochondral Graft

Sarnat and Robinson in 1956 were the first to advocate using actively growing costochondral graft. But it was Ware and Taylor who first suggested replacing damaged condyle with costochondral graft in 1966. Costochondral graft is usually harvested from 5th, 6th or 7th rib. A sub-mammary incision is used. A minimum length of 3cm graft is harvested which include 0.5-1 cm of cartilaginous part. Receptor bed is prepared and graft is fixed with wire or plate osteosynthesis. The advantages of this graft include biological compatibility, workability and functional adaptability and growth

potential",¹⁹. Potential disadvantages include fracture, donor site morbidity and unpredictable or excessive growth behavior in children^{15,19}.

Alloplastic Reconstruction of TMJ

The advantages of alloplastic TMJ replacement include absence of donor site morbidity, freedom of starting the post-operative physiotherapy immediately and ability to mimic the normal anatomy accurately. Main disadvantages include cost of device, material wear and failure to follow growth²⁰.

Saeed et al²¹ conducted a retrospective, two-center audit of 49 patients treated with costochondral graft and 50 patients treated with alloplastic joints. Patients in both groups showed an improvement in symptoms but more patients in the autogenous group required re-operation.

Henry and Wolford²² conducted a retrospective study of 107 patients with 163 joints previously treated with proplast Teflon. 5 different types of autologous tissues TMJ16used to reconstruct 110 joints where as 43 joints were reconstructed with total joint prosthesis. A low rate of success was noted with autologous tissue. The rate of success decreased as the number of surgeries performed previously increased. An improved rate of success was noted with total joint prosthesis.

Role of Arthroscopy

Arthroscopy with laser debridement has been successfully employed in fibrous TMJ ankylosis²³.

Complications

Re-ankylosis is universally accepted as the main complication following surgery. Kaban et al⁵ have recommended a seven-step protocol to decrease this risk;

- 1 Aggressively remove bony or fibrous ankylosis
- 2 Dissect and strip muscle from the ramus and perform ipsilateral coronoidectomy
- 3 Dissect and strip muscle from the ramus and perform contralateral coronoidectomy if MIO with out force is less than 35mm in ipsilateral cases
- 4 Create a new disc lining

5 Replace condyle with costochondral graft
Fix costochondral graft with rigid fixation

7 Imply early mobilization and aggressive physiotherapy

CONCLUSIONS

- 1 **TMJ** ankylosis remains relatively common in the third world countries
- 2 Main etiological agent is trauma
- 3 Age of onset is usually before 10 years age
- 4 Clinical features depend upon age of onset of condition and whether the condition is unilateral or bilateral
- 5 Current recommendation is to treat the condition as soon as recognized
- 6 Although there are some studies in the literature, which suggest equal success rate with gap arthroplasty alone, there is overwhelming evidence that interpositional arthroplasty has shown better results.
- 7 The indication for joint replacement are well established, however the choice between autogenous and alloplastic joint remains controversial

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