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Management of Temporomandibular Joint Ankylosis in Children with Their Surgical Risk and Benefits

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***Abstract*---**Aim: To Overview and analyse the various treatment options and risk & benefits used for management of ankylosis in growing children. Summary: A Number of technique have been used for the treatment of temporomandibular Ankylosis. Since it is a known challenging problem in paediatric patients. Main aim of our treatment is excision of ankylotic mass followed by recontouring of the joint.

***Keywords*---**ankylosis, costochondral grafts, fascia flap, temporalis muscle, temporomandibular joint.

Introduction

Ankylosis is a Greek word meaning 'Stiff joint'. Temporomandibular joint (TMJ) ankylosis may be defined as the fusion of joint surfaces by bone or fibrous tissue leading to restricted mouth opening (Chugh et al., 2011). Temporomandibular

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joint ankylosis is very distressing structural condition that denies the victim the benefit of a normal diet and opportunities in carriers that require normal speech ability. It also causes severe facial disfigurement that aggravates psychological stress. Temporomandibular joint ankylosis during early childhood may lead to disturbances in growth, or cause asymmetry and serious difficulties in eating and breathing during sleep (Su-Gwan, 2001).

Temporomandibular joint ankylosis in children is uncommon and is one of the most difficult and complex problems managed by oral and maxillofacial surgeons. Ankylosis is not only challenging to treat from a technical perspective, but in children, the surgeon must also consider the potential effects of time and growth The cognitive and emotional development of the patient and the role of parents are other factors that can affect the management and treatment results in children. Patient may have facial deformity, difficulty in chewing, swallowing and poor oral hygiene (Kaban et al., 2009).

Aetiological factor

The most common aetiological factor is trauma (Kaban et al., 1990; Toyama et at., 2003). In trauma cases, intra articular haematoma, scarring and excessive bone formations are responsible for restriction of jaw mobility. Trauma is most associated with a condylar process fracture during the active growth period in early childhood. When trauma is unilateral in childhood, deviation of the mandible to the affected side occurs, resulting in facial asymmetry. If it is bilateral, micrognathia is the main clinical feature. When surgical intervention is postponed, complete immobility of the jaw, occlusal disturbance, severe retrognathia, snoring and sleep apnoea occur. However, it may happen even in cases where no maxillomandibular fixation is done.

Aetiology of TMJ ankylosis may either be congenital or acquired TMJ ankylosis may be caused by trauma, infection, systemic inflammatory disorders, irradiation, previous surgery and neoplasm. The posttraumatic TMJ ankylosis follows misdiagnosis, delayed treatment, inadequate surgery, prolonged immobilization or insufficient physiotherapy. Currently, the surgical techniques used to treat TMJ ankylosis are gap arthroplasty, interpositional, arthroplasty, joint reconstruction and distraction osteogenesis. Some authors prefer to correct secondary deformities like facial asymmetry, occlusal canting and micrognathic mandible concomitantly with the release of the release of the ankylosis.

The goals for the release of TMJ ankylosis are to create a pseudo arthrosis that will improve function or movement of the mandible, prevent relapse, relieve airway obstruction if present, achieve normal growth and correction of deformity in children, restore appearance and occlusion in adults and facilitate maintenance of good oral hygiene. TMJ ankylosis is classified by location (intra-articular or extra-articular), type of tissue involved (e.g., Bone, fibrous, or fibro-osseous), and extent of fusion (complete or incomplete). Trauma, radiotherapy, surgical excision of TMJ tumours, infection, and systemic disease can all result in mandibular hypomobility, in third world countries, infection remains the most common cause of TMJ ankylosis in children. Local odontogenic, ear, and skin

infections or osteomyelitis and systemic spread of osteomyelitis from the long bones are the most common aetiologies.

In developed countries, intracapsular and sub condylar fractures are the most frequent causes of ankylosis in children. Prolonged immobilization is often associated with ankylosis, but excessive mineralization and bone formation in the healing fracture region can also occur in children who have not been placed into maxillomandibular fixation. Patients in the deciduous dentition, with intracapsular and/or comminuted fractures, are at the greatest risk for developing ankylosis.

Specifically, regarding children, surgeons not familiar with paediatric patients have significant misconceptions. The most common is that children cannot or will not cooperate with physical therapy and hence will have a poor outcome after ankylosis release. Our experience has been quite the opposite. The most frequent source of failure in children treated for TMJ ankylosis has not been a lack of patient cooperation but, rather, inadequate ankylosis release. This is most commonly caused by a failure to adequately excise the ankylotic mass, resulting in failure to achieve complete, passive opening (without the need for excessive force) in the operating room. If excessive force is necessary to open the jaw intraoperatively, even more force will be required postoperatively. Under these circumstances, physical therapy will be very painful, and the operation doomed to failure, regardless of the level of patient cooperation.

Imaging with fine-cut 3-dimensional computed tomography allows surgeons to specifically identify the location, extent, and anatomic relations of the area of ankylosis. This results in more accurate treatment planning and improves the possibility of obtaining a successful outcome. The use of surgical navigation will enable surgeons to execute these complex operations more precisely and safely in the future. Prolonged immobilization is often associated with ankylosis, but excessive mineralization and bone formation in the healing fracture region can also occur in children who have not been placed into maxillomandibular fixation. Patients in the deciduous dentition, with intracapsular and/or comminuted fractures, are at the greatest risk for developing ankylosis (Mabongo, 2013).

Protocal for management of TMJ ankylosis in children

The 7-step protocol is as follows:

- aggressive excision of the fibrous and/or bony ankylosis mass;
- coronoidectomy on the affected side;
- coronoidectomy on the contralateral side, if steps 1 and 2 do not result in a maximal incisal opening greater than 35 mm or to the point of dislocation of the unaffected temporomandibular joint;
- lining of the joint with a temporalis myofascial flap or the native disc, if it can be salvaged;
- reconstruction of the ramus condyle unit (RCU) with either distraction osteogenesis (DO) or a CCG and rigid fixation;
- early mobilization of the jaw;
- aggressive physiotherapy (Mabongo, 2013).

- Aggressive excision of fibrous and/or bony mass.
- Coronoidectomy on affected side.
- Coronoidectomy on opposite side it steps 1 and 2 do not result in MIO of >35 mm or to point of dislocation of opposite side.
- Lining of joint with temporalis fascia or the native disc, if it can be salvaged.
- Reconstruction of RCU with either DO or CCG and rigid fixation.
- Early mobilization of jaw; if DO used to reconstruct RCU, mobilize day of surgery; if CCG used, early mobilization with minimal intermaxillary fixation (not >10 days).
- Aggressive physiotherapy.

Risks and benefits of surgical approaches to the TMJ (the preauricular and endaural approach)

Benefits

These surgical approaches achieve an optimal lateral and anterior exposure of the TMJ. Modified by an anterior extension, they also permit better exposure of the articular eminence and zygomatic arch allowing for unrestricted access to the temporalis fascia and muscle for grafting. Moreover, the endaural approach is cosmetic, and shelters the scar within the confines of the tragus and helix of the ear.

Risks

Facial nerve damage

Dolwick and Kretzschmar found no significant difference in the incidence of nerve weakness when comparing the pre-auricular to the perimeatal approaches. The reported incidences of transient; facial nerve paresis after arthrotomy range from 1 to 25% (Su-Gwan, 2001). Facial nerve paresis after TMJ surgery usually involves the temporal branch of the facial nerve, resulting in eyebrow lag and decreased function in the orbicularis oculi muscle. Dingman et al. reported an incidence of 55% of temporal branch paresis following surgery using the preauricular approach. Weinberg and Kryshtalskyj reported that in 68 patients (83 temporomandibular joints) who had a variety of temporomandibular joint operations using a preauricular approach, 10.84% showed signs of a transient facial nerve injury in which the temporal and zygomatic branches were involved. The incidence of facial nerve injury was greater in patients who had undergone previous TMJ surgery (17.64%) than in patients with previously unoperated joints (9%). Scarring of tissues as a result of previous TMJ surgery may significantly increase the risk of facial nerve injury during subsequent TMJ surgery. Normal facial nerve function returned in 7 to 14 weeks, except in one patient who showed a persistent mild deficit of the zygomatic branch at 20 weeks. The nature and duration of the surgical procedure did not correlate with facial nerve injury.

Temporomandibular joint (TMJ) ankylosis is a very distressing structural condition that denies the victim the benefit of a normal diet and opportunities in

careers that require normal speech ability. It also causes severe facial disfigurement that aggravates psychological stress (Perrott et al., 1994; Umeda et al., 1993; Malis et al., 2007). Temporomandibular joint ankylosis during early childhood may lead to disturbances in growth or may cause serious difficulties in eating and breathing during sleep. This ailment is caused by various factors including trauma, systemic and local inflammatory conditions, as well as neoplasm in the TMJ area, and scan only be relieved by direct surgical procedure.

Treatment

The operative protocol for unilateral TMJ ankylosis in adults consisted of: (1) resection of ankylotic mass through extended preauricular incision; (2) intraoral ipsilateral coronoidectomy; (3) contralateral coronoidectomy when necessary; (4) the inferiorly based, U-shaped, finger like temporalis muscle and fascia flap was turned outwards and downwards over the zygomatic arch and placed in the TMJ: General anaesthesia with nasotracheal intubation and total muscle relaxation was administered. A single i.v. dose of steroid was given at the start of the case, generally using 8-12 mg of prednisolone (Delta-Cortef, Upjohn Korea).

A preauricular incision with a temporal extension was made. The external canal was lightly packed with Vaseline gauze. The temporalis muscle was lifted from the infratemporal fossa towards the anterior at the peri cranial level, while the zygomatic root was uncovered. An avascular tissue plane along the cartilaginous meatus was established using surgical scissors. The ankylosed TMJ was palpable, and an incision was made directly onto the bone, exposing the ankylosed TMJ. Excision of the fibrous tissue and ankylotic bony mass was carried out using drill and saw. The TMJ was lined with a temporalis muscle and fascia flap rotated over the arch into the joint. The flap was sutured medially, anteriorly, and posteriorly with 4-0 Vicryl.

Vigorous postoperative physiotherapy and continuous passive motion (CPM) therapy were performed to maintain the mobility obtained during surgery and to prevent postsurgical hypomobility secondary to fibrous adhesions. A nonsteroidal anti-inflammatory drug (NSAID) was used for approximately 2-4 weeks after the operation. The patients were started on a soft diet and jaw-opening exercises. Physiotherapy was started once a day for the first 2 weeks and once every 2 days for the following 2 weeks. Physiotherapy was continued for several months if deemed necessary.

Treatment images

Figure 1. Preoperative picture showing limited mouth opening

Figure 2. Preauricular incision or modified Alkayat bramely incision

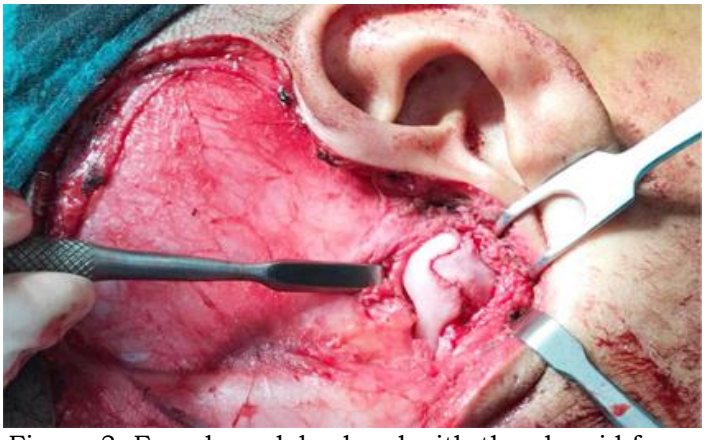

Figure 3. Fused condylar head with the glenoid fossa

Figure 4. During surgery mouth opening

Figure 5. 33 mm of mouth opening after 3 months of surgery

Surgical procedure

Pre auricular incision was taken with coronal incision (the temporomandibular joint ankylosis is approached through a preauricular incision with a temporal extension) to expose the temporalis fascia, Muscle, Zygomatic arch, Ankylotic mass and sigmoid notch. After exposure and identification of the site of the ankylotic mass, the superior osteotomy is extended in to the joint to separate the ramus from the skull base. the inferior osteotomy is created from the notch, extending posteriorly at least 1.5 to 2 cm below the margin of the ankylotic mass. failure will occur if the entire ankylotic mass is not removed. A bur is used to reshape the skull base into a glenoid fossa, when the excision is completed, the gap should be 1.5 to 2.5 cm. The maximal mouth opening should be at least 35-40mm depending on age and size of the child.

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