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Interpositional Gap Arthroplasty of Ankylosed TMJ and Reconstruction with Ipsilateral Coronoid Process: A Case Report

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Abstract: The temporomandibular joint (TMJ) forms the very cornerstone of cranio-facial integrity and is the most active, functioning joint of the body. It is one of the most common pathologies afflicting the facial skeleton, it is also the most overlooked and under-managed problem in children. Trauma to the TMJ is the most common etiology of ankylosis of TMJ. Clinical examination, radiographic evaluation is essential to confirm the diagnosis. Management of the TMJ ankylosis is mainly by surgical intervention but still composes a considerable challenge because of the high recurrence rate. Interposition arthroplasty in accordance with Kaban protocol was found to be the most successful treatment modality over other techniques due to lesser chance of recurrence while maintaining the ramal height. Though many types of autogenous grafts and alloplastic materials are available for the interposition arthroplasty, the temporalis myofascial flap offers significant advantages like ease of harvesting, minimal donor site morbidity and effective coverage of the arthroplasty site. The present case describes a surgical management of unilateral bony ankylosis of TMJ due to trauma which has been fused with glenoid fossa and root of the zygoma by interposition gap arthroplasty and reconstruction of condyle with excised coronoid process of ipsilateral side.

Keywords: Temporomandibular joint, bony ankylosis, fibrous ankylosis, ankylosis, gap arthroplasty, interpositional arthroplasty, coronoid process.

INTRODUCTION

ANKYLOSIS of the TMJ is a condition where the movement of condyle is limited and that leads to complete or partial inability to open the mouth. In most of the cases it is due to fusion of the condyle of the mandible to the base of the skull. Although there are many causes which give rise to ankylosis of TMJ, trauma and infection are the leading causes among them [1]. Most unilateral cases are caused by mandibular trauma or infection while rheumatoid arthritis in bilateral causes [2]. If it occurs in a child, it affects the future growth of the mandible and causes a grossly deformed lower jaw apart from the limited mouth opening.

Various classifications have been proposed for the ankylosis of the TMJ. True ankylosis occurs by fibrous or bony fusion of the structures within the joint, and bony fusion of the condyle to base of the skull reflects the most severe form. True ankylosis has been further classified into subtypes according to the anatomic location of the condyle and the extent of bridging bone [3].

Patients with true ankylosis usually present with restricted mouth opening and variable deformity in mandibular size and shape. Unilateral ankylosis in children may result in significant lower facial asymmetry, most probably due to shortened ramus. Development of anterior open bite with malocclusion may also be note due to the reduced ramal height [3]. In addition to the clinical examination, radiographic evaluation is important in arriving at a final diagnosis, severity, involvement of adjacent structures and ultimately to plan the treatment. When considering the plain radiographic imaging, pathology of the affected joint can be compared with the normal joint in unilateral cases using orthopantomograph, because both the joints can be seen. Elongation of the coronoid process can be seen in lateral oblique view since anteroposterior dimension of the condylar mass can be seen. Posteroanterior view shows medio-lateral extension of the bony mass and also clearly demarcates the asymmetry in unilateral cases [7].

CASE REPORT

A 19 years old otherwise healthy male was presented with persisting severe reduction in mouth opening with gross asymmetry of the face for 10 years.

The patient has a history of accidental fall from a tree when he was 9 years old and no symptoms were noticed until 12 years of age. At the age of 12, gradual reduction in mouth opening with gross facial asymmetry was noticed. At 19 years of age, patient was presented to the Dental Hospital, (ACPM Dental College, Dhule) with severe reduction in mouth opening and gross facial asymmetry.

On examination, 6mm of maximum mouth opening with painful right side TMJ was noticed. Gross asymmetry of the face due to shortness of the right side of face was clearly noticed (Figure 1). Both side preauricular and TMJ areas were not tender on palpation, but right TMJ area was painful while opening the mouth. Radiological investigations were done to identify the involvement of adjacent structures (Fig 2). According to the Orthopantamogram X-ray, obliteration of the right TMJ space and bony fusion of condyle to glenoid fossa of right side was clearly observed as a radio-dense mass. Surgery was planned to release ankylosed TMJ by interpositional gap arthroplasty using deep temporal fascia and reconstruction of condyle with ipsilateral coronoid process.

A written informed consent was taken for the procedure. General anesthesia was induced following fiber optic guided nasotracheal intubation since inter incisal opening of the patient was only 6mm. Standard preparation was done. Alkayat Bramley incision was made in order to achieve a greater access and pevent damage to the zygomatic and temporal branches of facial nerve and auriculotemporal nerve (figure 3). Further, incision was extended upto the level of ear lobe. Incision was deepened up to deep temporal fascia. Downward dissection was continued along the fascial plane up to the root of the zygoma. At the same time adequate length of deep temporal fascia was designed as an interpositional graft.

Excision of ankylotic mass was performed using surgical bur and chisel. Lateral aspect of the bony mass was removed using surgical bur. Medial aspect of the ankylotic mass was removed using hand chisel and mallet. Care was taken to protect maxillary artery. After the excision of ankylotic mass, approximately 1.5 cm gap was achieved. Ipsilateral coronoidectomy was performed through intra oral approach, and the result was 34mm of inter incisal opening. Contralateral coronoidectomy was performed according to Kaban's protocol and finally 50 mm of inter incisal opening was attained.The ipsilateral coroniod process which was removed, was shaped and used to reconstruct the right condyle and was fixed using 2x8mm 4-hole plate.

Post-operative mouth opening exercises were carried out and four stages of subsequent forceful mouth opening under general anesthesia were performed for better results. Long term prognosis is yet to be established since patient is on regular follow up without complications. Expected follow up period will be one year.

Fig-1: Preoperative frontal profile

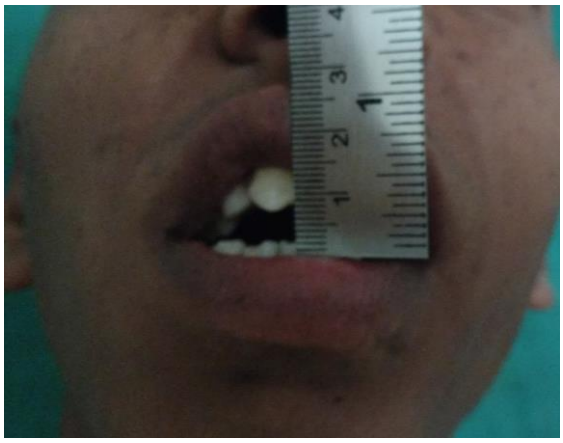

Fig-1.1: Preoperative mouth opening

Fig-2: OPG Showing the TMJ ankylosis

Fig-3: Designed deep temporal fascia flap was rotated and positioned into the site of arthroplasty

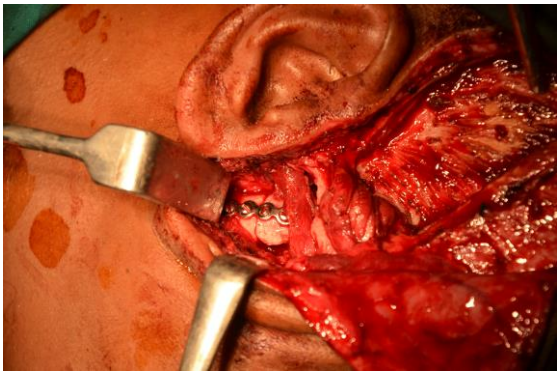

Fig-4: Reconstruction of condyle with ipsilateral coronoid process

DISCUSSION

Trauma is the leading cause of TMJ ankylosis while infections take the position after the trauma [1]. One study done by Roychoudhury et al. using 50 cases of TMJ ankylosis, revealed that trauma was the etiological factor in 86% of cases [9]. According to the

literature incidence of post-traumatic ankylosis of TMJ is higher in children. The patient in our case also had faced with an accident in his childhood and trauma to the right side TMJ which has gone unnoticed until significant sign and symptoms started to develop after a few years. The sequelae of unilateral ankylosis includes retarded facial growth and development, impairment of speech, nutrition, respiration, development of malocclusion, poor oral hygiene and multiple carious teeth [7].

Management of TMJ ankylosis is always surgical [7]. The main objective of early surgical intervention to correct TMJ ankylosis is to restore the function of the TMJ while preventing the future recurrence. The choice of treatment option depends on the age of onset, extent of ankylosis, unilateral or bilateral, associated facial deformity and experience and preference of the surgeon.

The gap arthroplasty is the surgical procedure that creates a new area of articulation in cases where extensive bony ankylosis has taken place involving joint, sigmoid notch and coronoid process[12, 13]. Therefore identification of joint demarcation is difficult or impossible and level of the osteotomy is below the previous joint space. That is done by creation of a 1cm of minimum gap by two horizontal osteotomy cuts between glenoid fossa and ramus without interposing any substance [7]. Gap arthroplasty procedure takes relatively less time and avoid donor site surgey compared to interposition gap arthroplasty. The main disadvantage of gap arthroplasty is re-ankylosis because no substance is interposed in to the gap which is surgically created [7]. Other possible reason could be incomplete or inadequate osteotomy in the medial aspect. That is because although lateral bone can be removed using a large surgical bur, bony mass in the medial aspect is removed carefully using hand chisel or osteotome. Therefore inadequate osteotomy in medial aspect could be given rise to reankylosis. Development of postoperative malocclusion due to shortening of ramal height and limited range of movements are other most common problems associated with gap arthroplasty [14].

Since re-ankylosis was the most troublesome as well as most common complication following surgical intervention, it was the main barrier that lowered down the success rate of treatment. Several possible factors have been documented to given rise to reankylosis [7] including inadequately created gap, inadequate coverage of the glenoid fossa, higher osteogenic potential, inadequately removed medial condylar bone, fracture and loosening of the costocondral graft, inadequate post-operative physiotherapy.

Interposition arthroplasty in accordance with Kaban protocol was found to be the most successful treatment modality over gap arthroplasty due to lesser chance of recurrence while maintaining of ramal height.

Complete excision of the ankylotic mass with subsequent joint reconstruction has shown better results following the surgery. Better treatment protocol for the management of ankylosis of TMJ was documented by Kaban and colleagues, which is based on wide resection of the ankylotic mass [15]. Since prolong ankylosis commonly give rise to muscle fibrosis and coronoid hyperplasia, in addition wide resection of the ankylotic mass, dissection of the temporalis, masseter, and medial pterygoid muscles followed by ipsilateral coronoidectomy are performed through the same incision. The aim is to achieve at least 35mm of maximum inter incisal opening following the procedure. If the maximum inter incisal opening is less than 35mm after above procedure, subsequent contralateral coronoidectomy with temporalis myotomy is performed through an intraoral approach to achieve the desired level of inter incisal opening.

Since complete resection of the ankylotic mass commonly associate with significant reduction in the ramus height, reconstruction of the joint should be considered. Commonly, temporalis fascia flap is used to fill the glenoid fossa while costochondral graft which is harvested through an inframammary incision, is used to restore ramus height [3]. Dependable blood supply, autogenous origin, proximity to the TMJ, less chance of failure and ability to alter the arc of rotation have made the temporalis myofascial flap ideal for filling the fossa. Costochondral graft poses biologic and anatomical similarities to the mandibular condyle but complications at the donor site of costochondral graft are reported and it takes around a year or more for regeneration. In this case, interposition arthroplasty procedure was performed and reconstruction was done using the autogenous graft i.e. the coronoid process of the ipsilateral side has shown good results following the surgery. Subsequent forceful mouth opening and adjunct physiotherapy can be performed following the surgery to attain excellent results. Patient is directed to a schedule of post- operative mouth opening exercise, until desired maximum inter incisal mouth opening is obtained.

When surgical intervention has to be performed in order to release ankylosed TMJ, surgical access to the condyle and TMJ is critical. Additional care should be taken to prevent damage to the adjacent vital structures, because condyle and TMJ have a close relationship with facial nerve, auriculotemporal nerve, and several dominant blood vessels. Clinically several commonly practiced approaches to the TMJ have been described [7]. Postauricular incision that is taken behind the external ear in the crease closer to the upper aspect of pinna and extending to the mastoid process is an incision which poses superior esthetic value. But access and visibility is less since it has little surgical exposure.

Risk of infection and stenosis of the external auditory canal is another disadvantage. Sometimes temporary or permanent paraesthesia may be experienced by the patient. Deformed auricle also can be resulted following the postauricular approach. Therefore this approach poses more disadvantages over advantages. Although endaural approach is also cosmetically better, it has become limited due to restricted access, risk of ear infection and meatal stenosis. Submandibular or risdon approach has limited accesss to the condylar head. Therefore this has limited value in surgical procedures related to condylar head region. Postramal or hind approach is better in procedures involving ramus and condylar neck. It has the advantage of better accessibility with superior esthetic value. Care should be taken to avoid damage to the facial nerve and posterior facial vein. Approach to the TMJ via preauricular incision has become the most accepted standard technique. Although several modifications of this technique are popular due to superior advantages, those techniques introduced later were based on this standard technique. This approach poses the advantages of greater accessibility and less risk of damaging to the facial nerve and auriculotemporal nerve compared to previous techniques.

In the management of current case, Al-kayat Bramley approach was selected according to the treatment plan and because of its superior advantages. Case in which we have treated in accordance with Kaban's protocol, finally 35 mm of post-surgical inter incisal opening was attained. Final outcome is yet to be observed since patient is currently on regular follow up for a period of 12 months following surgery.

CONCLUSION

Patients with possible trauma to TMJ should be carefully evaluated by the clinicians and need to make accurate and early diagnosis. Unnoticed trauma to the TMJ can cause potential complications related to the ankylosis even after several years later similar to the present case. Interposition gap arthroplasty with temporalis myofascial flap in accordance with Kaban protocol and reconstruction with ipsilateral coronoid process was found to be a useful treatment modality for treating ankylosis. A satisfactory surgical outcome was obtained in our patient with the above method.

CONFLICT OF INTEREST AND INFORMED CONSENT

There is no conflict of interest. This article does not contain any studies with animals performed by any of the authors. Informed consent was obtained from all individual participants included in the study.

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