

Bilateral temporomandibular joint reconstruction with alloplastic condylar prosthesis: a case report

Vignes Rao, DDS¹, Jonathan Rengarajoo, MClintDent OMFS², Jaswinder Singh Mukhwant Singh, FRACDS, MOMF Surg¹, Lim Yee Chin, MClintDent OMFS¹, Ravindran Murugesan Pillai, MClintDent OMFS¹

¹Department of Oral and Maxillofacial Surgery, Hospital Selayang, Gombak, Selangor, Malaysia, ²Department of Oral and Maxillofacial Surgery, Hospital Kuala Lumpur, Kuala Lumpur, Malaysia

SUMMARY

Trauma, pathology, and degenerative disease are common causes of structural damage to the temporomandibular joint (TMJ). The primary goal of TMJ reconstruction is to reestablish mandibular form, function and prevent further morbidity associated with non-functioning TMJ. Reconstruction of the condyle can be done with various material and techniques to achieve a functional and aesthetic outcome for the patient. We present a case of a 20-year-old male who was referred to our center for management of bilateral TMJ ankylosis post trauma. Patient sustained comminuted anterior mandible fracture with bilateral condylar fracture, however only the anterior mandible was reduced and fixed with titanium reconstruction plates. Post open reduction and internal fixation, the patient was noted to have progressively limited mouth opening, difficulty in both mastication and speech. Alloplastic condylar prosthesis is an option in this patient as his TMJ structure was damaged due to trauma. Bilateral gap arthroplasty with interposition temporalis graft was performed prior to placement of alloplastic titanium condylar (Synthes®) Head Add - on system. Currently, post-operative 1 year, patient has a good mouth opening of 30mm, with improved function and aesthetics. We present this case to highlight that with detailed and methodical treatment planning, alloplastic titanium condylar prosthesis is a safe and effective choice in the reconstruction of TMJ.

INTRODUCTION

Temporomandibular joint ankylosis (TMJA), can be classified by location, type of tissue (fibrous or bony), and extent of fusion (complete or partial). Multiple aetiologies account for hypomobility and TMJA, which ultimately leads to progressively decreased translation and rotation movement of the joint. Trauma is the most common cause, and other causes include otitis media, mastoiditis, ankylosing spondylitis, rheumatoid arthritis, osteoarthritis, scleroderma, irradiation, previous surgery, internal derangements, and perinatal events.¹ Patients with a fibrous or bony ankylosis may have a facial asymmetry, restricted range of motion, malocclusion, anterior open bite from a shortened ramus, or possibly midface abnormalities, including those of the piriform rim and orbits. The current treatment for ankylosis must be tailored based on the cause and other patient factors. Compressive management of TMJA starts with surgical intervention followed by physiotherapy. The scope of surgery

includes gap arthroplasty, with or without interpositional tissue or joint reconstruction using autogenous grafts or alloplastic material.²

In maxillofacial trauma, it has been postulated that the formation of TMJA is secondary to organization and ossification of haematoma that arise from the fractured condylar head of mandible. Besides these local causes, poor reduction of condylar segments and conservative management (non-surgical) of condylar fractures has been shown to cause TMJA. When TMJA is present at an early age, there is significant disturbance toward the growth of the mandible, usually leading to patients presenting with limited mouth opening and asymmetrical face. This leads to physiological stress, lack of good oral hygiene and eventually loss of multiple tooth due to decay. Cumulatively, this leads to reduced quality of life for TMJA patient.

The main aim of any TMJA is to restore mouth opening, restore adequate ramus height, prevent further recurrence and symmetric growth of the mandible in the growing patient. TMJA management protocol by Kaban et al,³ is generally used to guide the surgeon in achieving optimal results. The use of autogenous bone graft to reconstruct the TMJ has always been the gold standard, however here we describe an alternative option, using titanium alloplastic condylar prosthesis in TMJA.

CASE REPORT

A 20 -year- old gentleman, was referred for management of progressive limited mouth post open reduction internal fixation of mandible. Patient was involved in a motor vehicle accident, where he sustained high Le Fort 1 with palatal split, right orbital floor blow out fracture, comminuted fracture of bilateral parasymphysis of mandible and bilateral high sagittal intracapsular condylar fracture. Following the accident, open reduction internal fixation of Le Fort 1 with palatal split, right orbital floor blow out fracture, comminuted fracture of bilateral mandible 10 months prior to the initial referral. Over the months, despite aggressive post-operative physical therapy his mouth opening worsened to 4mm (inter incisor distance). Baseline computer tomography imaging showed bilateral sagittal fracture of the mandibular condyle, with dislocation of the medial segment of fracture, with widening of the intercondylar distance. The distal aspect of bilateral condyle appears to have moved

This article was accepted: 13 July 2022

Corresponding Author: Vignes Rao

Email: sainesh88@gmail.com

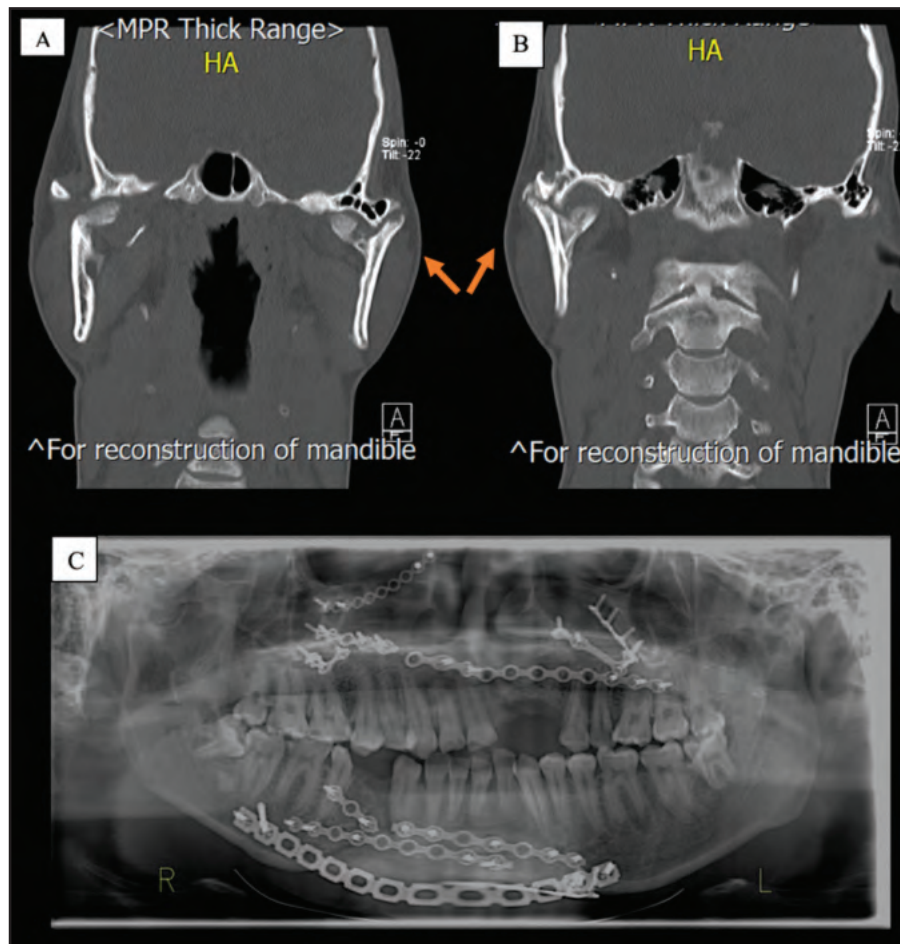


Fig. 1: A & B: Dislocation of the medial segment of fracture, with a widening of the intercondylar distance and the distal aspect of bilateral condyle, appears to have moved superolateral leading to widening of the midface clinically (arrow) (C): Orthopantomogram showing bilateral ill-defined condyle, loss of bilateral synovial cavity, and reconstruction plate over the lower border of mandible.

superolateral (Figure 1A & B), with significant flaring of the ramus leading to widening of the midface clinically. Panoramic Imaging taken shows bilateral ill-defined condyle, loss of bilateral synovial cavity, multiple titanium plate at anterior mandible and reconstruction plate over the lower border of mandible (Figure 1C). The proposed surgical plan for him was bilateral gap arthroplasty with interposition temporalis muscle, coronoidectomy, and reconstruction of condylar head with stock alloplastic titanium condylar prosthesis (Synthes ®) due to financial constraints. Extended pre-auricular incision was done to expose bilateral TMJ area. Intraoperatively, noted type IV TMJA⁴, where there was extensive ankylosis, with complete disappearance of temporomandibular joint and fusion with the zygomatic arch (Figure 2A).

Bilateral condylectomy and coronoidectomy were performed followed by contouring of excessive bone to prepare a neoglenoid fossa. Inferior attachment of the temporalis muscle was mobilized to be used as interpositional flap over the neoglenoid fossa and anchored to underlying bone (Figure 2B). Intermaxillary fixation was placed, to ensure optimal occlusion prior to placement of condylar prosthesis. Synthes

condylar head add-on with fixation plate used to reconstruct the TMJ with the desired vertical height (Figure 2B). Post-operative recovery was uneventful. Post-operative skull imaging displays a symmetrical appearance of both TMJ prosthesis secured to ramus of mandible (Figure 2C). Patient was put back on physical joint therapy incorporating TheraBite ® jaw motion rehabilitation system, to restore jaw mobility. Post-operative 1 year, his mouth opening was maintained at 35mm (Figure 2D).

DISCUSSION

Correction of TMJA is one of the most challenging procedures in oral and maxillofacial surgery. Apart from the complex anatomy surrounding the TMJ, in order to achieve adequate ramus height, multiple graft sources have been used over the years, including costochondral, sternoclavicular, fibular, iliac crest, and metatarsophalangeal tissue. The most widely used graft, particularly in children, is the costochondral graft. Unfortunately, the costochondral graft has been shown to have an unpredictable growth pattern and results in more complications. Regardless of these problems, the costochondral graft is still considered by some to be the

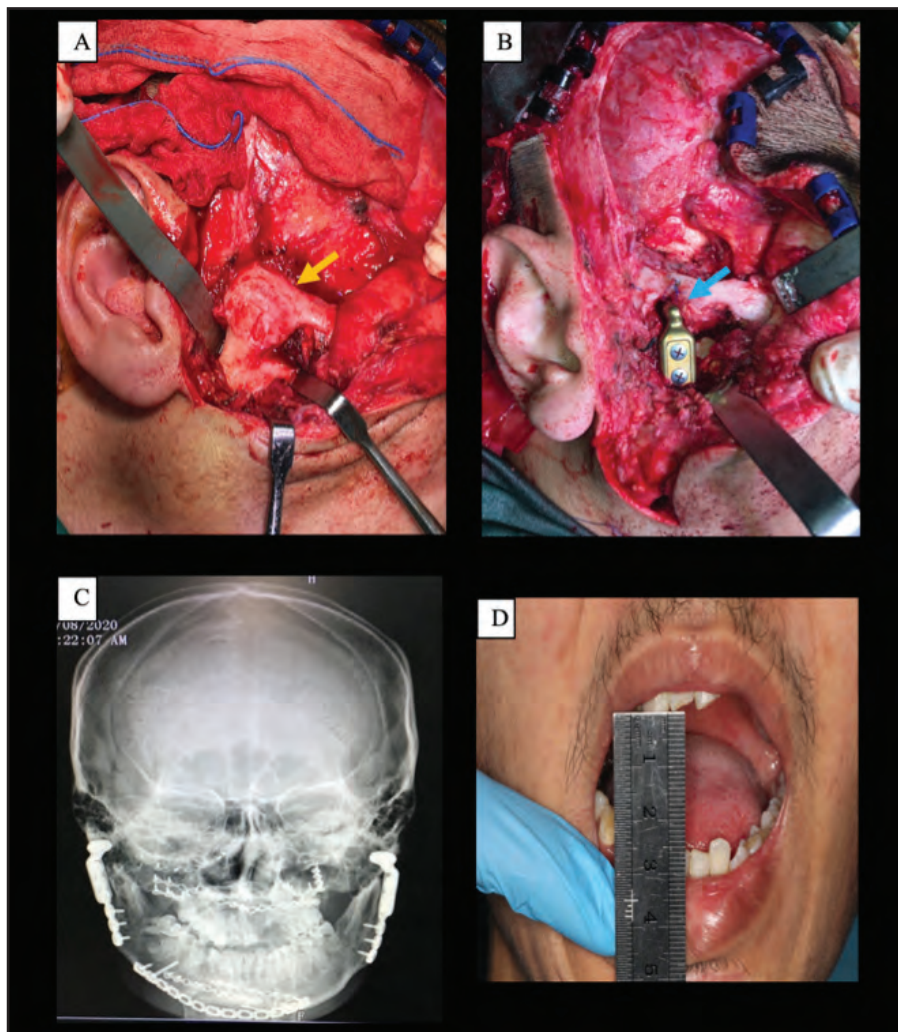


Fig. 2: A Exposed right TMJ with extensive ankylosis and with complete disappearance of temporomandibular joint space with fusion into the zygomatic arch (Arrow). B: Neo- glenoid fossa with temporalis muscle acting as interpositional flap (arrow) with condylar prosthesis. C: Post-operative skull posteroanterior view shows, symmetrical TMJ prosthesis secured to ramus of mandible D: Post-operative 1 year, mouth opening at 30mm.

operative management of choice in children and adults who have not had prior surgery.⁵ Besides free grafts, distraction osteogenesis of the ramus in order to create adequate ramus height is an option to achieve adequate mouth opening and functional jaw movements.⁶ However, the cost of the distraction device is quite expensive and subjects the patient to multiple sessions of surgery. Performing gap arthroplasty with no reconstruction of the condyle and interposition flap is another option discussed in the literature, however we believe that this will cause loss of ramus height which will lead to anterior open bite with the risk of ankylosis in the future.

Alloplastic condylar prosthesis can be an excellent option in achieving adequate ramus height and preventing the risk of ankylosis in the future. Alloplastic condylar prosthesis available in the market can be divided into stock and custom made patient specific implant. The idea of using alloplastic condyle was first done by Carmochan using wood in the 1840.⁷ The advantages of using alloplastic condylar prosthesis are lack of donor site related complication, leading to

reduced post-operative stay and reduction in operative time. Besides that, the ability to start physiotherapy immediately post operatively, is a major advantage as it returns the jaw to normal function, reduces scar tissue formation, and allows for immediate optimal range of motion. Three-dimension stability of alloplastic prosthesis is superior when compared to risk of resorption in autogenous graft, and this allows for long term stable occlusion. As for the customizable prosthesis, the ability to create a specific size condylar head and glenoid fossa based on the patient anatomy is an added advantage. The disadvantages of using alloplastic material are the potential wear and debris formation which is usually associated with pathological response which will lead to potential re-surgery. Besides that, the size of the condyle head may be a mismatch to the underlying glenoid fossa, leading to unstable occlusion. The financial cost of purchasing the prosthesis needs to be factored in when discussing it with the patient. Finally, the risk of foreign body reaction, which may lead to re surgery with complete removal of prosthesis is a possibility. After deliberating with the patient regarding the multiple options available together with its advantages and

disadvantages, patient decide for stock alloplastic condylar prosthesis because it entailed a single surgical session and site, as well as being affordable for the patient.

In future management of post trauma TMJA, we believe prevention is the best option. In this particular case, we postulate that the combination of high intracapsular sagittal fracture with bilateral comminuted parasymphysis fracture leads to the formation of TMJA. This was further complicated with lateral flaring of the ramus due to the placement of reconstruction plate over the lower border of mandible. All these combinations lead to condylar fracture to be displaced laterally, where it then forms ankylosis with the zygomatic arch. This is similar to what is proposed by He et al,⁸ where they postulated that TMJA can be traumatically induced in patient with condylar fracture, no/inadequate reduction of condyle fracture, fracture condyle/ residual ramus displaced laterally or superior to the glenoid fossa, and mandibular hypomobility secondary to pain, head injury, mechanical restriction due to lateral displacement, and duration of maxillomandibular fixation. Management of anterior mandibular fracture with a concomitant high intracapsular fracture should have a high index of suspicion to the formation of TMJA and preventive steps should be taken to avoid the formation of TMJA.

Currently, there is no single surgical procedure or reconstruction option that provides absolute success in TMJA management. A systematic review and meta-analysis of surgical outcome in TMJA showed similar clinical outcomes in a patient treated with autogenous material or alloplastic prosthetic device. However, we believe compressive, immediate management of mandibular fractures will help prevent TMJA in trauma patients.

CONCLUSION

The use of stock (Synthes ®) add-on condylar prosthesis was successful in reestablishing mandibular form, function and to prevent further morbidity associated with non-functioning temporomandibular joint. However long term periodic post-operative review and serial imaging will require to monitor

the new joint space and signs of glenoid fossa erosion. A proper TMJ prosthesis which consist of glenoid fossa and condyle is still required in a long term measure. Due to financial constraint patient opted for this option and will consider it later for re-operation.

ACKNOWLEDGEMENT

We would like to thank the Director General of Health Malaysia for his permission to publish this article.

DECLARATION

The authors declare no conflict of interest.

REFERENCES

1. Topazian RG. Etiology Of Ankylosis Of Temporomandibular Joint: Analysis Of 44 Cases. *J Oral Surg Anesth Hosp Dent Serv.* 1964; 22: 227-33.
2. MacIntosh RB. The use of autogenous tissues for temporomandibular joint reconstruction. *J Oral Maxillofac Surg.* 2000; 58(1): 63-9.
3. Kaban LB, Perrott DH, Fisher K. A protocol for management of temporomandibular joint ankylosis. *J Oral Maxillofac Surg.* 1990; 48(11): 1145-51; discussion 1152.
4. Xia L, An J, He Y, et al. Association between the clinical features of and types of temporomandibular joint ankylosis based on a modified classification system. *Sci Rep.* 2019; 9(1): 10493.
5. Kaban LB, Bouchard C, Troulis MJ. A protocol for management of temporomandibular joint ankylosis in children. *J Oral Maxillofac Surg.* 2009; 67(9): 1966-78.
6. Sharma R, Manikandhan R, Sneha P, Parameswaran A, Kumar JN, Sailer HF. Neocondyle distraction osteogenesis in the management of temporomandibular joint ankylosis: Report of five cases with review of literature. *Indian J Dent Res.* 2017; 28(3): 269-74.
7. De Meurechy N, Mommaerts MY. Alloplastic temporomandibular joint replacement systems: a systematic review of their history. *Int J Oral Maxillofac Surg.* 2018; 47(6): 743-54.
8. He D, Ellis E, 3rd, Zhang Y. Etiology of temporomandibular joint ankylosis secondary to condylar fractures: the role of concomitant mandibular fractures. *J Oral Maxillofac Surg.* 2008; 66(1): 77-84.