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Membuka Kunci Rahang - Meningkatkan Kualitas Hidup pada Ankylosis Fibrosa Bilateral Kondil Mandibula dengan Pendekatan Bedah Ganda: Laporan Kasus

Unlocking the Jaw - Improving Quality of Life in Bilateral Fibrous Ankylosis of the Mandibular Condyle with Dual Surgical Approach : A Case Report

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ABSTRAK

Ankylosis fibrosa pada kondilus mandibula membatasi gerakan rahang akibat adhesi jaringan fibrosa pada sendi temporomandibula (TMJ), yang menyebabkan gangguan fungsi oral. Pengelolaan bedah, terutama prosedur kondilektomi dan koronoidektomi, tetap menjadi metode paling efektif untuk meningkatkan fungsi rahang. Seorang gadis berusia 12 tahun dengan riwayat trauma wajah dan intervensi bedah sebelumnya, yang mengalami pembatasan progresif dalam membuka mulut selama tiga tahun terakhir. Pemeriksaan klinis menunjukkan ketidakmampuan total untuk membuka mulut. Cone Beam Computed Tomography (CBCT) mengonfirmasi ankylosis fibrosa bilateral pada mandibula. Pasien menjalani pendekatan bedah bilateral preaurikular, dengan pengangkatan adhesi fibrosa, kondilektomi bilateral, dan koronoidektomi unilateral. Jaring Mersilene ditempatkan secara bilateral. Terapi fisik intensif dimulai setelah operasi. Pada pemeriksaan ulang enam bulan, pasien menunjukkan perbaikan signifikan dalam mobilitas rahang. Ankylosis fibrosa pada kondilus mandibula dapat secara signifikan membatasi fungsi rahang, terutama pada anak-anak yang sedang tumbuh. Pengelolaan bedah berhasil melepaskan ankylosis dan memulihkan gerakan mandibula. Pemasangan jaring Mersilene membantu mencegah re-ankylosis, sementara fisioterapi dini dan intensif memainkan peran krusial dalam mempertahankan kemampuan membuka mulut pascaoperasi. Pengelolaan bedah komprehensif yang dikombinasikan dengan rehabilitasi pascaoperasi intensif sangat penting untuk pengobatan yang efektif pada pasien dengan ankylosis fibrosa bilateral pada kondilus mandibula.

ABSTRACT

Fibrous ankylosis of the mandibular condyles restricts jaw movement due to fibrous tissue adhesions in the temporomandibular joint (TMJ), leading to

impaired oral function. Surgical management, especially condylectomy and coronoidectomy procedures, remains the most effective method of improving jaw function. A 12-year-old girl with a history of facial trauma and previous surgical intervention who developed progressive limitation in mouth opening over last three years. Clinical examination showed complete inability to open the mouth. Cone Beam Computed Tomography (CBCT) confirmed bilateral fibrous ankylosis of the mandible. The patient underwent bilateral preauricular surgical approaches, with excision of fibrous adhesions, bilateral condylectomies, and unilateral coronoidectomy. Mersilene mesh was placed bilaterally. Intensive physiotherapy was initiated after the surgery. At six months follow-up, the patient demonstrated significant improvement in jaw mobility. Fibrous ankylosis of the mandibular condyles can severely limit jaw function, especially in growing children. Surgical management successfully released the ankylosis and restored mandibular movement. Placement of Mersilene mesh helped prevent re-ankylosis, while early and intensive physiotherapy played a crucial role in maintaining postoperative mouth opening. Comprehensive surgical management combined with intensive postoperative rehabilitation is essential for effective treatment in patients with bilateral fibrous ankylosis of the mandibular condyles.

INTRODUCTION

Ankylosis is a word from greek which means ‘stiffnes’. In medical acronym, this means a stiffnes on joint due to trauma or pre-existing condition. TMJ ankylosis is defined as bony or fibrous adhesion from anatomic joint that followed by limitation of mouth opening. Ankylosis can be classifed into some types: false or true, extraarticular or intraarticular, fibrous or bony, unilateral or bilateral and either partial or complete. While fibrous ankylosis on mandibular condyles is a condition that prohibits jaw movement caused by fibrous tissue on TMJ that could limit oral function (Mehta et al., 2015; Hupp et al., 2019; Singh et al., 2022).

TMJ ankylosis is a debilitating condition characterized by restricted mandibular movement due to fibrous or bony fusion between the condylar head of the mandible and the glenoid fossa of the temporal bone. Fibrous ankylosis involves dense fibrous tissue obstructing the joint space, often resulting from trauma, infection, or previous surgical interventions. In children, this condition can severely impact quality of life by interfering with essential functions such as chewing, speaking, and maintaining oral hygiene. In growing patients, this condition can lead to mandibular growth disturbances, malocclusion, facial asymmetry, and psychosocial challenges (Mehta et al., 2015; Hupp et al., 2019; Singh et al., 2022).

Previous literature has established that surgical release is the most effective treatment for TMJ ankylosis, with condylectomy and coronoidectomy being the primary procedures employed to restore joint mobility. However, recurrence due to inadequate surgical clearance or poor postoperative rehabilitation remains a significant challenge. The use of interpositional materials like Mersilene mesh has been reported to prevent re-ankylosis, while early and sustained physiotherapy is essential to reduce the risk of re-ankylosis and to restore normal function (Garoma et al., 2022; Yadav et al., 2021).

The purpose of this paper is to present a rare and illustrative case of bilateral fibrous ankylosis of the mandibular condyles in a growing child, highlighting the dual surgical approach of bilateral condylectomy and unilateral coronoidectomy with the application of Mersilene mesh and intensive physiotherapy. This case demonstrates the importance of a multidisciplinary, structured treatment plan in improving function and preventing recurrence (Garoma et al., 2022; Yadav et al., 2021).

CASE REPORT

A 12-year-old girl came to the Oral and Maxillofacial Surgery Department with a chief complaint of persistent inability to open her mouth for the past three years. The patient had a known history of facial trauma at age 6, followed by an unsuccessful surgical intervention that temporarily

improved her condition. +/- 6 years prior to admission when she was riding motorcycle as a passenger in front of the driver, they passed the downhill road then the motorcycle was speeding up and the driver couldn't brake so they fell down and she hit the handlebar first. After the accident, her jaw was locked with her mouth open. She couldn't close her mouth or even moving her jaw but she didn's see any treatment. +/- 2 months after the accident, her condition didn't change and she was taken to a private hospital at Bandung area and performed panoramic x-ray. She was diagnose with TMJ dislocation and fracture at bilateral head mandibular condyles then she had a TMJ surgery (bilateral condylectomy). The complaints resolved, she could open her mouth normally and restored oral function. +/- 3 years prior to admission she developed progressive limitation in mouth opening but she didn't see any treatment. As time pass by, the mouth opening become smaller until the jaw was totally locked. This condition made her difficulty in eating, speaking and maintaining oral hygiene.

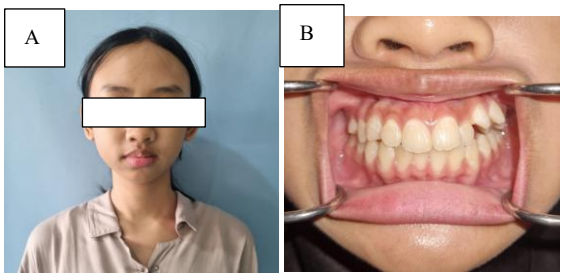

Figure 1. Pre operative documentation (A) Facial symmetry: relatively preserved; (B) Mouth opening : 0 mm (complete trismus); speech and mastication: Severely impaired

The patient then performed Cone Beam Computed Tomography (CBCT). The result showed irregularities and fibrous adhesions involving both mandibular condyles, consistent with bilateral fibrous ankylosis of the mandibular condyle. The coronoid processes were also noted to be elongated (Figure 2).

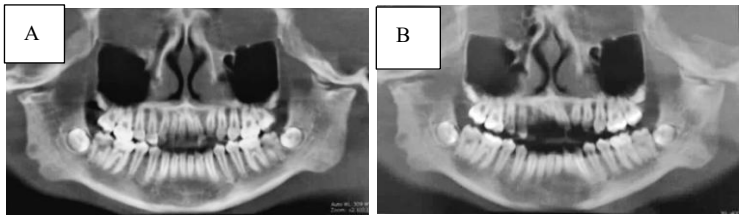

Figure 2. Cone Beam Computed Tomography (CBCT) showed ankylosis on bilateral mandibular condyle (A) CBCT with closing the mouth (B) CBCT with opening the mouth

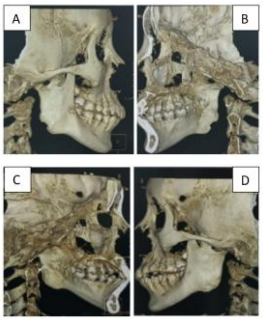

Figure 3. Cone Beam Computed Tomography (CBCT) showed irregularities and fibrous adhesions involving both mandibular condyles confirmed bilateral fibrous ankylosis. The coronoid processes were also noted to be elongated (A) Buccal 3D view on mandibular condyles (B) Palatal 3D view on right mandibular condyles (C) Palatal 3D view on left mandibular condyles (D) Buccal 3D view on left mandibular condyles

Clinical findings and CBCT imaging confirmed bilateral fibrous ankylosis of the mandibular condyle. Therefore bilateral condylectomy with preauricular approach was planned under general anesthesia. The treatment was started with adrenalin injection on right preauricular region then incision was performed. The incision and dissection of tissue continued layer by layer untill the TMJ was exposed (Figure 4A). The mandibular condyle bone was cut using saw and fibrous tissue was excised and bone fragment were seperated with chisel (Figure 4B). The bone fragment was taken out using clamp (Figure 4C). The same treatment was done on left mandibular condyle bone (Figure 4 D,E). The mouth opening was checked and the mouth opening was 20 mm and still obstructed. It was found out that an intracapsular ankylosis at left coronoid and was decided to perform a coronoidectomy (Figure 4F). After left coronoidectomy was performed, the mouth opening was found to be 25 mm without any obstruction and concluded as adequate (Figure 4 G). After the treatment, mersilene mesh was applied on both side to prevent reankylosis (Figure 4 H, I). The wound was closure with suturing layer by layer from the muscle using polyglactin thread number 3 untill the skin using nylon thread number 4 (Figure J, K).

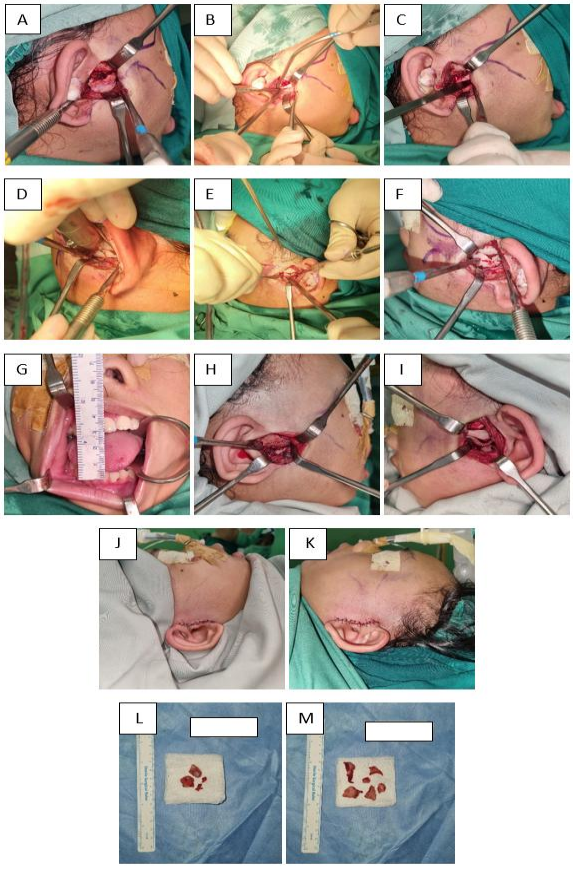

Figure 4. Step by step documentation of the surgeries (A) The incision was done layer by layer untill the mandibular condyle was exposed (B) The right condylectomy was performed (C) Bone fragmen at right side was separated and taking out (D) The left condylectomy was performed (E) Bone fragmen at left side was separated and taking out (F) The left coronoidecectomy was performed (G) Intra operative mouth opening evaluation (H) Mersilene mesh was placed on the right side (I) Mersilene mesh was placed on the left side (J) Wound closure on the right side (K) Wound closure on the left side (L) Bone fragmen from right condylectomy (M) Bone fragmen from left condylectomy dan coronoidectomy

Mouth excersise strarted from post operative day one and suggested to do an active mouth-opening exercises daily at home. Patient was called post operative day seven for evaluation and suture removal (Figure 5A,B). The patient denied any complaint and could open her mouth about 30 mm without any restriction and she also showed normal mastication and speech (Figure 5 D). The pasient also reffered to phisiotherapy to maintain good mouth opening. No any complicacion was found.

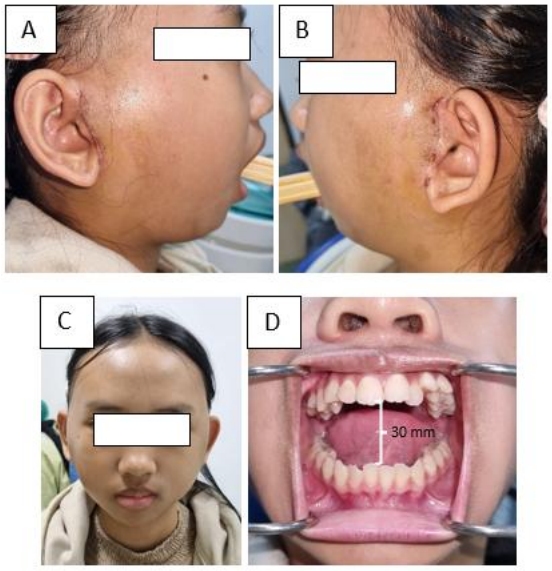

Figure 5. Follow up post operative day VII (A) Post suture removal at right preauricular (B) Post suture removal at left preauricular (C) Profil photo (D) Maximum mouth opening approximately 30 mm

Patient was recalled after 3 months post operative. She had no any complain and was performed 3D head CT Scan to evaluate her condition after surgery. Maximum mouth opening was still in 30 mm.

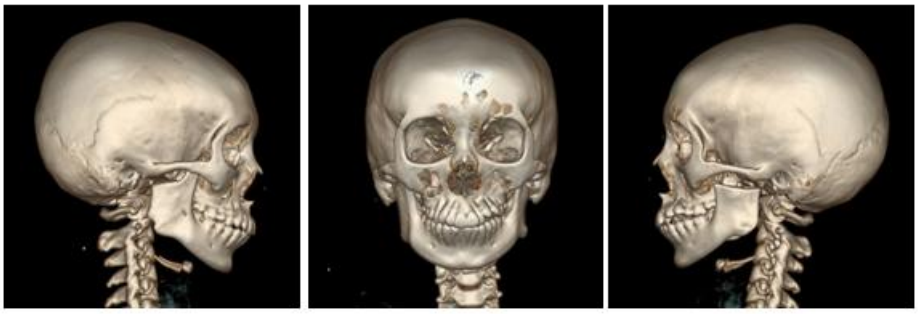

Figure 6. 3D head CT scan after three months of surgery : Post bilateral condylectomy and left coronoidectomy

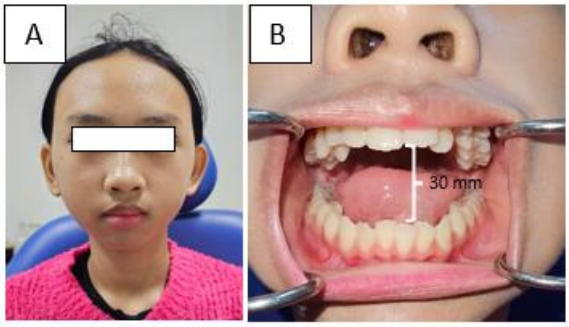

Figure 7. Follow up after three months of surgery (A) Profil photo (B) Maximum mouth opening

Patient was recalled for evaluation after 6 months of post operative and summarized that the improvement was significant. Patien's mouth opening was 30 mm (Figure 8B) and the occlusion was normal (Figure 8C). The patient was performed MRI for evaluating (Figure 9).

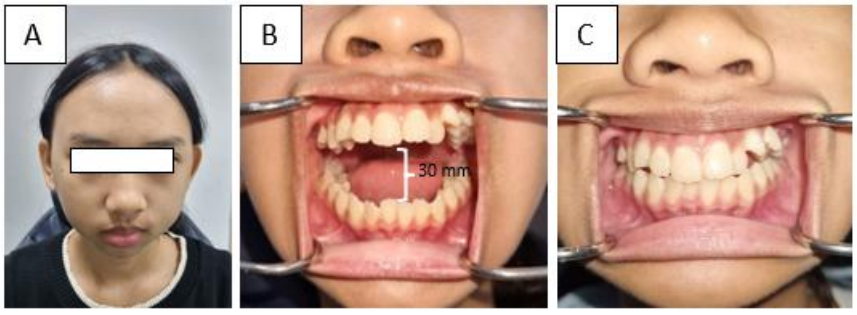

Figure 8. Follow up after six months of surgery (A) Profil photo (B) Maximum mouth opening (C) Patient's occlusion

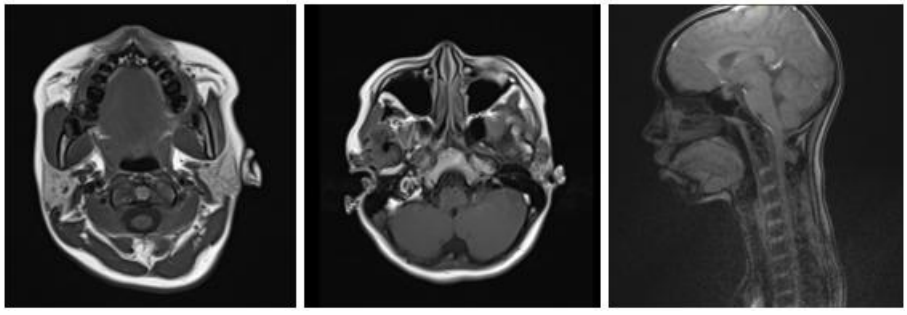

Figure 9. MRI imaging after six months of surgery: Post osteotomy on bilateral condylar processes and left coronoid process. No bone marrow replacement, no fluid collection and no pathological signal changes were seen

RESULTS AND DISCUSSION

Traumatic TMJ ankylosis is a condition of bony or fibrous fusion between condyle and fosa that are mostly caused by condyle fracture. This condition mostly developed before the age of 10 but could manifest at any age. The main clinical feature of TMJ ankylosis is proggresive limitation of mouth opening, facial deformity and obstructive sleep apnea syndrome (OSAS). Mostly, the patient came with the complaint of limitation of mouth opening with maximal of interincisal mouth opening 0-20 mm. If the condition left untreated, it could affect facial aesthetic, malocclusion especially on children (Mehta et al., 2015; Hupp et al., 2019; Singh et al., 2022).

The diagnosis of temporomandibular joint (TMJ) ankylosis is established through a combination of clinical examination and imaging studies. Clinical examination typically reveals limited mouth opening, facial asymmetry, deviation of the jaw, and sometimes pain or difficulty in mastication. Imaging studies are essential to confirm the diagnosis, determine the type (fibrous or bony ankylosis), extent, and plan treatment. Common imaging modalities include plain radiographs and panoramic radiography (orthopantomograms) provide initial assessment but have limitations due to overlapping structures; Computed tomography (CT) scans, especially with three-dimensional reconstruction, are considered the gold standard for evaluating bony ankylosis. CT provides detailed visualization of the joint anatomy, extent of bone fusion, and helps in surgical planning; Magnetic resonance imaging (MRI) is preferred for assessing soft tissue involvement and fibrous ankylosis, as it can visualize joint effusions, disc position, and soft tissue fibrosis not seen on CT or X-rays. The diagnosis of TMJ ankylosis relies on clinical signs of restricted mandibular movement combined with advanced imaging,

particularly CT for bony changes and MRI for soft tissue evaluation, to accurately characterize the ankylosis and guide treatment decisions (Mehta et al., 2015; Garoma et al., 2022).

The utilization of CBCT had been widely used due to excellent spatial resolution with low radiation dosage. On, previous literatures, a radiolucent zone found on CBCT on TMJ ankylosis could reflect TMJ ankylosis pathogenesis, disease pathway and mouth opening capacity. There is a hypothesis about radiolucent zone could represent bone healing progress of traumatic articular suface as well as disturbance on mouth opening movement (Mehta et al., 2015; Garoma et al., 2022). This is what seen on CBCT imaging that shows radiolucency. In this case, the imaging showed irregularities and fibrous adhesions involving both mandibular condyles, support the diagnose bilateral fibrous ankylosis of the mandibular condyle. The coronoid processes were also noted to be elongated.

The etiology of fibrous ankylosis of the temporomandibular joint (TMJ) primarily involves (1) Trauma, the most common cause, trauma to the jaw or TMJ (such as fractures, dislocations, or soft tissue injury) leads to bleeding and hematoma formation within the joint. Subsequent organization of this hematoma and soft tissue scarring causes fibrous tissue formation between joint components, restricting movement without complete bony fusion, (2) Infection: Local infections like septic arthritis, osteomyelitis, or otitis media can cause inflammation and fibrosis within the TMJ, resulting in fibrous ankylosis (3) Systemic inflammatory diseases: Conditions such as rheumatoid arthritis and ankylosing spondylitis can induce chronic joint inflammation, leading to fibrous tissue proliferation and ankylosis, (4) Other factors: Neoplasms, post-surgical changes, and congenital anomalies may also contribute but are less common.

On the case of TMJ ankylosis, bony mass of ankylosis most of the time goes through joint capsule. This process could arise 3 trouble : (1) change of local anatomy and distance to nearest vasculature that cause bleeding risk, (2) bone mass addition could complicate separation of mandible from cranium base which arises risk of exposure or perforation of middle cranial fossa (3) limited movement of mandible could cause muscle fibrosis or elongation of coronoid process which cause secondary trismus or persistent trismus if not treated promptly (Yadav et al., 2021; Xia et al., 2019). On the third point was the case that was found on presented case.

The treatment for condylar ankylosis of the temporomandibular joint (TMJ) is primarily surgical, aiming to restore joint mobility and prevent recurrence. The main surgical options include: (1) Gap Arthroplasty (removal of the ankylosed bone to create a gap usually >1 cm) between the mandibular ramus and glenoid fossa, restoring joint mobility. Sometimes combined with coronoidectomy to improve mouth opening; (2) Interpositional arthroplasty, after removing the ankylotic mass, an interpositional material (autogenous tissue like temporalis fascia or cartilage, or alloplastic materials such as Mersilene mesh) is placed to prevent re-ankylosis. Mersilene mesh has shown good tolerance and effectiveness in preventing recurrence; (3) Condylectomy, especially in fibrous ankylosis, involves removal of the condylar head; (4) Reconstruction of the joint using autogenous grafts or alloplastic total joint prostheses (artificial joint replacements), which have shown good outcomes with low recurrence rates. The choice of treatment depends on the individual case, including the type (bony or fibrous ankylosis), duration, and extent of deformity. Early surgical intervention is recommended to restore function and promote mandibular growth, especially in younger patients.

Bilateral condylectomy was planed to treat the bilateral mandibular condyle ankylosis on presented case. After the bone was taken out, jaw function must be evaluated. If the mouth opening measured less than 30 mm, coronoidectomy must be thought (Xia et al., 2019; Priyadarsani, 2020). During intra-operatively the mouth opening was checked and there was still resistance and the mouth opening was 20 mm. On the CBCT imaging showed the coronoid processes were also noted to be elongated then then left coronoidectomy was performed. Sometimes condylectomy combined with coronoidectomy to improve mouth opening and prevent postoperative restriction caused by the temporalis muscle. The coronoid process serves as the attachment site for the temporalis muscle, which

elevates the mandible. After condylectomy or ankylotic mass removal, the temporalis muscle can exert a restrictive pull on the mandible via the coronoid process, limiting mouth opening. In many cases of TMJ ankylosis, especially long-standing ones, the coronoid process may become elongated or hyperplastic, or the temporalis muscle may be hyperactive or fibrotic, further restricting mandibular movement. Coronoidectomy (removal of the coronoid process) releases this muscular restriction, allowing greater mandibular excursion and improving mouth opening after condylectomy or gap arthroplasty. It is particularly indicated when condylectomy or gap arthroplasty alone fails to achieve adequate mouth opening, or when preoperative imaging shows an elongated coronoid process causing mechanical obstruction. Coronoidectomy helps to prevent immediate postoperative relapse of limited mouth opening due to muscle pull, especially when the TMJ capsule and lateral pterygoid muscle are disrupted. Coronoidectomy is performed after condylectomy to eliminate the restrictive effect of the temporalis muscle via the coronoid process, thereby improving mouth opening and preventing postoperative trismus.

Mersilene mesh provides benefit to prevent re ankylosis. This material is considered to be simple, safe, cost effective with excellent patient acceptance and satisfaction. This mesh is stable, not absorbed by the body and is biocompatible. This mesh is made with polyester with 0.010 thicness. Indefinitely, this material can maintain the strength for clinical use. This mesh provides sufficient elasticity for the movement of TMJ joint due to the knit process that connects each fiber joint. These splices don't break under stress (Parrino et al., 2022; Dhabale & Bhowate, 2022). For the inflammation aspect, this mesh elicit minimal to mild inflamatory reaction. Because of it's properties that prevents re ankylosis, this mesh was used in the presented case.

Other than the mesh, physiotherapy plays a crucial role on TMJ ankylosis. This could offer therapeutic interventions to improve jaw mobility, alleviate pain and strengthen muscle strength. This intervention involves a variety of therapeutic exercises, manual techniques and modalities of stimulation of heat, cold or electrical. It is a prime importance that intensive physiotherapy plays a crucial role in maintaining and improving post operative mouth opening and prevent re-ankylosis (Haggerty & Laughlin, 2015; Kademani & Tiwana, 2016).

A customized surgical plan combined with rigorous physiotherapy is the current standard for managing condylar ankylosis of the TMJ. Postoperative intensive physiotherapy plays a crucial role in preventing re-ankylosis after surgery for TMJ condylar ankylosis by maintaining joint mobility, preventing postoperative adhesions, and promoting functional recovery. Early initiation of physiotherapy immediately after surgery is essential to avoid fibrosis and bony re-ankylosis by encouraging active mouth opening and muscle movement. A rigorous and prolonged physiotherapy program, often recommended for at least six months, helps maintain the surgical gap and prevents the joint surfaces from fusing again. Physiotherapy protocols typically involve gradual, customized jaw-opening exercises using simple devices like wooden spatulas to measure and improve mouth opening while minimizing pain and discomfort. Overall, physiotherapy optimizes postoperative results by restoring mandibular function, improving mouth opening, and preventing the recurrence of ankylosis, which is critical for long-term success.

In the case of TMJ surgery without reconstruction in children, there is a high risk of disturbance in the center of mandibula development, especially the condyle, which corresponds to 60-70% of mandibular growth. A study about a patient with Juvenile Idiopathic arthritis (JIA) shows condyle damage due to inflammation or surgical resection without reconstruction could arise problems including mandibular retrognathia, facial asimmetry, class II malocclusion and anterior open bite (Bahal et al., 2023; Setyawan et al., 2023). In the case of condylectomy without adequate reconstruction could dispel joint structure integrity. Other than that, there would be a risk of reankylosis, which post resection joint room are prone to form fibrous or osseus tissue. Post operatively, the mesenchymal cells in joint room differentated into osteoblast caused by pro-osteogenic signal exposure. This process triggers bony

bridge between condyle and glenoid fossa. The sinthetic material could trigger chronic foreign object reaction which would pull inflammation cell and cause fibrosis (Setyawan et al., 2023; F et al., 2021).

In this reported patient, a child who has undergone bilateral condylectomy, the next surgical steps typically focus on restoring mandibular function, preventing deformity, and promoting mandibular growth. Since bilateral condylectomy removes the mandibular condyles, reconstruction of the condylar head is essential to restore vertical ramus height and mandibular function. TMJ reconstruction should be done, there would be two choices of reconstruction. First one is costochondral graft (CCG) which is currently considered as gold standard for TMJ reconstruction for 4-12 years old patient, leveraging its own growth potential from chondral plates to adapt to facial development (Setyawan et al., 2023). Although considered as gold standard, CCG post a high risk of unpredictable growth, involving overgrowth (54%) or resorption (30%) which arise facial asimmetry, especially beyond age 12, often causing facial asymmetry (Saini et al., 2024; Patil et al., 2022). In contrast, custom TMJ Prostheses are recommended for patients above 15 years old for female and above 17 years old for males, or once mandibular growth is considered complete, which can be confirmed via carpal radiography (Saini et al., 2024). This prostheses, offer superior long term stability and low risk of reankylosis.

CONCLUSION

Bilateral fibrous ankylosis of the mandibular condyle is a rare but functionally devastating condition, particularly in growing children. Early recognition and comprehensive surgical management—consisting of bilateral condylectomy, selective coronoidectomy, and placement of interpositional material—postoperative intensive physiotherapy are essential for restoring mandibular function and preventing long-term complications. This case highlights the importance of combining a dual surgical approach with intensive postoperative physiotherapy to achieve optimal functional recovery and improve the patient's quality of life. Long-term follow-up remains crucial to monitor growth, function, and to prevent recurrence.

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