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## Case Report

# Surgical Management of Temporomandibular Joint Ankylosis with Mersilene Mesh Interpositional Arthroplasty: A Case Series Study

Aris Setyawan<sup>1,2</sup>, Maria Montessory<sup>1</sup>, Ronny Baehaqi<sup>3</sup>, Andra Rizqiawan<sup>1</sup>, Indra Mulyawan<sup>1</sup>, Mohammad Z. Rahman<sup>1,4</sup>

<sup>1</sup>Department of Oral and Maxillofacial Surgery, Faculty of Dental Medicine, Universitas Airlangga, Surabaya, <sup>2</sup>Dentistry Study Program, Faculty of Medicine, Diponegoro University, Semarang, <sup>3</sup>Oral and Maxillofacial Surgery Division, Dr. Soetomo General Hospital, Surabaya, Indonesia, <sup>4</sup>Department of Oral and Maxillofacial Surgery, Pioneer Dental College and Hospital, Dhaka, Bangladesh

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**ABSTRACT** Ankylosis of the temporomandibular joint (TMJ) is one of the most prevalent TMJ disorders in patients who have experienced trauma. Due to the high risk of recurrence, gap arthroplasty without interpositional material has been gradually discontinued as a treatment for TMJ ankylosis. After arthroplasty surgery, various interposition materials have been used to prevent a recurrence. Reporting on the effectiveness of TMJ bony ankylosis treatment using Mersilene mesh interpositional arthroplasty is the purpose of this study. This was a retrospective study carried out on five patients of TMJ ankylosis. All patients were treated through a Mersilene mesh interpositional arthroplasty procedure from January 2016 to April 2022 in Dr. Soetomo General Hospital and Universitas Airlangga General Hospital and evaluated 3 months postoperatively for the functional stability of TMJ. The result is preoperative mouth opening ranged between 0.7 and 13 mm. The patients achieved the interincisal opening between 27 and 40 mm postoperatively and had no complications for 3 months. In conclusion, Mersilene mesh interpositional arthroplasty is a very effective surgical treatment for TMJ bony ankylosis to achieve maximum mouth opening and avoid recurrences. The prevention of ankylosis recurrence necessitates thorough rehabilitation.

**KEYWORDS:** Ankylosis, interpositional arthroplasty, medicine, Mersilene mesh, temporomandibular joint

## INTRODUCTION

The inability to open the mouth due to a fusion of fibrous tissue or bone between the mandibular condylar head and the glenoid fossa is known as temporomandibular joint (TMJ) ankylosis. Patients who have trouble opening mouth may experience a range of issues, including speech and mastication abnormalities.

In addition, TMJ ankylosis can also cause facial and mandibular growth disorders, causing facial asymmetry, particular in children during their growth and development.<sup>[1]</sup> Some of the factors that can cause TMJ ankylosis include the following: trauma, chronic TMJ disease, inflammation of the TMJ, TMJ's prior surgery history and autoimmune diseases. The first sign is the increasing limitation of

jaw opening, usually noticed by the dentist.<sup>[2]</sup> There is also a classification, according to Sawhney, which classifies ankylosis of the temporomandibular joint, among others, as follows: type I is minimal bone formation, but fibrous attachments extend around the joint; type II is bone formation occurs, especially at the periphery of the joint surface; type III is the formation of bone between the mandible and the temporal bone; and type IV is the replacement of joints with bone mass.<sup>[3]</sup>

**Address for correspondence:** Dr. Andra Rizqiawan, Department of Oral and Maxillofacial, Faculty of Dental Medicine, Universitas Airlangga, Prof. Moestopo No. 47, Surabaya 60132, Indonesia. E-mail: andra-r@fkg.unair.ac.id

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The treatment of TMJ ankylosis is significantly challenging because of technical difficulties and a high incidence of recurrence.<sup>[4]</sup> The most frequently reported operations include gap arthroplasty, interpositional arthroplasty, and joint reconstruction with autogenous or alloplastic materials.<sup>[5]</sup> Interpositional arthroplasty is believed to be able to reduce the occurrence of re-ankylosis by insertion of interpositional materials after resection of the ankylosis. Interpositional arthroplasty is a method of treating ankylosis in the TMJ by creating a 1 cm gap between the glenoid fossa and the mandibular ramus and then placing a material such as temporal fascia, cartilage, or alloplastic material.<sup>[4]</sup> Alloplast materials such as Mersilene mesh in interpositional arthroplasty operations have been widely used. There are four types of Mersilene mesh: Type I is the macropore monofilament prosthesis, for example, Prolene®, Surgimesh®, and Trelex®. Type II is the macropore multifilament prosthesis with microporous components, for example, Mersilene® and Surgipro®. Type III is the total micropore prosthesis, for example, surgical membrane, dual mesh, and Gore-Tex®, and type IV comprises biomaterials with submicron pore size/sheets, for example, Silastic® and Cellguard®.<sup>[6]</sup> The use of type II mesh has been shown to have good tolerance with body tissues without any rejection reactions.<sup>[6]</sup>

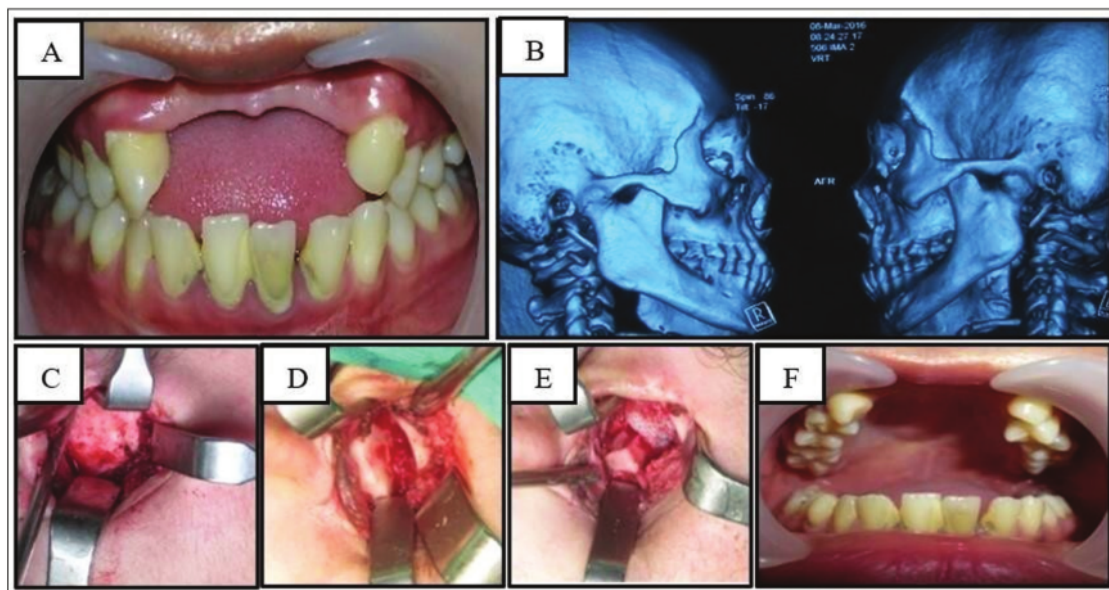
In this case series study, a retrospective study was carried out on five patients with TMJ ankylosis. All patients

had complaints of inability to open their mouths post-trauma. All patients treated through a Mersilene mesh interpositional arthroplasty procedure from January 2016 to April 2022 in Dr. Soetomo General Hospital and Universitas Airlangga General Hospital were evaluated at 3 months postoperatively for the functional stability of the jaw. This report aimed to present several cases of TMJ ankylosis managed successfully by Mersilene mesh interpositional arthroplasty.

### SERIAL OF CASES

All operations have earned informed consent filled by the patient. The first patient, a 16-year-old woman, had a complaint of inability to open her mouth for 3 years after trauma to her mandible. The maximal opening was two millimeters [Figure 1A], and there was no palpable movement over the bilateral TMJ.

The patient got an accident three years ago and was diagnosed with a mandible symphysis fracture. The patient was treated with a closed reduction procedure (arch bar). One-month post-trauma and after the closed reduction procedure had been conducted, the patient noticed a slight decrease in her mouth opening, and with time she ignored the disability. Computed tomography scan showed bilateral bony fusion of condyles to glenoid fossae and fusion of the condylar heads to the temporal bones [Figure 1B]. Clinical examination after the right TMJ opening through preauricular incision showed bony fusion of the condylar heads to the temporal



**Figure 1:** Preoperative mouth opening (A), Computed tomography-scan view showed bilateral ankylosis (B), bony ankylosis right TMJ (C), gap arthroplasty (D), interpositional arthroplasty with Mersilene mesh (E), 3 months postoperative mouth opening (F)

bones [Figure 1C]. Patient was diagnosed with type IV bilateral TMJ ankylosis (Sawhney classification). The patient only wanted the left side of the body operated on. The gap is made by resection of the neck of the condyle by removing the ankylotic mass using a round bur and an osteotome with a gap of about 1 cm wide [Figure 1D]. After removing the resected bone segment and the ankylotic mass, the gap in the neck of the condyle is filled with a folded Mersilene mesh sheet [Figure 1E]. On evaluation at 3 months, although the maximum mouth opening was 30 mm [Figure 1F], the patient still had some difficulty opening her mouth. On postoperative evaluation, there were no signs of complications, such as facial nerve deficits. Postoperative scars were still esthetically acceptable.

The second patient, 18-year-old man, had a complaint of difficulty opening his mouth for 1 year after trauma to his mandible. There was a maximum mouth opening of 8 mm [Figure 2A], and only slight movement over the bilateral TMJ. The radiograph examination [Figure 2B and C] suggested type I bilateral TMJ (fibrous) ankyloses (Sawhney classification).

The interposition arthroplasty procedure was performed on the left TMJ using a preauricular incision approach. On examination, fibrous tissue was found in the left TMJ

[Figure 2D]. The gap was made by resecting the neck of the condyle and removing the fibrous tissue using a round bur and an osteotome with a gap of about 1 cm wide [Figure 2E]. After that the gap in the neck of the condyle was filled with a folded Mersilene mesh sheet [Figure 2F]. On postoperative examination maximum mouth opening recorded was 35 mm [Figure 2G].

The third patient, 22-year-old man, had a complaint of difficulty in opening his mouth for 9 years after a traffic accident a year before. The maximal mouth opening was only 5 mm [Figure 3A], and there was almost no movement over the bilateral TMJ. The patient was diagnosed with type III unilateral TMJ ankylosis (Sawhney classification) based on radiographic examination [Figure 3B].

The gap was made by resection of the neck of the condyle by removing the ankylotic mass using a round bur and an osteotome with a gap of about 1 cm wide. After taking the resected bone segment and taking the ankylotic mass, the gap in the neck of the condyle was filled with a folded Mersilene mesh sheet [Figure 3C and D]. On postoperative evaluation, the maximum mouth opening recorded was approximately 35 mm [Figure 3F], but the patient still had difficulty opening his mouth. This may be due to fibrous ankyloses of the left TMJ due to limited mandibular mobilization for 9 years, which

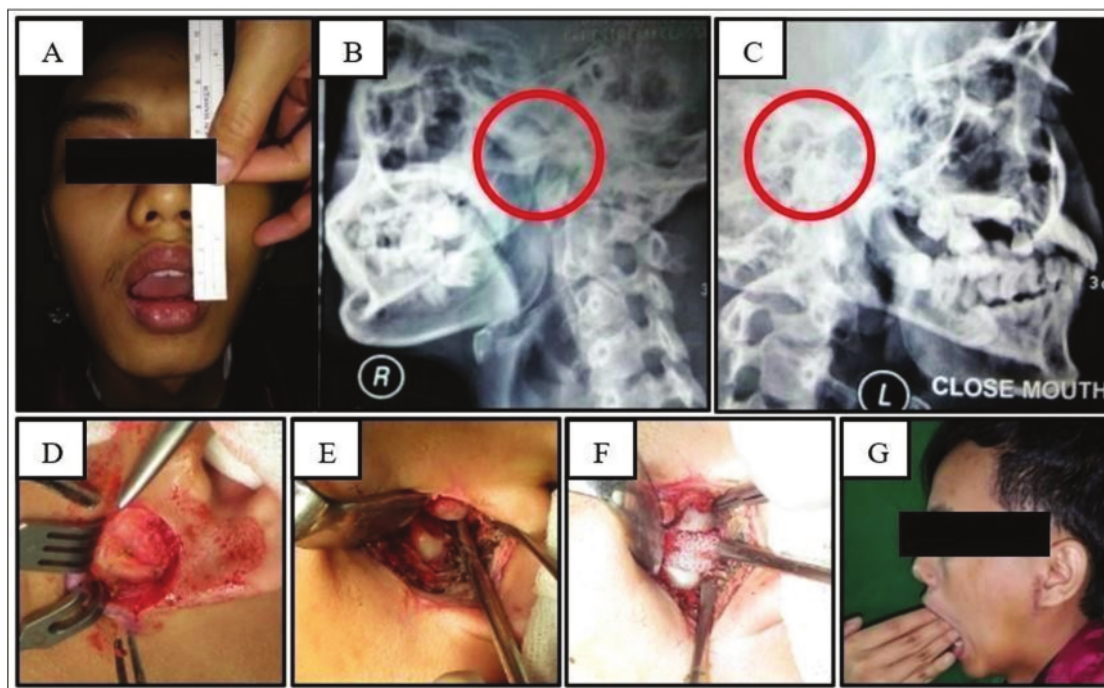


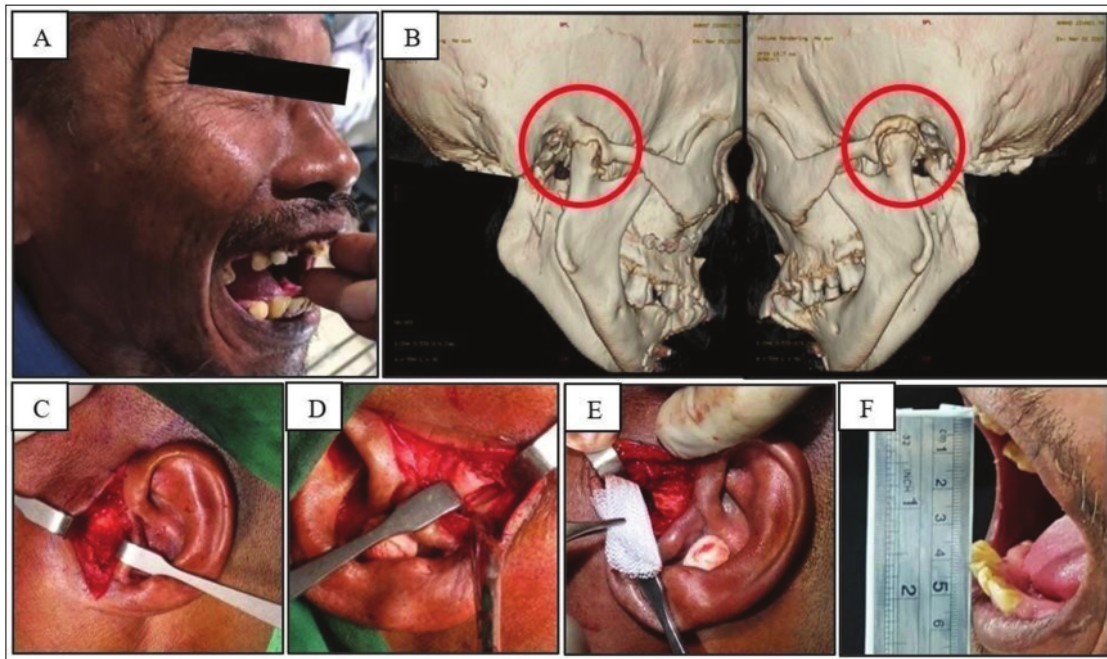
Figure 2: Preoperative mouth opening (A), Towne projection of right TMJ (B), Towne projection of right TMJ (C), fibrous ankylosis left TMJ (D), gap arthroplasty (E), interpositional arthroplasty with Mersilene mesh (F), 3 months postoperative mouth opening (G)



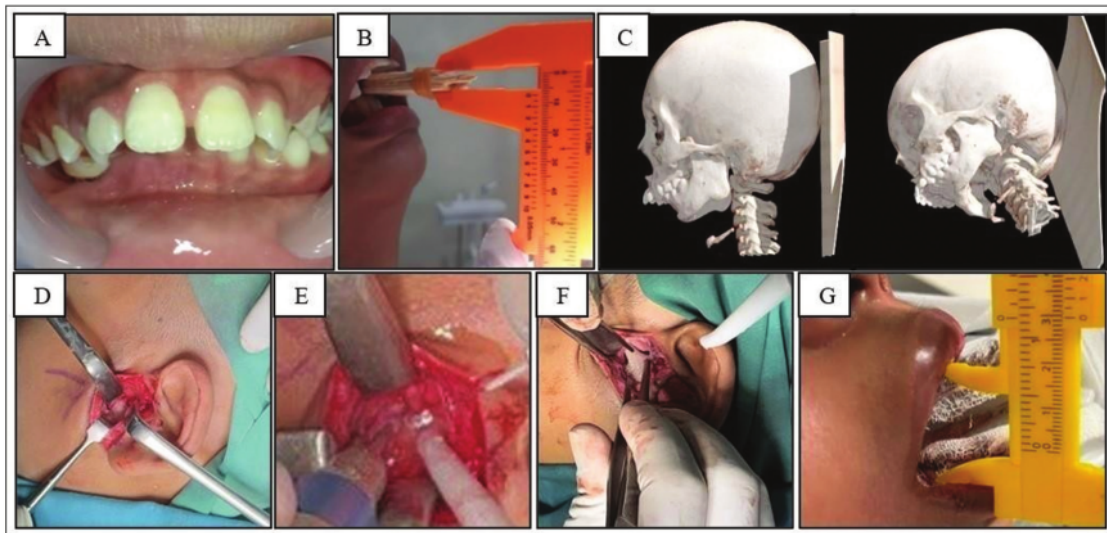
The fifth patient, 12-year-old man, complained of difficulty opening his mouth since he was three months

Intraoperative finding the left TMJ opening through the preauricular incision showed bony fusion of the condylar heads to the temporal bones [Figure 5D]. The gap was made by resection of the neck of the condyle and removing the ankylotic mass using a round bur and an osteotome with a gap of about 1 cm wide [Figure 5E]. After removing the resected bone segment and the ankylotic mass, the gap in the neck of the condyle is filled with a folded Mersilene mesh sheet [Figure 5F]. Although the maximum mouth opening recorded at post-operative evaluation was 27 mm [Figure 5G], the patient still had some difficulty opening his mouth [Table 1].

Statistical analysis was performed with SPSS version 25.0 from IBM (IBM Inc., Chicago, IL, USA). The Kolmogorov–Smirnov test was conducted for the data distribution normality test. The data normality test showed normally distributed data with a significance



**Figure 4:** Preoperative mouth opening (A), Computed tomography-scan view showed bilateral ankyrosis (B), TMJ fibrous ankyrosis with ankylosing bone formation (C), gap arthroplasty (D), interpositional arthroplasty with Mersilene mesh (E), 3 months post-operative mouth opening (F)



**Figure 5:** Preoperative mouth opening (A and B), Computed tomography-scan view showed unilateral ankyrosis left TMJ (C), bony ankyrosis left TMJ (D), gap arthroplasty (E), interpositional arthroplasty with Mersilene mesh (F), 3 months postoperative mouth opening (G)

value of more than 0.05. After the normality of the data was met, a paired *t* test was applied. It shows that the *P*-value is 0.000 ( $< 0.05$ ), so there is a significant difference between MIO preoperative and MIO 3 months post-operative [Table 2].

## DISCUSSION

In this case series, four patients studied had a history of trauma before presenting complaints of difficulty opening their mouths. Two of the five patients had a

Table 1: Periodical observation of maximal interincisal opening (MIO)

Patient	Age (year)	F/M	Duration of ankylosis (month)	Type of ankylosis (Sawhney)	Pre-operative MIO (mm)	3 months post-operative MIO (mm)	Increased MIO compared to average normal MIO*
Patient 1	16	F	36	Type IV	2	30	58.65%
Patient 2	18	M	12	Type I	8	35	68.43%
Patient 3	22	M	108	Type III	5	35	68.43%
Patient 4	48	M	9	Type II	13	40	78.20%
Patient 5	12	M	141	Type IV	0.7	27	52.78%
Mean	23.2	—	41	—	6.14	33.4	68.43%

\* In percentage

Table 2: Comparison of preoperative and post operative values of maximal interincisal opening

Time end point	Mean	Standard deviation	P-value *	95% confidence interval	
				Lower bound	Upper bound
Preoperative	6.14	5.24	0.00*	-29.59	-24.92
3 months postoperative	33.40	5.03			

Based on estimated marginal means

\* The mean difference is significant at the 0.05 level

\* Adjustment for multiple comparisons: Bonferroni

fracture of the condyle of the head and/or neck and also had a fracture of the mandibular symphysis but did not receive proper treatment because only mandibular symphysis fractures just got intermaxillary fixation, and the jaw was immobilized for a long time. Two patients had a history of traffic accidents, while one patient, in this case series, had trauma to the chin during a fall which could also cause bleeding into the joint.

Trauma is the leading cause of temporomandibular joint ankylosis. Condylar fractures, especially fractures of the condylar head and neck, are the leading cause of ankylosis of the temporomandibular joint.<sup>[7]</sup> Trauma causes extravasation of blood into the joint space called hemarthrosis. This predisposes to calcification leading to loss of joint space, whereby joint immobility is maintained over a prolonged period. Much of the initial fibrous tissue leads to bone consolidation or ossification, leading to a fusion of fibrous tissue or bone between the mandibular condylar head and the glenoid fossa. Especially in children, there are increased incidences of hemarthrosis due to excellent vascularity and they are more likely to develop ankylosis.

Condylar fractures that are not appropriately treated cause the joint surface not to heal properly. In such cases, joint surface will be more inflamed, and fibrotic tissue will adhere to the disc so that it can potentially become ankylosis.<sup>[2]</sup> Ankylosis that occurs in young patients also has the potential to interfere with

mandibular growth. This is because the cartilage in the condylar process is the center of mandibular growth.<sup>[2]</sup> This can be seen especially in patients 1 and 3, who had experienced trauma when the patients were 11 years old and 13 years old, so from extra oral examination, slight micrognathia was also observed in both patients. Patients who develop ankylosis after full growth have no facial deformities.

Consequences of TMJ ankylosis that are not treated properly can cause impaired facial growth and development, speech disorders, nutritional disorders, respiratory disorders (tongue falling), etc. Bilateral ankylosis causes an inability to open the mouth with a gradual decrease in the interincisal opening and may lead to severe micrognathia, malocclusion, poor oral hygiene, etc.<sup>[1]</sup>

Several surgical techniques are often used in treating ankylosis, namely condylectomy, gap arthroplasty, and interposition arthroplasty. Surgical treatment of TMJ ankylosis also considers the ramus height involved, the difference in ramus height on both sides, and the patient's age.<sup>[8]</sup> Many techniques have been described to treat TMJ ankylosis.<sup>[5]</sup> In these cases, the treatment was planned in the following stages: Mersilene mesh interpositional arthroplasty, physiotherapy, and rehabilitation by a partial denture or dental implantation. All the patients were treated by interpositional arthroplasty through a preauricular approach. Interpositional arthroplasty is a highly effective surgical management option for TMJ ankylosis with acceptable immediate and long-term outcomes.<sup>[9,10]</sup> According to research by Zhu *et al.*,<sup>[13]</sup> short-term follow-up visits, interpositional arthroplasty can treat posttraumatic temporomandibular joint ankylosis with good facial morphology, occlusal rehabilitation, maximal incisor opening, and good imaging results without experiencing significant complications. The use of interpositional material following an arthroplasty is to prevent recurrence.<sup>[10]</sup> At present, there are no ideal interpositional graft materials. In these cases, Mersilene mesh was used as interpositional material. Mersilene

Mersilene mesh interpositional arthroplasty is an effective and efficient procedure for TMJ ankylosis

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