



Temporomandibular joint re-ankylosis: a case report and literature review

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Re-ankylosis is a common postoperative complication of temporomandibular joint (TMJ) ankylosis surgery. Various surgical options to prevent re-ankylosis, both with and without interpositional material, have been discussed in the literature. However, no standardized protocol has been suggested for management or prevention of TMJ ankylosis. This paper discusses the probable causes behind TMJ re-ankylosis and presents a case of unilateral TMJ re-ankylosis, which was managed by gap arthroplasty using an autologous abdominal dermal fat graft as an interpositional material and closely monitored for signs of relapse. Autologous fat graft acted as an effective barrier between the glenoid fossa and mandibular condyle, thus preventing dead space, hematoma and heterotrophic bone formation. A brief review of the literature and update on TMJ re-ankylosis are also presented.

Key words: Temporomandibular joint reankylosis, Autologous abdominal dermal fat graft, Gap arthroplasty, Interpositional arthroplasty
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I. Introduction

Temporomandibular joint (TMJ) ankylosis is defined as “bony/fibrous adhesion of the anatomic joint components accompanied by a limitation in opening the mouth, causing difficulties with mastication, speaking and oral hygiene as well as inadvertently influencing mandibular growth”. TMJ ankylosis can result from trauma, infection, arthritis, congenital deformities, previous TMJ surgery, and iatrogenic causes. Trauma is the leading cause as it results in the formation of hematomas within the articular surfaces, scarring, and osseous replacement. Gap arthroplasty, interpositional arthroplasty alone, and rebuilding of the ramus condylar unit with autogenous grafts or alloplastic materials, including, recently, total joint reconstruction (TJR) alone, are among the surgical

options proposed to manage TMJ ankylosis. Prevention of re-ankylosis is one of the prime goals of therapy irrespective of treatment modality. However, the re-ankylosis rate varies from 2.56% to 11.97% according to different treatment modalities¹. Lack of adequate ankylotic mass removal and post-surgery exercise are some of the most reported causes of re-ankylosis¹. Interpositional arthroplasty is reportedly more effective than gap arthroplasty alone in preventing re-ankylosis. Gap arthroplasty without the use of interpositional material needs a gap of 10 to 20 mm to prevent re-ankylosis, but too large a gap can result in a reduction of the ramus height and abnormal rotation of the mandible². A gap of not more than 10 mm should therefore be created with interpositional material to prevent re-ankylosis. Taking this into account, various soft- and hard-tissue interpositional graft material has been introduced. Autologous (soft-tissue) fat grafting has been found to be effective and safe. Grafted autologous fat (buccal fat pad, dermal fat) serves as a barrier, helping prevent dead space, hematomas, and heterotrophic bone formation, minimizing contact between the glenoid fossa and condyle of the mandible, and preventing fibrosis around the joint by stimulating stem cells to form more adipocytes and new blood vessels (angiogenesis). Wolford et al.³ first used abdominal dermal fat in alloplastic TMJ replacements. Dermal fat grafts hide scars, involve facile and rapid harvesting and

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minimal heterotrophic calcification, and, most importantly, limit the chances of re-ankylosis. This paper discusses a case of unilateral TMJ re-ankylosis of a 33.8 mm×20.1 mm bony mass and provides brief review of TMJ re-ankylosis.

II. Case Report

A female patient 21 years of age reported to the department accompanied by her mother and pursuing a solution for a severely limited mouth opening. The patient was apparently normal until the age of 6, at which time she fell from a terrace onto the right side of her face. Her parents did not seek medical attention until they noticed a gradual decrease in mouth opening between the ages of 7 and 11 years and for which she has undergone surgery of the right TMJ. The patient appeared normal after surgery, but a gradual decrease in the mouth opening became evident between 14 and 21 years of age to the point of almost no mouth opening. The patient had signs of injury and scarring on the chin. She had no breathing difficulty, no history of ear discharge, and no significant weight loss.

On clinical examination, the patient appeared pale, tired, and psychologically upset. She had a slightly retruded mandible with a scar on her chin, and she was unable to move the mandible in eccentric directions. Hollowing of the right temporal region was evident, along with a pre-auricular scar extending as an Al-Kayat–Bramley incision, suggesting previous surgery in which the temporalis fascia was used to reconstruct the joint. The face was flattened to the left and rounded toward the right, and no condylar movement could be palpated on the right side. A horizontal scar on her neck indicated a tracheostomy had been performed during the previous surgery. An intra-oral examination showed class 1 molar relation with no mouth opening. Based on this finding, a provisional diagnosis of right TMJ ankylosis was given.

Radiographic examination via orthopantomography showed a prominent antegonial notch on the right side. Computed tomography with axial and coronal sections was advised. Complete unilateral bony ankylosis of the TMJ measuring 33.8 mm×20.1 mm was clearly evident on the right side.

A treatment plan was discussed with the family, and consent for open TMJ surgery was given following clear explanations of the associated and anticipated difficulties and complications.

The patient underwent surgery under general anesthesia with fiberoptic intubation. An incision was made on the pre-

existing scar with extension to the temporal bone region. The incision was done in the blood-less plane with electrocautery to expose the TMJ. The ankylosed bony mass involved both the mandibular condyle and coronoid processes. Approximately 1.5 to 2 cm of bone was removed by osteotomy. Gap arthroplasty of 1.5 to 2 cm (Fig. 1. A) was created and ipsilateral coronoidectomy (on the affected side) was performed. The maximum mouth opening was 25 mm. Coronoidectomy of the opposite side was performed, achieving a maximum forced mouth opening of 45 mm without dislocation of the left TMJ.(Fig. 1. B)

A dermal fat graft was obtained from the suprapubic area of the abdomen (Fig. 1. C, 1. D) through an incision of approximately 6 cm×3 cm and the harvested fat was de-epithelized to obtain a volume of 14 mL.(Fig. 1. E, 1. F) The graft was then spread into the created gap, with the fat layer facing the glenoid fossa and the dermal layer toward the ramus.(Fig. 1. G) Finally, the wounds were closed in layers.

Two days post-surgery, aggressive physiotherapy was initiated and continued for six months. The maximal interincisal opening is currently 35 mm. The patient is still under follow-up.

III. Discussion

Ankylosis of the TMJ is a rare condition that can lead to severely limited mouth opening, facial asymmetry, and occlusal disharmony. It is most commonly seen in socioeconomically underdeveloped strata of society, in which awareness of early management of trauma due to condylar fractures is typically lacking. Gap arthroplasty requires the creation of a 10 to 20 mm gap to prevent re-ankylosis, which in turn causes a decrease in ramal height, creating an open bite and deviation of the mandible to the contralateral side. Ideally, a gap of at least 10 mm is required with interpositional material to prevent reankylosis. In this case, the patient had a history of trauma, previous surgery, and re-ankylosis.

Re-ankylosis is commonly associated with these conditions:

1) Inadequate surgery:

- An incomplete/inadequate gap is created, while mouth-opening exercises bring the osteomized segments close together, particularly at the posterior-superior aspect of the ramus end.
- Pain during exercises discourages a patient from taking part in regular physiotherapy.
- Inadequate strength and bulk of interpositional soft-tissue graft/necrosis/displacement.

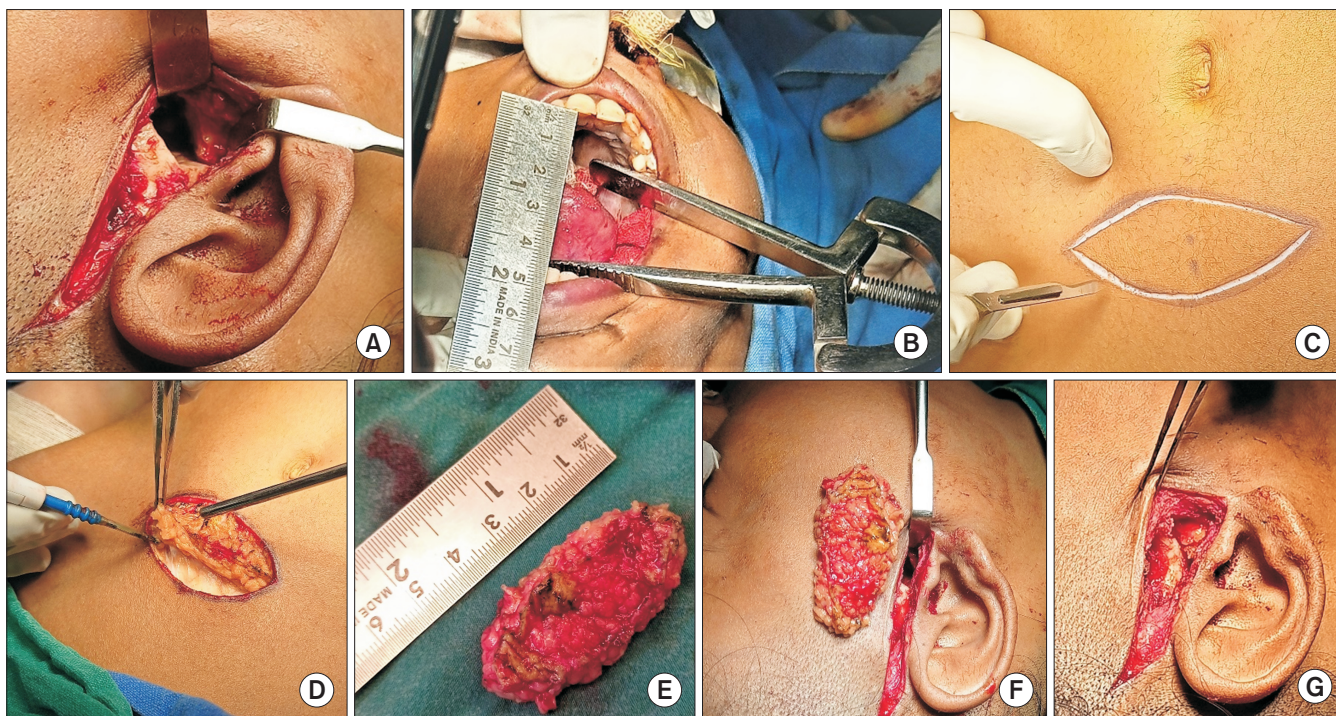


Fig. 1. Intraoperative pictures. A. Gap arthroplasty of 1.5 cm done. B. Maximum mouth opening, 45 mm. C. Incision marking over supra-pubic area. D. Dermal fat is harvested. E. De-epithelization of dermis is done and fat is procured. F. Free fat graft. G. Free fat graft interposition done.

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- When an autogenous bone graft is used, the initial two-week period allows for graft healing, which may have an impact on subsequent exercises.
- 2) Patient compliance: not following the physiotherapy instruction strictly.
 - 3) Biological causes:
 - An inadequate soft-tissue barrier after gap arthroplasty may allow bony segments to reunite.
 - Increased heterotrophic bone formation (osteoblastic jumping phenomenon) after surgery.
 - High remodeling and bone turnover in children.
 - Fibrosis of longstanding inactive muscles involved in mastication, resulting in an inability to perform mouth-opening exercises.
 - Cartilaginous part of graft dislodgement and osseous remodeling.

A dermis fat graft provides a cushioning affect within the joint, allowing for smooth and pain-free joint function, stable interposition and adequate shape, and is less prone to fragmentation^{4,5}. It acts as a framework for healing and growth of soft tissues within the joint space^{4,6}. A dermal fat graft provides adequate shape, improved survival due to angiogenesis, and a reduced resorption rate^{4,7}. The graft reduces re-

ankylosis by preventing the development and organization of hematomas, which minimizes fibrosis and calcification, thereby improving joint movement. According to Shen et al.⁶, fat grafts tend to survive, with 50% of their original size remaining around the TMJ at different stages. Multiple studies have shown that free-fat grafts survive, with their average size remaining constant and no statistically significant difference evident even after several years⁴⁻⁸. Stem cells present in a graft result in the production of adipocytes and new blood vessels and prevent fibrosis around the joint. A macroscopic and histological experimental study by Dimitroulis⁵ on abdominal dermis fat grafts revealed that grafts initially undergo necrosis for a few days followed by the gradual formation of new adipose tissue around the TMJ stimulated by adipose precursor cells in connective tissues. This acts as an effective hemostatic agent and space filler and reduces scarring⁷. The incisions made for this graft tend to be confined to the pre-auricular region without the need for unnecessary extension to the temporal area compared with other grafts, preventing undesirable results, such as alopecia along the incision line and ugly bulging in the temporal region⁷. Additionally, there is no need for an adjuvant procedure such as scar revision as the graft is usually harvested from the suprapubic and ingui-

Table 1. Rate of ankylosis found in various studies with different types of interpositional material in management of temporomandibular joint ankylosis

Serial No.	Study	Type of interpositional graft used	Re-ankylosis (%)
1	Sawhney ⁹ (1986)	Acrylic spacer	4.28
2	Chossegros et al. ¹⁰ (1999)	Full thickness skin graft	10
3	Erdem and Alkan ¹¹ (2001)	Acrylic marbles	6.38
4	Dimitroulis ⁵ (2004)	Autogenous dermis fat graft	7.69
5	Huang et al. ¹² (2007)	Autogenous costal cartilage graft	25
6	Krishnan ¹³ (2008)	Autogenous auricular cartilage	10
7	Singh et al. ¹⁴ (2011)	Buccal fat pad	0
8	Rajurkar et al. ¹⁵ (2017)	Temporomyo-fascial flap	5.88
9	Awal et al. ¹⁶ (2018)	Costochondral graft	32.7
10	Anchlia et al. ¹⁷ (2019)	• Temporalis • Temporalis and coronoid bone • Temporalis and costochondral graft	• 8.70 • 6.52 • 26.09

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nal folds¹.

However, the use of dermal fat comes with certain disadvantages, such as donor-site morbidity, difficulty in securing the graft to surrounding tissues, hematoma, seroma, infection, ileus, dermoid cyst (rare) and, in rare cases, perforation and infection of the donor site⁴. However, no wound infection or foreign-body reaction to the autogenous abdominal dermal fat graft was observed in the present case.

Apart from autogenous dermal fat, other options of interpositional material are widely discussed in the literature, such as buccal fat pad, meniscus, full-thickness skin graft, fascia, cartilage, and silicone, as shown in Table 1^{5,9-17}, each with its own advantages and disadvantages.

Recent advances have given rise to total alloplastic joint replacement in the management of multiple failed TMJ ankylosis surgery, and its success in various studies may warrant considering it a gold standard for treating TMJ ankylosis alone¹⁸. Alloplastic prosthesis is reportedly superior to any other allogenic tissue as it prevents donor-site morbidity and avoids the need for multiple TMJ surgeries. Long-term stability and improved maximal jaw opening with the combined use of alloplastic TJR of the TMJ and grafting of fat around the joint warrant describing the procedure as a definitive protocol for the management of adult TMJ ankylosis, but its high cost and the possibility of heterotrophic calcification limits its use^{7,18}.

Immediate postoperative exercise allows for inactive muscles to loosen and reattach at new levels that do not interfere with mouth opening. Although some studies revealed a chance of early bleeding and large hematomas delaying healing, if immediate physiotherapy is initiated postoperatively, placement of a vacuum drain along with nonsteroidal anti-inflammatory drugs can prevent hematomas and the secretion of prostaglandin in the area postoperatively during

first few days of exercise⁵. A recent study revealed that dose-dependent local release of dexamethasone after removal of the ankylotic bony mass in the TMJ region can prevent re-ankylosis¹⁹. Preoperative evaluation of the extension of ankylotic bony masses and proper planning of the osteotomy pattern reportedly help prevent incomplete removal of ankylotic masses and provide hindrance-free mouth opening, thereby preventing re-ankylosis.

Until there is a standardized surgical protocol, TMJ ankylosis will remain a challenging problem both for patients and surgeons. Failure of surgery and re-ankylosis are common. Multiple failed surgeries may lead a patient to become psychologically ill, making them totally dependent on health care. Such patients should be provided with perioperative counseling to avoid interference in rehabilitation after surgery. Surgical treatment should be tailored to each patient depending on the severity of the defect, as the best treatment method is yet to be determined. In our present case, fat was used as an interpositional material after removal of the ankylotic mass to prevent dead space and consequent hematoma and heterotrophic bone formation, thereby anticipating comfortable long-term physiotherapy which in turn probably avoided re-adhesion and the need for another surgery. Signs of relapse, such as tightness of joint during the morning hours and gradual decrease in mouth opening compared to what was achieved during immediate postoperative physiotherapy days, are closely monitored, and the patient is encouraged to engage in progressively more frequent physiotherapy sessions each day. Prolonged post-surgical physiotherapy for a minimum of six months to a year is crucial to treatment success. A focus on maintaining the maximum interincisal opening attained intraoperatively, along with accurate monitoring of the patient, is necessary to prevent recurrence.

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Authors' Contributions

F.K. participated in data collection, wrote the manuscript and participated in the surgery. A.K.V. participated in head surgeon and provided guidance for writing this manuscript.

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Consent for Publishing Photographs

Written informed consent was obtained from the patient for publication of this article and accompanying images.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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