

# Bidirectional Temporomandibular Joint Ankylosis: A Rare, Disabling Condition of Mastication

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**Abstract:** Temporomandibular joint (TMJ) ankylosis is characterized by a bony mass that generally creates difficulty in 1 direction, opening the mouth. In this paper, the patient who presented was experiencing difficulty in 2 directions, both in opening and closing the mouth. A rare disabling condition of mastication and bidirectional ankylosis and its surgical treatment have been presented. Bidirectional temporomandibular joint ankylosis is a rare condition that disables the patient both to open and close the mouth. The left side of type 2 ankylosis (Sawhney, *Plast Reconstr Surg* 1986;77:29–38) was treated conservatively. Disc was preserved and used as interpositional material. In treatment of the right side, which was type 4 ankylosis (Sawhney, *Plast Reconstr Surg* 1986;77:29–38), a gap was created, and then, a titanium fossa implant was placed to prevent ankylosis.

**Key Words:** TMJ, TMJ ankylosis, growing patients, TMJ fossa prosthesis, condyle, TMJ fracture

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Temporomandibular joint (TMJ) ankylosis is a serious complication after a trauma, local or systemic infection, or systemic diseases. The highest incidence in children is trauma. A class 6 fracture<sup>1</sup> with intracapsular hematoma incurs the formation of fibrous and/or bony bridges between the condyle and articular fossa and creates a bony mass. It gives rise to disability of mastication, impairment of speech, poor oral hygiene, rampant caries, disturbances in facial and mandibular growths, and physiological disability in the upper airway. Most important of all, it jeopardizes the life of a patient because of the inability to open the mouth.

Sawhney<sup>2</sup> classified ankylosis in 1986: In ankylosis type 1, fibrous adhesions are formed in/around the joint. In ankylosis type 2, there is a formation of a bony bridge between the condyle and glenoid fossa. In ankylosis type 3, there is a bony bridge between ramus and zygomatic arch on the outer aspect, whereas the articular fossa on the deeper aspect is intact with the articular disc, and in ankylosis type 4, there is a wide and thick bony bloc bridging across ramus and zygomatic arch. It is possible to detect an extension and a penetration into the middle cranial fossa.

Treatment of ankylosis in children is probably one of the greatest challenges in TMJ surgery. The type of operation and the policy of the treatment vary from one country to another. However, an early and effective therapy is a must. Treatment in children always has a particular importance. The goal is, to release ankylosis, to prevent reankylosis, to provide functioning as early as possible and eventually to maintain a normal growth.<sup>3</sup>

A variety of techniques for the treatment of ankylosis have been described in the literature, ranging from gap arthroplasty to TMJ prosthesis.<sup>3–9</sup> Previously reported studies revealed that the disability in TMJ ankylosis was mainly in 1 direction.<sup>3–9</sup> Patients were not able to open the mouth satisfactorily. Nevertheless, all were able to close the mouth. This gave the patients a chance to bite and feed within limited interincisal distance and to keep the mouth closed during the rest. None of the studies published so far has presented any case with bidirectional ankylosis. Bidirectional ankylosis is a rare case where a patient experiences the disability of opening the mouth and, moreover, the disability of closing the mouth during the rest. The purpose of this paper was to report a rare condition with bidirectional ankylosis in a growing patient and its treatment.

## CLINICAL REPORT

A 12-year-old boy visited the maxillofacial surgery department with the disability of mastication and dry mouth. The history of the patient revealed that the cause was trauma. When he was 7 years old, he fell from a tree. His parents had taken him to the local hospital. During the 2-day stay at the hospital for possible brain damage, his skin injury on the chin was sutured. When he was 11 years old, he had visited a dentist with the complaint of toothache. The dentist diagnosed a difficulty in mouth opening and advised him to go to a hospital for his disability. At the hospital, an orthodontist had taken care of the patient and made an acrylic plate



FIGURE 1. Acrylic plate to prevent closure of the mouth.

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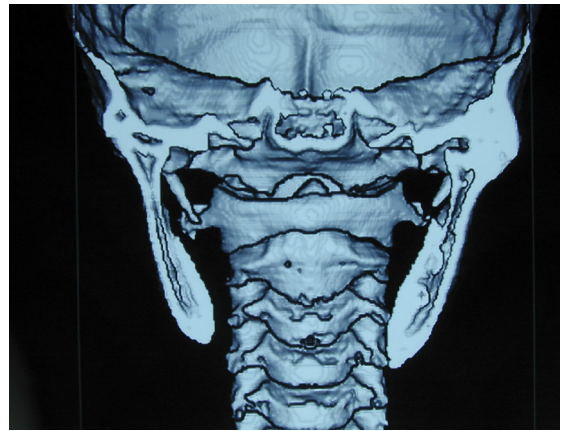
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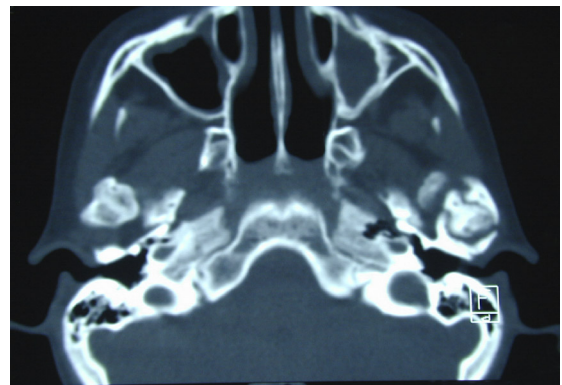
**FIGURE 2.** Placement of the appliance.



**FIGURE 5.** Bony bridges between the misshaped condyle and articular fossa at the right TMJ and bony block at the left side between the ramus and skull base.



**FIGURE 3.** Patient is not able to close the mouth less than 8 mm.



**FIGURE 6.** Computed tomographic scan showing the extension of the ankylosis of the left TMJ.



**FIGURE 4.** Maximal interincisal distance of the patient, 20 mm.



**FIGURE 7.** Placement of titanium fossa prosthesis.





**FIGURE 8.** Improved occlusion after 3 years.

to prevent the closure of the mouth. In the following weeks, the orthodontist had increased the thickness of the plate gradually to increase mouth opening and recommended the patient never to remove the device (Figs. 1 and 2). When it had been realized that jaw movements were limited in both directions, the orthodontist had sent the patient to the maxillofacial surgery department.

Clinical examination revealed that the movements of the mandible were limited in both, opening and closing, directions. The patient was not able to bite, and he was able to close only 8 mm anteriorly and 12 mm posteriorly (Fig. 3), yet maximal interincisal distance (MID) was 20 mm. (Fig. 4). Radiologic examination revealed type 4 ankylosis at the left side and type 2 ankylosis at the right side (Figs. 5 and 6).

### Treatment

An endaural incision was used as described Al-Kayat and Bramley.<sup>10</sup> Dissection was carried out through the superficial temporal fossa, which was retracted anteriorly to protect facial nerve and periosteum over zygomatic arch that was incised. To release ankylosis of the left TMJ, the subankylotic approach was preferred.<sup>9,11</sup> Bone was drilled with a round bur, and 2 segments were split. A 3-mm gap was created, and a titanium fossa prosthesis<sup>3</sup> was placed to prevent reankylosis and secured by titanium screws (Fig. 7). For the treatment of the type 2 ankylosis of the right TMJ, fibrous



**FIGURE 9.** Maximal interincisal distance after 3 years.



**FIGURE 10.** Facial appearance before surgery.

attachments and bony bridges between the physically disabled condyle and glenoid fossa were removed while avoiding damage to the disc and articular fossa as Nitzan et al<sup>12</sup> described. The discs were preserved, and no interpositional material was placed to prevent ankylosis.

Two days after surgery, the patient started to do mouth opening exercises and received physiotherapy for 6 months. The patient was able to bite and open the mouth more than 30 mm 1 month after the surgery. Three years of postoperative clinical examination revealed improved occlusion without having orthodontic treatment (Fig. 8), satisfactory mouth opening (Fig. 9), and improved facial appearance. There was no asymmetry (Figs. 10 and 11).

### DISCUSSION

Most studies agreed that the predominant etiologic factor for TMJ ankylosis is trauma.<sup>2,3,6,9,11</sup> If a condyle fracture is not treated on time, it may give rise to some facial abnormalities. That is why early diagnosis and proper management of condyle fractures, particularly in children, gain great importance.

The anatomy and physiology of the condylar region varies with age. This dictates to a great extent the location and type of fractures in each age group and also the way they need to be treated. Up to the second year of life, there are many vascular channels within the condylar head, but they vanish soon afterward. Active movement of the jaw is particularly important in combating ankylosis in this highly vascularized and osteogenic



**FIGURE 11.** Facial appearance 3 years after surgical intervention.

environment. There is an enormous potential for regeneration in a group aged 3 to 12 years when compared with adults and even adolescents.<sup>13,14</sup>

Ankylosis in children usually occurs from a type 6 fracture of the condyle.<sup>1</sup> A blow to the chin results in the force being transmitted to the condyle, which can result in an intracapsular comminuted fracture with fragmentation and hemarthrosis of the highly osteogenic particles. When the mobility of the TMJ is not maintained, the organization of the fibro-osseous mass occurs and bony ankylosis can ensue.

The measurement of the MID is a very good indicator of TMJ function. With reduced MID, the disability is greater. The reduced MID is an expected and common finding of TMJ ankylosis. On the other hand, in the presented case, the patient was not able to close the mouth either. This created disability in feeding and discomfort due to the dry mouth.

Treatment of ankylosis is probably one of the greatest challenges in TMJ surgery, and the treatment of TMJ ankylosis in children is much more challenging than in adults because of high recurrence and the probable change in the unpredictable growth of the mandible.

A variety of techniques has been used for the treatment of TMJ ankylosis. However, there is no agreed way of management, and results have been variable. Common treatment modalities include gap arthroplasty and the use of autogenous interposition materials such as, dermis,<sup>15,16</sup> muscle and fascia,<sup>17</sup> and metatarsal<sup>18</sup> and sternoclavicular joints.<sup>19</sup> The growth potential of a costochondral graft created an idea that it will act as a real condyle in TMJ reconstruction.<sup>20–22</sup> An unpredictable growth pattern, donor site morbidity, and reankylosis were the disadvantages of this technique.<sup>23–25</sup>

Numerous alloplastic materials have been proposed as spacers; they were made of silicone, acrylic, polyoxymethylene, ceramic, or various metals.<sup>4,26–35</sup> The first surgeon to place metal interposition material was Eggers.<sup>32</sup> Smith and Robinson<sup>33</sup> first used hemijoint prosthesis, and in 1965, Christensen<sup>34</sup> described the first total joint prosthesis. In the following years, the Vitek-Kent total joint prosthesis<sup>30</sup> became popular; however, because of the improper wear of the material, it failed, and the factory was bankrupted. New TMJ prostheses have been developed; however, there is still no accepted concept of what is required for a successful TMJ prosthesis. The advantages and disadvantages of the previously mentioned techniques have been discussed previously.<sup>3,9,35</sup>

The type of operation and the policy of the treatment vary from one country to another. However, actual surgical treatment depends on the extent and the type of ankylosis, the age of the patient, onset and the time of the surgery, and whether the ankylosis is unilateral or bilateral.<sup>3</sup> In the treatment of the presented patient, for the treatment of the type 2 ankylosis of the right side, a conservative treatment has been preferred. Fibrous attachments and bony bridges were removed and the condyle was contoured while avoiding damage to the disc. The disc of the patient was used as the interposition material on this side. Because of the extent of the bony mass at the left side, gap arthroplasty was applied and a titanium fossa prosthesis was placed to prevent reankylosis and to minimize loss of the posterior dimension of the ramus.<sup>2,3</sup>

In the treatment of the presented bidirectional ankylosis, 3 of the basic objectives in the treatment of TMJ ankylosis were achieved: to release ankylosis, to improve mandibular function, and to maintain normal growth and development of the face.

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