Treatment of Temporomandibular Joint Ankylosis: A Case Report

• **Bob Rishiraj,** BSc, DDS •
• **Leland R. McFadden,** DDS, MSc, FRCD(C) •

Abstract

Bony ankylosis of the temporomandibular joint (TMJ) in a male patient was not diagnosed until the patient reached his early teens, at which time the condition was treated with a costochondral graft. At the time of treatment, there was an expectation that further orthognathic surgery would be required to correct the skeletal deformity. However, with the release of the ankylosis and growth of the costochondral graft, a good functional and esthetic result was achieved without further surgery. It is important that family dentists be aware of the clinical signs and symptoms of TMJ ankylosis, to allow early diagnosis and treatment.

MeSH Key Words: *ankylosis; case report; temporomandibular joint disorders*

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Ankylosis of the temporomandibular joint (TMJ) involves fusion of the mandibular condyle to the base of the skull. When it occurs in a child, it can have devastating effects on the future growth and development of the jaws and teeth. Furthermore, in many cases it has a profoundly negative influence on the psychosocial development of the patient, because of the obvious facial deformity, which worsens with growth. Trauma and infection are the leading causes of ankylosis.[1] However, in a young patient, a joint injury may not be noticed immediately. The first sign of a significant problem may be increasing limitation of jaw opening, usually noticed by the dentist. Pain is uncommon. Early diagnosis and treatment are crucial if the worst sequelae of this condition are to be avoided. Optimal results can be achieved only after a complete assessment and development of a long-term treatment plan. We present a case report of TMJ ankylosis diagnosed and successfully treated in the early teen years.

Case Report

A 12-year-old boy was referred to the oral and maxillofacial surgery service for investigation and treatment of congenital right TMJ ankylosis. As a result of his ankylosis, the right mandible had become hypoplastic. At initial presentation, his height was 138 cm (smaller than normal for his age) and his weight 27.1 kg (below the fifth percentile for his age group). He was otherwise healthy. No complications had been reported at birth, and there was no subsequent history of trauma to the facial skeleton.

The initial clinical examination revealed an obviously hypoplastic mandible with a class II dental relationship (**Figs. 1a**, **1b**, and **1c**). The mandibular midline was 5 cm to the right of the facial midline, and the occlusal plane was canted. Maximum opening was minimal, and there was no palpable movement over the right TMJ and only slight rotation on the left side.

Radiographic investigation included posteroanterior Panorex imaging (**Fig. 2a**), lateral cephalometric radiography, and a 3-dimensional computed tomographic reconstruction (**Fig. 2b**). These images confirmed bony ankylosis of the right TMJ with bilateral elongation of the coronoid processes.

The following 4-stage treatment plan was developed:

1. Surgery
   - Gap arthroplasty through a submandibular or preauricular approach
   - Coronoidectomy (ipsilateral and possibly contralateral)
   - Costochondral graft (CCG) with rigid internal fixation
   - Extraction of selected dentition
   - Impressions for fabrication of occlusal splint

Figure 1a: *Pretreatment — frontal view.*

Figure 1b: *Pretreatment — lateral view.*

Figure 1c: *Pretreatment — occlusal view.*

   - Placement of splint
   - Short-term maxillomandibular fixation
2. Physiotherapy
   - Aggressive use of continuous passive movement (CPM) and tongue blades
   - Adjustment of maxillary surface of splint to allow eruption of posterior dentition
3. Orthodontics
   - Functional appliance
   - Orthodontic treatment
   - Extractions as required
4. Orthognathic surgery

The initial surgery was accomplished under general anesthesia. Right gap arthroplasty and coronoidectomy were performed through the submandibular approach (**Fig. 3**). During the procedure, the surgeon (LRM) noticed an increase in maximum opening to about 20 mm, but interference from the contralateral side prevented further improvement. Therefore, left coronoidectomy and extraction of teeth 38, 63 and 64 were completed. These procedures allowed the maximum opening to increase to 35 mm. Alginate impressions were taken intraoperatively to fabricate a splint that would allow a right posterior open bite. It was hoped that adjustment of the splint would help to level the occlusal cant. The splint was secured by means of skeletal fixation. The right temporal bone in the region of the ankylosis was contoured with a bur into a glenoid fossa. The CCG was sculpted to fit this fossa, care being taken not to separate the cartilaginous part of the graft from the bone, and was secured to the right ramus with 3 bicortical screws (**Fig. 4**).

Maxillomandibular fixation was maintained for 2 days, and the patient was discharged from hospital 3 days after surgery with good range of motion. He started an exercise program involving the use of tongue blades to stretch the mouth maximally, because CPM could not be used with the splint in place. The splint, held in place by circummandibular wires, was removed under general anesthesia 8 weeks after the initial surgery. The patient was then referred for aggressive physiotherapy involving CPM. He was advised to continue wearing the unsecured splint until he saw the orthodontist, who incorporated the splint into a functional appliance.

Twin-block therapy (at the near-maximum protrusive

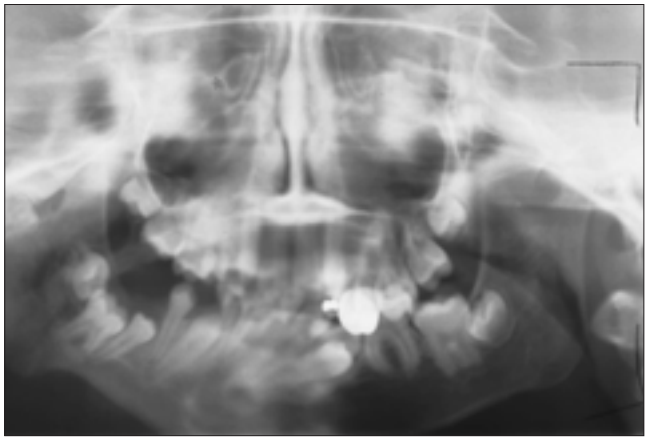

Figure 2a: *Pretreatment — panoramic radiograph.*

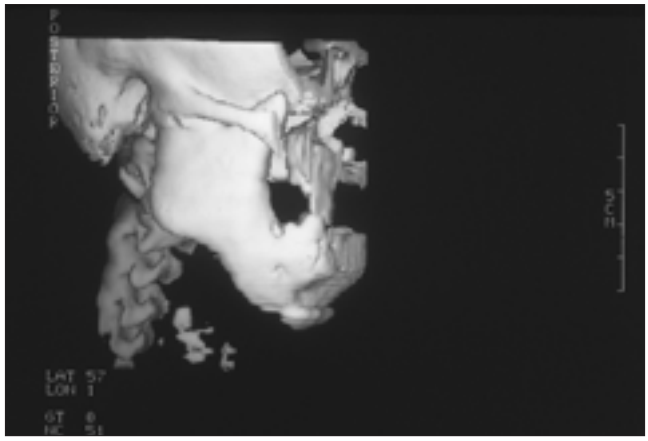

Figure 2b: *Pretreatment — 3-dimensional computed tomogram.*

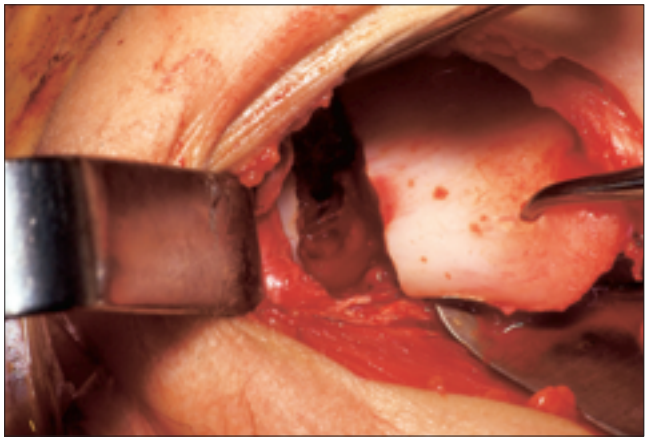

Figure 3: *Gap arthroplasty.*

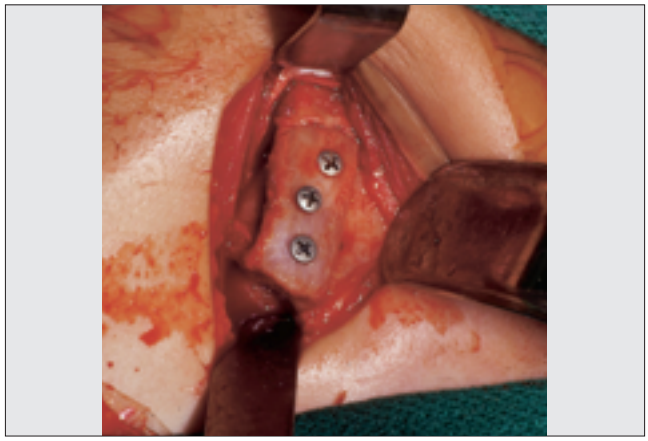

Figure 4: *Costochondral graft secured to mandibular ramus with 3 bicortical screws.*

Figure 5: *Post-treatment, 2 years — frontal view.*

position) was started 3 months after the initial surgery. At that time, the vertical opening was about 25 mm, with slight deviation to the right side (maximum right lateral movement 6 mm and left lateral movement 3.5 mm). The twin-block appliance was worn intermittently (mainly during the evening and at night) for the next year. The range of motion had increased vertically to 35 mm by 36 months.

During this period, we monitored the eruption of the permanent teeth closely, and 18 months after the initial surgery, the patient returned to the operating room for extraction of impacted teeth 34 and 47, to allow for orthodontic alignment.

Two years after the initial surgery, the patient had grown significantly (**Fig. 5**).

Fixed appliances were placed about 36 months after the initial surgery. Retainers were placed in both arches. A bridge was placed on the existing lower anterior teeth and the patient discontinued wearing appliances in approximately June 1999.

Figure 6a: *Post-treatment, 8 years — frontal view.*

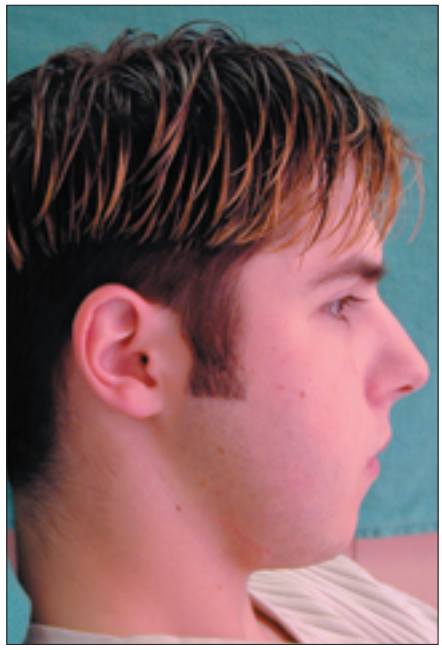

Figure 6b: *Post-treatment, 8 years — lateral view.*

Figure 6c: *Post-treatment, 8 years — occlusal view.*

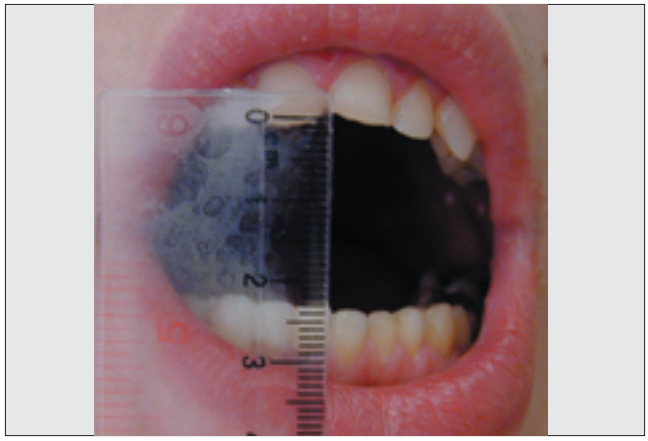

Figure 6d: *Post-treatment, 8 years — maximum opening.*

Five years after the initial surgery, the patient returned, at which time his chief complaint was a sharp edge that could be felt in the area of the original procedure. Palpation of the right surgical site revealed a sharp edge of the CCG and the associated bicortical screws just beneath the skin. Further clinical examination revealed a flat labiomental fold. He had already seen the orthodontist, who had requested removal of teeth 18, 17, 28 and 48. The patient subsequently underwent recontouring of the right angle of the mandible, advancement genioplasty, removal of the 3 screws and extraction of the above-mentioned teeth.

At his most recent follow-up, 8 years after the initial surgery, his occlusion remained stable and he had good range of motion, vertical opening of 26 mm, and left and right lateral excursive movements of 4 and 6 mm, respectively (**Figs. 6a**, **6b**, **6c** and **6d**). He is happy with his facial appearance and functional occlusion.

Discussion

The causes and treatment of TMJ ankylosis have been well documented,[2,3] with trauma and infection identified as the 2 leading causes.[1] In children, TMJ ankylosis can result in mandibular retrognathism with attendant esthetic and functional deficits. Therefore, treatment should be initiated as soon as the condition is recognized, with the main objective of re-establishing joint function and harmonious jaw function.[4,5] Various autogenous grafts, including the metatarsus,[6] clavicle,[7] and iliac crest,[8] as well as various alloplastic materials,[9] have been used to reconstruct the TMJ. However, the free CCG has gained popularity in the past 2 decades.[4,9-12]

Mandibular hypomobility resulting from TMJ ankylosis is classified according to location (intracapsular or extracapsular), type of tissue involved (bony, fibrous or fibro-osseous) and extent of fusion (complete or incomplete).[13] If the cause is trauma, it is hypothesized that intra-articular hematoma, along with scarring and formation of excessive bone, leads to the hypomobility. Infection of the TMJ most commonly occurs secondary to contiguous spread from otitis media or mastoiditis, but it may also result from hematogenous spread of infectious conditions such as tuberculosis, gonorrhea or scarlet fever. Systemic causes of TMJ ankylosis include ankylosing spondylitis, rheumatoid arthritis and psoriasis.[14]

In children, not only can trauma to the TMJ result in ankylosis, but it may also impair mandibular growth and result in mandibular retrognathism. These problems have functional and esthetic implications, as well as causing difficulties pertaining to nutrition and oral hygiene.[15]

A variety of techniques for the treatment of TMJ ankylosis have been described, including intraoral coronoidectomy, ramus osteotomy, high condylectomy, forceful opening of the jaw under general anesthesia, lysis of adhesions of the pterygoid space during exploration for a foreign body,[16] autogenous CCG [17] and free vascularized whole-joint transplants.[18] In addition, several prosthetic options for TMJ reconstruction exist, including Silastic sheeting material (Vitek Inc., Houston, Texas), the TMJ condylar prosthesis, custom glenoid fossa implants, articular eminence implants and mandibular reconstruction plates with condylar heads.[19]

The CCG offers several advantages, including biologic and anatomic similarity to the mandibular condyle, low morbidity of the donor site, ease in obtaining and adapting the graft, and regenerative potential in the growing child.[5,8] When a CCG is used, the hope is that, because of the similarities of its primary and secondary cartilage to those of the mandibular condyle,[8] the graft will provide growth potential and keep pace with the growth of the unaffected side, to maintain mandibular symmetry throughout the growth period.[5] It has been demonstrated that CCGs tend to have a more vertically directed condylar growth pattern and a more laterally positioned condyle than the native bone tissue and may even cause mandibular prognathism necessitating orthognathic surgery in the form of mandibular setback.[12]

A 7-step protocol has been developed for the treatment of TMJ ankylosis:[4] 1) aggressive resection of the ankylotic segment, 2) ipsilateral coronoidectomy, 3) contralateral coronoidectomy when necessary, 4) lining of the joint with temporalis fascia or cartilage, 5) reconstruction of the ramus with a CCG, 6) rigid fixation of the graft and 7) early mobilization and aggressive physiotherapy. With this protocol, Kaban and others[4] achieved a mean maximum postoperative interincisal opening at 1 year of 37.5 mm, with lateral excursions present in 16 of 18 joints and pain present in 2 of 18 joints.[4] This protocol formed the basis of the treatment plan that was undertaken in this patient, except the joint was not lined with temporalis fascia or cartilage.

This case demonstrates (in support of other similar studies) that use of a CCG to reconstruct a TMJ affected by ankylosis yields a functional condyle with growth potential. In this patient, there has been a significant improvement in the anteroposterior position of the mandible and a noticeable increase in the patient's size since the release of the ankylosis. The net result has been a high degree of patient satisfaction. ◆

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Dr. Rishiraj *is a resident, oral and maxillofacial surgery, Health Sciences Centre, University of Manitoba, Winnipeg, Manitoba.*

Dr. McFadden *is a staff surgeon, oral and maxillofacial surgery, Health Sciences Centre, University of Manitoba, Winnipeg, Manitoba.*

Correspondence to: *Dr. Leland R. McFadden, 902-388 Portage Ave., Winnipeg, MB R3C 0C8. E-mail: mcfadden@mb.sympatico.ca.*

The authors have no declared financial interest in any company manufacturing the types of products mentioned in this article.

References

To obtain the complete list of references, please see the *eJCDA* at http://www.cda-adc.ca/jcda/vol-67/issue-11/659.html.

CDA Resource Centre

Surgical treatment of TMJ disorder **(video),** produced by the American Association of Oral & Maxillofacial Surgeons, W.B. Saunders, 1993 can be borrowed by CDA members, who should contact the Resource Centre at tel.: 1-800-267-6354 or (613) 523-1770, ext. 2223; fax: (613) 523-6574; e-mail: info@cda-adc.ca.