Intraoral mandibular distraction osteogenesis in facial asymmetry patients with unilateral temporomandibular joint bony ankylosis


Abstract. Gap arthroplasty and costochondral rib bone graft are commonly performed by oral and maxillofacial surgeons to reconstruct the temporomandibular joint with ankylosis. However, unpredictable and unsatisfactory results such as re-ankylosis, growth disturbance, and facial asymmetry often occur. Even if the costochondral graft is successful, donor-site morbidty is inevitable. More recently, surgeons have become interested in distraction osteogenesis as a means of temporomandibular joint reconstruction. This case series presents the results of intraoral mandibular distraction osteogenesis and gap arthroplasty in two patients with facial asymmetry and unilateral temporomandibular joint bony ankylosis. Both patients had experienced failed gap arthroplasty and costochondral graft for the reconstruction of the temporomandibular joint. Distraction osteogenesis with gap arthroplasty proved successful in these two patients with follow-up of longer than 2 years.

Key words: mandibular distraction; TMJ ankylosis.

Accepted for publication 25 April 2002

Distraction osteogenesis is a very attractive technique and has been applied for the treatment of craniofacial microsomia, developmental micrognathia, Treacher Collins syndrome, Nager’s syndrome, craniofacial synostosis syndrome and Pierre Robin syndrome, transverse mandibular deficiency. More recently, distraction osteogenesis has been proposed for the treatment of bony ankylosis of the temporomandibular joint.

In this case report, the long-term results of two cases treated by intraoral mandibular distraction osteogenesis and gap arthroplasty for facial asymmetry and unilateral temporomandibular joint bony ankylosis is described.

Case reports
(1) Case I
A 13-year-old girl was admitted for a limitation of mouth opening and facial asymmetry. At 4 years of age she had suffered trauma of the right TMJ and her mouth opening had become gradually limited. Gap arthroplasty surgery was performed twice at other hospitals.

Clinical examination showed chin deviation to the right, retrognathic mandible, maxillary cant, deviation of the mandibular dental midline to the right and a 4 mm overjet (Fig. 1A, B). Mouth opening was reduced to 8 mm. Radiographic examination showed an irregularly shaped right condylar head with bony ankylosis and short rami (Fig. 2A, B).

Under general anaesthesia, coronoidectomy was performed, but her mouth
Condylc圩omy and gap arthroplasty were undertaken on the right TMJ using a preauricular and Risdon approach. A preplanned corticotomy was performed in the lateral cortex, extending from the external oblique ridge to the angle of the right mandible. An intraoral distractor (Medicon, Tuttlingen) was placed across the corticotomy and fixed, and the osteotomy then completed. Special care was taken to place the distractor parallel to the vector of growth needed. At the end of surgery, the patient had a mouth opening of 35 mm. Following a latency of 5 days, the intraoral distractor was activated at a rate of 0.8 mm per day or 1.2 mm per day on alternating days for 16 consecutive days (Fig. 3A, B). The distractor was removed 8 weeks after completing the distraction. During the entire distraction process, the patient performed active mouth opening exercises and received a tolerable diet. No complications occurred over a clinical follow-up period of 25 months. At which time the patient had a more favourable facial appearance and a mouth opening of 33 mm (Fig. 4A, B, and C, Fig. 9A, B).

(2) Case II

A 31-year-old woman presented with the complaint of limited mouth opening and an asymmetric face. At age 2 years, she had suffered right TMJ trauma. Over the years, she had undergone several operations at other hospitals, including, orthognathic surgery (twice), costochondral rib bone graft (3 times), and gap arthroplasty (once), to correct her deformities.

Physical examination revealed facial asymmetry with chin point deviation to the right, maxillary cant, retrognathic mandible, scars from previous operations (Fig. 5A, and B), malocclusion, severe overjet (6 mm) and a maximum interincisal opening at 15 mm. Radiographic evaluations revealed bony ankylosis of the costochondral graft (inferior portion) with the glenoid fossa and the coronoid process (Fig. 6A, B, and C). Coronoidectomy and resectioning of the middle and superior portion of costochondral graft were performed under general anaesthesia, but mouth opening did not increase. A further operation was then performed as described for Case I. Accordingly, the patient had a postoperative interincisal opening of

Fig. 1. A and B. Preoperative facial photographs showing chin deviation to the right, a retrognathic mandible, and maxillary canting.

Fig. 2. A. Maximum mouth opening preoperatively, B. 3D CT shows an irregularly shaped right condylar head with bony ankylosis and short rami.

Fig. 3. A and B. Cephalometric and panoramic radiograph at the completion of distraction (a white line: the osteotomy line in the distal segment, a dotted line: the osteotomy line in the proximal segment).
and at that time the patient had a maximum mouth opening of 42 mm (Fig. 8A, B, and C, Fig. 10A, B).

Discussion

Patients with bony TMJ ankylosis have various functional and aesthetic facial deformities. Moreover, the earlier the bony ankylosis process starts, the worse these deformities become later: retrognathic mandible, chin deviation towards the affected side, limitation of mandibular movement, facial muscle atrophy and occlusal plane cant. The main goals of treatment are successful surgical resection of the ankylosis, the prevention of its recurrence and the re-establishment of a harmonious jaw relationship and functional occlusion.

Ankylosis release and costochondral graft reconstruction continue to be used as the standard procedures to treat TMJ ankylosis. However, costochondral grafts in children are often associated with problems, such as, excessive and unpredictable growth or the necrosis and resorption of the costochondral graft.4–6 Another common problem is that the costochondral graft does not release the tension caused by the atrophic facial muscle against the graft. Because of these shortcomings, oral and maxillofacial surgeons have become interested in gap arthroplasty and distraction osteogenesis for the treatment of temporomandibular joint ankylosis.3,10

Distraction osteogenesis can shorten the admission and operation time, the risk of surgery, and the possibility of relapse.8 Above all, the direction and amount of bony lengthening can be controlled, and soft tissue as well as hard tissue can be lengthened.7

The cutaneous scars produced by the extraoral distraction of mandibular pins are always conspicuous and are often hypertrophic.1,11 In the two cases presented here, an intraoral distractor was used to avoid this problem, and oblique device placement was applied to increase the vertical and horizontal dimensions of the ramus and the body.2

The two patients described here, treated by gap arthroplasty and distraction osteogenesis, showed favourable results in terms of function and aesthetics during the follow up period of 2 years. Although more experience and long-term follow-up are needed, it is concluded that distraction osteogenesis can be useful for the resolution of bony ankylosis of the temporomandibular joint.
Fig. 6. A, B, and C. Radiographic evaluations showing lateral bony ankylosis of the costochondral graft with a glenoid fossa and coronoid process.

Fig. 7. A and B. Cephalometric and panoramic radiograph at the completion of distraction (a white line: the osteotomy line in the distal segment, a dotted line: the osteotomy line in the proximal segment).

Fig. 8. A, B, and C. Lateral and frontal facial appearance of the patient with a mouth opening of 42 mm. Thirty-four months postoperatively.

Fig. 9. A and B. Cephalometric and panoramic radiograph. Twenty-five months postoperatively.

Fig. 10. A and B. Cephalometric and panoramic radiograph. Thirty-four months postoperatively.
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