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Clinical Paper
TMJ Disorders

Pre-arthroplasty simultaneous maxillomandibular distraction osteogenesis for the correction of post-ankylotic dentofacial deformities

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Abstract. The aim of this study was to evaluate the hard and soft tissue changes after pre-arthroplasty simultaneous maxillomandibular distraction osteogenesis for the correction of post-ankylotic dentofacial deformities. This prospective study included 10 patients with unilateral temporomandibular joint (TMJ) ankylosis who presented with a facial deformity and a maxillary cant. Informed patient consent was obtained for participation. Simultaneous maxillomandibular distraction was planned based on clinical and radiographic examinations. A horizontal mandibular osteotomy was performed in the ramus and the distractor device was fixed. A bilateral Le Fort I osteotomy was then performed and a four-hole straight plate was fixed on the contralateral zygomatic buttress to act as a fulcrum. After a latency period of 5 days, the distractor was activated twice daily by 0.5 mm until the required vertical lengthening was achieved. Intermaxillary fixation was maintained during the entire distraction period. After a consolidation period of 8–12 weeks, the distractor was removed. The TMJ ankylosis was released and a temporal fascia interpositional arthroplasty was performed as second surgery, along with a genioplasty if needed. All patients were followed up for a period of 12–24 months. A marked improvement in the facial asymmetry was noted in all cases. The occlusal cant and mandibular retrusion improved satisfactorily, and the average postoperative inter-incisal opening was 35.6 mm. Pre-arthroplasty simultaneous maxillomandibular distraction offers a good treatment outcome, as it allows improvements in facial aesthetics as well as function.

Key words: temporomandibular joint; facial deformity; maxillomandibular; bimaxillary; distraction osteogenesis; Le Fort I osteotomy.

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Temporomandibular joint (TMJ) ankylosis is a joint disorder caused by bony or fibrous adhesion of the anatomical joint components. The most common cause of TMJ ankylosis is trauma (13–100%), followed by local or systemic infection (0–53%) and systemic diseases such as ankylosing spondylitis, rheumatoid arthritis, and psoriasis (28%); it may also occur after any TMJ surgery.[1–6] TMJ ankylosis not only limits mouth opening and chewing, but may also affect the growth of the mandible as well as the maxilla. When it occurs in children, it can cause secondary dentofacial deformities leading to psychological problems such as low self-esteem and an inferiority complex.

Post-ankylotic facial deformities include micrognathia, reduced facial height, poor jaw–neck definition, chin shift to the affected side, and occlusal discrepancies.[6] In unilateral cases, a cant of the occlusal plane is frequently observed due to mandibular hypoplasia on the affected side, and hence a secondary ipsilateral vertical deficiency in the maxilla.[7–9] The management of these dentofacial deformities due to TMJ ankylosis remains a challenge for surgeons and a series of operations is often required.

In 1905, Codvilla described distraction osteogenesis as an effective technique for lengthening the mandible.[10] Lopez and Dogliotti stated that they preferred to restore the jaw movements first and address the secondary facial deformities later in paediatric patients with TMJ anklyosis.[11] In contrast, Ortiz-Monasterio et al.[12] and Cho et al.[13] recommended simultaneous bimaxillary distraction osteogenesis using external devices in patients with hemifacial microsomia for the correction of facial asymmetry. Others have advocated simultaneous mandibular distraction and arthroplasty in such patients, but have reported an unstable proximal condylar segment as a remaining problem during the distraction process.[14–16] Sadakah et al. evaluated the feasibility of transoral bimaxillary distraction osteogenesis before releasing TMJ ankylosis using intraoral mandibular distractors in nine patients and found this to be a feasible and perhaps advantageous technique.[7]

The aim of the present study on post-ankylotic facial deformity was to assess the feasibility of pre-arthroplasty bimaxillary distraction osteogenesis to correct the deformity and also to evaluate the hard and soft tissue changes.

Materials and methods

Ten patients with unilateral TMJ ankylosis presenting with a facial deformity and maxillary cant, ranging in age from 15 to 35 years, were included in this study (Fig. 1); institutional ethics clearance was obtained prior to recruitment. The diagnosis of TMJ ankylosis was based on clinical and radiographic evidence, including a computed tomography (CT) scan. Patients with bilateral TMJ ankylosis, recurrence, who were medically compromised, and those not consenting to surgery were excluded. All patients were informed about the surgical procedure and possible complications, and consent for the treatment was obtained and recorded. All patients were operated on by a single surgeon. A two-stage surgical protocol was followed: the first stage comprised a unilateral mandibular osteotomy with fixation of the distractor device to the ramus and a complete Le Fort I osteotomy, with intermaxillary elastics maintained during the distraction phase; the second stage comprised osteoarthrectomy and a temporal fascia interpositional arthroplasty, which were performed later with removal of the distractor, and a genioplasty if needed.

Preoperative clinical assessment included evaluations of facial aesthetics, function, and occlusion. Panoramic radiographs and CT scans were used to determine the extent of the ankylotic mass and for surgical planning. Radiological evaluation was based on postero-anterior (PA) and lateral cephalograms (Fig. 2a–e).

The vertical and transverse positions of the mandibular angles were assessed by constructing the mandibular triangle on a PA cephalogram using sphenofrontal junction (SF) (where the smaller wing of the sphenoid crosses the medial orbital ridge), M (the inferior-most point on the mastoid bone), gonion (Go; the inferior-most posterior point at the angle of the mandible), cranial base plane (C-plane), occlusal plane, and C (midpoint of the C-plane where geometric midline (GM) crosses) (Fig. 3a). The height of the mandibular ramus was measured as the distance between M and Go. Occlusal cant (°) was measured by the angle formed between the occlusal plane and true horizontal plane. The mandibular triangle was constructed by connecting C–Go–Go bilaterally. The lengths of C–Go were evaluated and GM–Go was compared on both sides to assess the transverse discrepancies (Fig. 3a).

The parameters used to observe angular changes were sella–nasion–A-point (SNA), sella–nasion–B-point (SNB), nasolabial angle, and facial convexity angle. Changes in the position of various hard tissue points of the maxilla (anterior nasal spine (ANS), A-point, upper incisor edge (U1E)) and mandible (lower incisor edge (L1E), B-point, pogonion (Pog)), and their corresponding soft tissue points (pronasale (Pn), subnasale (Sn), labrale superior (Ls),

Fig. 1. (a) Preoperative front view of a TMJ ankylosis patient showing gross facial asymmetry and an occlusal cant; (b) preoperative profile; (c) preoperative occlusion; (d) preoperative inter-incisal mouth opening.