

Simultaneous Interpositional Arthroplasty with Ramus Lengthening Using Intra Oral Distractor- A Prospective Study

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ABSTRACT

Background: The aims of the study were to evaluate the efficacy of simultaneous interpositional arthroplasty with distraction osteogenesis (DO) as a single procedure. **Methods:** Nine patients of temporomandibular joint (TMJ) ankylosis with micrognathia were treated with interpositional arthroplasty and simultaneous DO and followed for a period of minimum 3 years. Preoperative, immediate postoperative, at the end of distraction, at 6 months and 3 years postdistraction consolidation radiographs were taken along with the clinical examination for mouth opening, deviation, length of the mandible and ramus, midline shift, occlusal cant, and occlusion. **Results:** The results showed an increase in the mouth opening, length of the mandible and ramus height, correction of deviation, occlusion, and midline shift. one patient developed infection at the distractor site. There was an overall improvement in the facial asymmetry. **Conclusion:** Simultaneous interpositional arthroplasty with DO should be used to correct TMJ ankylosis associated with facial asymmetry/micrognathia, as it reduces the need for second surgery, thereby saving the trauma of a second surgery and difficulty in intubation, increases the length of the mandible, corrects the deformity, thereby resulting in an acceptable facial esthetics and function.

Keywords: tmj ankylosis; distraction osteogenesis.

INTRODUCTION

Temporomandibular joint (TMJ) ankylosis is the fusion of the condyle to glenoid fossa resulting in limited movement of the mandible leading to severe debilitation. If it occurs at a young age, it can affect the growth of the mandible, leading to micrognathia, retruded chin, reduced airway, compromised function, and esthetics. Diagnosis and treatment, if done at an early age, would save the patient from psychological trauma and help in the overall growth. Treatment of TMJ ankylosis with mandibular micrognathia restores the form, function, and facial esthetics. The treatment varies from center to center, which includes resection of the ankylotic mass with physiotherapy, reconstruction with costochondral graft, and orthognathic surgery to reconstruction with prosthesis recently to the distraction. The distraction osteogenesis (DO) offered the option of lengthening the mandible, providing space for correction of crowding and eruption of hitherto unerupted teeth, correction of occlusal cant, midline shift, and gross asymmetry. The main bone of contention was whether to perform the surgery as a single stage procedure or as a two-staged procedure. In this study, we decided to do interpositional arthroplasty and osteotomy for DO simultaneously.

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MATERIALS AND METHODS



This clinical study was conducted in the Department of Oral and Maxillofacial Surgery, SGT Dental College Dehli on patients with TMJ ankylosis treated by interpositional arthroplasty and simultaneous DO. The patients were evaluated with regard to maximum pre- and post-operative mouth opening, midline shift, and cephalometric analysis (which includes length of condylion to gonion for ramus height and gonion to gnathion for body length) including complications and recurrence of

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ankylosis, if any. The final results, after compilation, were assessed using SPSS version 18.



Surgical technique

As with all our major surgeries, a strict premedication protocol was followed to relieve the anxiety and apprehension of the patient before the surgery and facilitate smooth induction which comprised anti-anxiety drugs, anticholinergics, antiemetics, H2 blockers, and prophylactic antibiotics. All patients were advised not to take any food for 10 h prior to surgery. Following the standard norms of painting and draping, all the patients were operated under general anesthesia using fiberoptic nasendotracheal intubation. Tracheostomy was usually avoided, except in few cases where fiberoptic intubation was unsuccessful. To approach the TMJ area, standard Al-Kayat and Bramley incision was used as it gives direct access to the ankylotic mass. The periosteum over the zygomatic arch and the

ramus were incised and elevated to expose the ankylotic bony mass. A condylar retractor was placed to protect the tissues medial to the condyle. Bone was removed by making a cut below the identifiable zygomatic arch and another cut about 1.5 cm below this using a straight fissure bur from posterior border to sigmoid notch or anterior border of the coronoid process further, using a chisel the block of bony mass was removed. The irregular edges were smoothed by large round bur. A temporalis myofascial flap was raised and interpositioned between the zygomatic arch and the mandible due to its proximity and ease of use, stability, owing to its connection at the base, its availability at the same surgical site, and its lack of cosmetic, and functional morbidity;^[1] apart from this, in our opinion, it provides the bulk and may offer resistance to re-ankylosis, especially in DO. All the cases underwent osteotomy for DO in the same procedure. This was achieved by making an osteotomy in the region of angle and placing a bone-borne unidirectional distractor after exposing via a submandibular incision. An oblique vector, resulting in both vertical and horizontal elongation of the mandible, will result when the osteotomy is performed at an angle between 0° (the vertical vector) and 90° (the horizontal vector) to the occlusal plane, generally in the angle region of the mandible.^[1] Whenever possible, physiotherapy was initiated for most cases on day 3 or latest by 5th day postoperatively and continued over a period of 3 months.



Distraction was initiated on 5th day postoperatively and continued till midline shift was corrected in case of unilateral ankylosis and in case of bilateral ankylosis distraction was carried out till the chin was brought forward to correct the deformity. Slight overcorrection of about 2 mm was made to compensate for the relapse. Distractor was left in place for 12 weeks for consolidation, and then removed under general anesthesia. Based on the surgeon's preference, the period of time for bony consolidation varies.^[1] We used a consolidation period of 12 weeks (3 months) based on the

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radiographic findings which showed a bony cortex by that time, in our opinion, mature bone might reduce relapse.



RESULTS

The mean age of patients was 15.5 years with four males and five females. Of this, 4 (44.44%) were left and 4 were right and one (11.11%) was bilateral ankylosis. Infection was the major cause of ankylosis in our institution comprising 54.4%, followed by trauma, one case was due to birth trauma (12.11%) and two cases due to fall (20.22%). The mean preoperative mouth opening was 4.89 ± 1.81 mm; the mean postoperative mouth opening was 33.89 ± 1.98 mm, which was statistically significant ($P < 0.001$). The chin deviation was also corrected to acceptable limits. We noted that even though the midline discrepancy was corrected to a great extent, still there was, on an average, a midline shift of 2.9 mm still remaining to be corrected. The gross occlusal discrepancy was corrected in most of our cases, together with correction of the occlusal cant and lengthening of the mandibular ramus height and body length, which resulted in the eruption of the teeth, finer occlusal corrections were made with orthodontic treatment. In one case, the patient developed infection (11.11%) which was taken care of; as compared to a study done by Verlinden et al,^[2] where they reported 21% of infection in a systematic review complications of DO in acquired deformities and an overall complication of 44%.

DISCUSSION

Restoration of normal function and motion in pediatric patients with TMJ ankylosis has been difficult, especially because of the severe retrognathia. Therefore, when treating these patients, two parameters must be addressed: the ankylosis, with care to prevent re-ankylosis, and mandibular growth. Until now, the standard treatment for these patients has been resection of the ankylosed condyle and its replacement with a free graft that provides the cartilage-bone interface and a growth site.^{20a21} Unfortunately, these procedures have unpredictable results as far as the growth pattern is concerned, and many of these patients have required multiple

surgeries. With the advent of distraction osteogenesis for the treatment of mandibular hypoplasia, a new chapter has been opened in the surgical management of patients with congenital or acquired anomalies of the lower jaw. Several articles have been published presenting patients with hemifacial microsomia treated with callous distraction techniques.^{*,19,**} In this report, we describe the simultaneous treatment of TMJ ankylosis and mandibular hypoplasia using callous distraction. This mode of treatment has several advantages over the previous technique of costochondral grafting. The amount and direction of mandibular growth or lengthening is more predictable because the clinician is able to control the callus distraction. In addition to the skeletal manipulation and bone healing, the other major advantage is the ability to increase the soft tissue during the distraction process. These tissues do not simply become attenuated during distraction, but rather undergo synthesis and regeneration.^{2,3} The enhancement of the surrounding soft tissue produces superior aesthetic results. The use of bidirectional and multidirectional distraction devices allow three-dimensional augmentation. The appropriate rate of callous lengthening creates well-vascularized bone in the distraction gap that is not subject to the process of graft incorporation and resorption. A second surgical site for bone harvesting is not necessary, thus reducing the operating time, the risk for blood transfusion, and the postoperative morbidity. Not unlike all surgical techniques, distraction osteogenesis also has some disadvantages. The distraction device has to remain in place for a period encompassing the lag, distraction, and healing period of the bone. This may have some psychologic effect on a child. The external devices leave scars that result from the pin tracks in the skin. The absolute compliance of the patient and the family is of utmost importance, and close and frequent follow-up is needed. The high cost of the device may also be a disadvantage. To maximize the advantages of this technique, preservation of the periosteum at the osteotomy site, good segment immobilization, the correct lag period, and the appropriate rate and rhythm of distraction are all very important. In our patient, we waited 5 days before initiation of distraction. In younger patients, a shorter lag period is acceptable. We used a rate of distraction of 1 mm/d. The optimum rate of distraction is one that allows for lengthening with bone formation. If the rate is too rapid, immature bone will form, and if it is too slow, fibrosis of the callus will occur. A continuous rhythm of distraction is ideal, with a lengthening of 1 mm a day. The distraction device was left in place for 6 weeks after completion of distraction in this patient to allow for adequate consolidation and maturation of the bony callus. We performed a complete osteotomy in the mandibular ramus in this

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patient; as shown by others, there is no need to perform only a corticotomy as proposed by Ilizarov. Use of an osteotomy is an equally predictable procedure, and new bone forms in the clot between the two segments, and is formed by the periosteum that surrounds the osteotomy. The design of the osteotomy left the angle of the mandible intact, because the angle is a very important aesthetic component of the face. By alternate lengthening of the horizontal and vertical vectors in our patient, we were able to improve the steep mandibular plane angle, and the angles of the mandible became more pronounced by including them in the distal segment. Because of the lack of long-term data with respect to skeletal relapse, we believed it was important to overcorrect the mandibular hypoplasia in this patient and thus produced an edge-to-edge occlusion. The mandibular lengthening also produced an unstable malocclusion. Thus, a functional appliance was fabricated after removal of the distraction device to maintain the position of the jaw. The importance of combined surgical and orthodontic treatment for these patients also must be stressed. This patient will now proceed with orthodontic treatment that will include correction of the transverse deficiency of the maxilla and alignment and decompensation of the arches. Despite the disadvantages that have been stated, it is our opinion that the advantages of this technique largely outweigh its drawbacks. If the principles of osteodistraction set by Ilizarov¹⁻³ and McCarthy et al⁴ are followed closely, these patients can have a greatly improved functional and aesthetic result. As new research findings and advances in technologic development occur, these disadvantages will be minimized.

CONCLUSION

Simultaneous DO and ankylosis release is a good alternative to improve function and esthetics at the same time.

REFERENCES

1. Ilizarov GA: The principles of the Ilizarov method. Bull Hosp Joint Dis 48: 1, 1988
2. Ilizarov GA: The tension-stress effect on the genesis and growth of tissues: Part I. The influence of stability of fixation and soft tissue preservation. Clin Orthop 238:249, 1989
3. Ilizarov GA: The tension-stress on the genesis and growth of tissues: Part II. The influence of the rate and frequency of distraction. Clin Orthop 239:263, 1989
4. McCarthy JG, Schreiber J, Karp N, et al: Lengthening the human mandible by gradual distraction. Plast Reconstr Surg 89:1, 1992
5. Miloro M, Ghali GE, Larsen P, Waite P. Peterson's Principles of Oral and Maxillofacial Surgery. 3rd ed. New Delhi: CBS Publishers & Distributors Pvt. Ltd.; 2012. p. 1145, 1475, 1473. [Google Scholar]
6. Verlinden CR, van de Vijfeijken SE, Tuinzing DB, Becking AG, Swennen GR. Complications of mandibular distraction osteogenesis for acquired deformities: A systematic review of

- the literature. Int J Oral Maxillofac Surg. 2015;44:956-64. [PubMed] [Google Scholar]
7. Qudah MA, Qudeimat MA, Al-Maaita J. Treatment of TMJ ankylosis in Jordanian children – A comparison of two surgical techniques. J Craniomaxillofac Surg. 2005;33:30-6. [PubMed] [Google Scholar]
8. Papageorge MB, Apostolidis C. Simultaneous mandibular distraction and arthroplasty in a patient with temporomandibular joint ankylosis and mandibular hypoplasia. J Oral Maxillofac Surg. 1999;57:328-33. [PubMed] [Google Scholar]
9. Rao K, Kumar S, Kumar V, Singh AK, Bhatnagar SK. The role of simultaneous gap arthroplasty and distraction osteogenesis in the management of temporomandibular joint ankylosis with mandibular deformity in children. J Craniomaxillofac Surg. 2004;32:38-42. [PubMed] [Google Scholar]
10. Yu H, Shen G, Zhang S, Wang X. Gap arthroplasty combined with distraction osteogenesis in the treatment of unilateral ankylosis of the temporomandibular joint and micrognathia. Br J Oral Maxillofac Surg. 2009;47:200-4. [PubMed] [Google Scholar]
11. Zhu S, Wang D, Yin Q, Hu J. Treatment guidelines for temporomandibular joint ankylosis with secondary dentofacial deformities in adults. J Craniomaxillofac Surg. 2013;41:e117-27. [PubMed] [Google Scholar]
12. Fieldhouse J. Bilateral temporomandibular joint ankylosis with associated micrognathia – Report of a case. Br J Oral Surg. 1974;11:213-6. [PubMed] [Google Scholar]
13. Su-Gwan K. Treatment of temporomandibular joint ankylosis with temporalis muscle and fascia flap. Int J Oral Maxillofac Surg. 2001;30:189-93. [PubMed] [Google Scholar]

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