Management of Obstructive Sleep Apnea Syndrome Associated with Severe Micrognathia

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ABSTRACT

Obstructive sleep apnea syndrome (OSAS), commonly associated with mandibular micrognathia, is a serious condition that can lead to various devastating cardiovascular and neurocognitive consequences. Patients of OSAS with micrognathia present with many functional and esthetic problems. Therefore, comprehensive management of these patients requires multiple surgeries and frequent follow-up. Several surgical and non-surgical treatment options have been proposed for the treatment of OSAS. Distraction osteogenesis (DO) in maxillofacial region, although a newer treatment modality, is being increasingly favoured by many surgeons because of its many advantages over other treatment methods. We present comprehensive management of a case of OSAS associated with post temporomandibular joint ankylosis severe micrognathia. Various surgical treatment methods including DO and conventional orthognathic surgical procedures were employed in management of this patient of obstructive sleep apnea. Both functional and esthetic complaints of the patient were addressed, and we achieved exceptional results at the end of treatment.

Key Words: *Obstructive sleep apnea syndrome. Micrognathia. Distraction osteogenesis.*

INTRODUCTION

Obstructive sleep apnea syndrome (OSAS) is temporary but repeated interruption of normal breathing during sleep. Sleep apnea is a common disorder with significant adverse health consequences.[1] The narrowing of airway causes increase in negative intrathoracic pressure during sleep, which results in sleep fragmentation and excessive daytime somnolence. The prolonged consequences are obesity, glucose intolerance, hypertriglyceridemia, and hypertension, described as a deadly quartet.

Maxillofacial skeletal abnormality is a well-recognised cause of OSAS. Normally, the tongue is held forward by the attachments of the genioglossus muscle to the lingual surface of the mandibular symphysis. Retrognathia, with or without micrognathia, positions the base of the tongue posteriorly causing obstruction of airway.[2] Airway obstruction is especially marked in the supine position as the force of gravity causes the tongue base to abut posterior pharyngeal wall.[3]

Here, we present a case of severe micrognathia and obstructive sleep apnea, which was treated by a series of different surgical procedures.

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CASE REPORT

A 20-year female undergraduate student presented with complaint of progressively increasing episodes of night time snoring and apnea and day time somnolence, dizziness, and drowsiness for the last 5 years. She also had unaesthetic facial profile because of extremely deficit mandible. She had history of bilateral condylar fractures due to fall and subsequent development of temporomandibular joint (TMJ) ankylosis 10 years back. Bilateral interposition arthroplasty was performed to achieve optimum mouth opening at the age of 10 years. Past medical, personal as well as drug history was not contributory.

On extraoral examination, she had a typical bird face appearance with extremely deficit mandible in sagittal plane (Figure 1). Lateral cephalometric analysis revealed SNA angle in normal range, i.e. 78° and extremely decreased SNB angle of 52°. It was a high angle case and she had vertical growth pattern as Y axis was 96° (normal value = 66 ±3°). Ratio of posterior facial height to anterior facial height was increased while lower anterior facial height, Jarabak's ratio, and mandibular corpus length were all less than normal. She had optimal mouth opening (inter-incisal distance = 30 mm). On intraoral examination, she had class II malocclusion, increased upper incisal show, proclination of upper and lower anterior teeth and 15 mm of overjet.

A comprehensive management of patient was carried out in three phases. Phase I included advancement of mandible by distraction osteogenesis for micrognathia and OSAS, orthodontic treatment, advancement genioplasty with interposition iliac crest bone graft. Phase II involved bimaxillary orthognathic surgery to treat any residual deformity. Phase III was the final settling of occlusion by orthodontic treatment.

Figure 1: Preoperative photographs: (a) front view, (b) profile view, (c) lateral cephalogram.

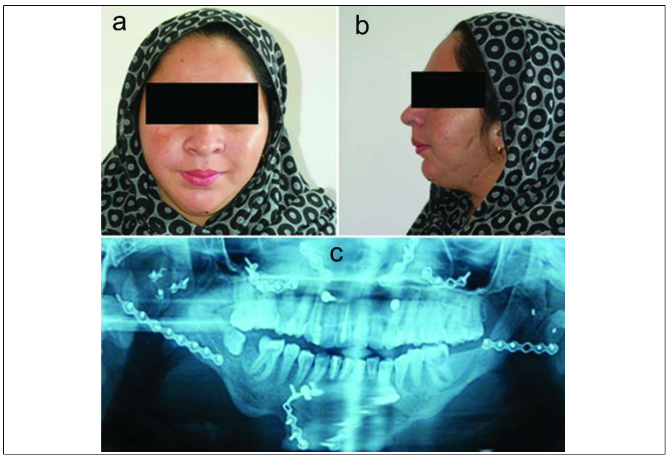

Figure 2: Postoperative photographs (2 years after last surgical intervention: (a) frontal view, (b) profile view, (c) Orthopantomogram.

During phase I surgery, bilateral monoplane distractors were placed by extraoral Risdon's approach. As increase in vertical ramal height and advancement of mandible in sagittal plane were required, the distractors were placed in an oblique vector. After the latency phase of one-week, distraction was started at the rate of 1.05 mm per day on each side by anticlockwise rotation of distractors three times a day (one anticlockwise rotation = 0.35 mm). The symptoms of OSAS regressed considerably after approximately 20 mm distraction of mandible in downward-forward direction, but patient was not satisfied till then as far as her facial esthetic was concerned. As patient had undergone multiple surgeries, she opted for a comparatively less invasive surgical intervention to improve her facial profile. Sagittal advancement genioplasty of 15 mm with interposition bone grafting was performed. Although there was marked improvement in her facial profile but still there was vertical maxillary excess with excessive gummy smile.

After six months, patient wanted further improvement in her facial profile. At that time, it was really challenging to do further surgical intervention. The authors along with colleague in Germany, Alexander Schramm, formulated a surgical plan of 10-mm vertical maxillary impaction by Lefort I osteotomy and mandibular advancement by inverted L osteotomy with interposition bone grafting and fixation with miniplates. The plan was executed and there was significant improvement in her facial profile (Figure 2). Final settling of occlusion was done by finishing orthodontic treatment. Later on, six weeks after final surgery, patient met a road traffic accident resulting in avulsion of four lower anterior teeth and two upper anterior teeth. The avulsed teeth were replanted; later on, their root canal treatment was carried out and the occlusion was adjusted with elastic traction by applying four IMF screws: two in maxilla and two in mandible, thus re-orthodontic treatment was avoided. Patient had considerably improved esthetics at the end of treatment and was quite satisfied regarding the functional and esthetic outcome of her treatment (Figure 2).

DISCUSSION

Various treatment options have been suggested for OSAS, including use of nasal continuous positive airway pressure, or an oral appliance to keep the mandible forward during sleep. Surgeries including uvulopalato-pharyngoplasty, laser-assisted uvulopalatoplasty, maxillo-mandibular osteotomy, distraction osteogenesis, and hyoid suspension are other therapeutic alternatives for OSAS.[4]

Distraction osteogenesis (DO) has become an effective surgical technique for correction of deformities in craniofacial region. It is a process in which osteotomised bone segments are mechanically moved by externally or internally placed devices to form new bone at the osteotomy site. DO has several advantages over conventional orthognathic surgery as it reduces surgical stress, requires no bone grafting, induces soft-tissue regeneration, and enables extensive bone lengthening. Because of these advantages, distraction is widely used for treatment of hypoplastic mandible and OSAS in a wide range of acquired and congenital disorders. In a recent prospective study,[5] it has been shown that distraction osteogenesis results in considerable improvement of facial esthetics in case of severe mandibular deficiency. In another study, Zanaty O and colleagues have concluded that DO of mandible results in marked improved in apnea-hypopnea index in patients of obstructive sleep apnea.[6] It has been shown that DO can also result in avoidance of need of tracheostomy in infants and young patients with severe airway obstruction due to mandibular micrognathia.[7]

TMJ ankylosis and associated dentofacial deformities can be surgically managed by single-stage or multistage treatment protocols.[8] Generally, single-stage treatment produces satisfactory outcomes in patients with mild to moderate dentofacial deformities. But in patients with severe jaw deformities, usually multistage surgical treatment is required. Since this patient had severe mandibular hypoplasia, a multistage treatment protocol was employed.

Distractors can be broadly divided into monoplanar and multiplanar distractors. Monoplanar distractors move the osteotomised bone in only one direction depending on the vector in which distractor is placed, i.e. vertical,

horizontal or oblique.[9] Whereas, with multiplanar distraction devices, it is possible to manipulate vector during the activation phase. Monoplane distraction, if employed, for the treatment of severe multidimensional jaw deformities might later require conventional orthognathic surgical procedures for better outcome. Even patients treated with bi-directional distractor, surgical interventions like genioplasty or Lefort 1 osteotomy may be required for fine esthetic adjustments. Similarly, in this case monoplane distractor was used to augment mandible primarily in sagittal plane while conventional orthognathic surgical procedures addressed further deformity. The inverted L ramus osteotomy was required due to severe deficiency or probable underutilisation of distraction.

In conclusion, mandibular distraction osteogenesis, supported by conventional orthognathic surgery procedures, can have effective functional and esthetic outcomes in case of severe mandibular micrognathia associated with obstructive sleep apnea syndrome.

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