Management of Obstructive Sleep Apnea: Role of Distraction Osteogenesis

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KEYWORDS

• Distraction osteogenesis • Obstructive sleep apnea
• Orthognathic surgery • Maxillomandibular advancement
• Respiratory disturbance index

In the past, oral and maxillofacial surgeons were consulted on patients with obstructive sleep apnea (OSA) only when other methods of treatment, such as continuous positive airway pressure, dental appliances, and soft tissue operations, failed.[1–6] Maxillomandibular advancement (MMA) to enlarge the skeleton and thereby expand the soft tissue airway was a treatment of ''last resort.'' With time, the high level of success achieved by MMA has been well documented[5–10] and oral and maxillofacial surgeons are now regularly consulted by sleep medicine physicians and OSA patients earlier in the course of disease.

The indications for distraction osteogenesis (DO) in patients with OSA include infants and children with airway obstruction as a result of congenital micrognathia or midface hypoplasia (**Fig. 1**). These patients may have Treacher Collins or Nager syndromes, craniofacial microsomia, syndromic or nonsyndromic Robin sequence, and syndromic or nonsyndromic midface hypoplasia. They have OSA as a result of severe micrognathia, short posterior face height, malposition of the tongue base,[11] or midface deficiency and choanal atresia. A significant number of these patients are tracheostomy-dependent and they require large advancements (>15 mm) to adequately improve the upper airway. Because of the magnitude of advancement needed, DO is the treatment of choice. The ultimate goal is to prevent tracheostomy or to decannulate the trachea in patients who already have a surgical airway.

OSA may also occur in adults with mandibular or maxillary retrognathia manifest by a convex profile and a short chin-to-throat distance (**Fig. 2**). Occasionally, these patients may have an orthognathic profile. The magnitude of advancement required to successfully manage OSA (10–15 mm) in these adults is less than in patients with congenital or infant airway obstruction. The advancement can often be achieved by standard osteotomies and acute lengthening. DO is chosen if the patient is unwilling to accept the risk of inferior alveolar nerve paresthesia with standard orthognathic surgery or if special circumstances (eg, multiple operations for cleft lip/palate, large magnitudes of advancement, maxillofacial radiation therapy) prevent successful skeletal expansion by traditional osteotomies.

This article discusses the role of DO in the management of airway obstruction and OSA.

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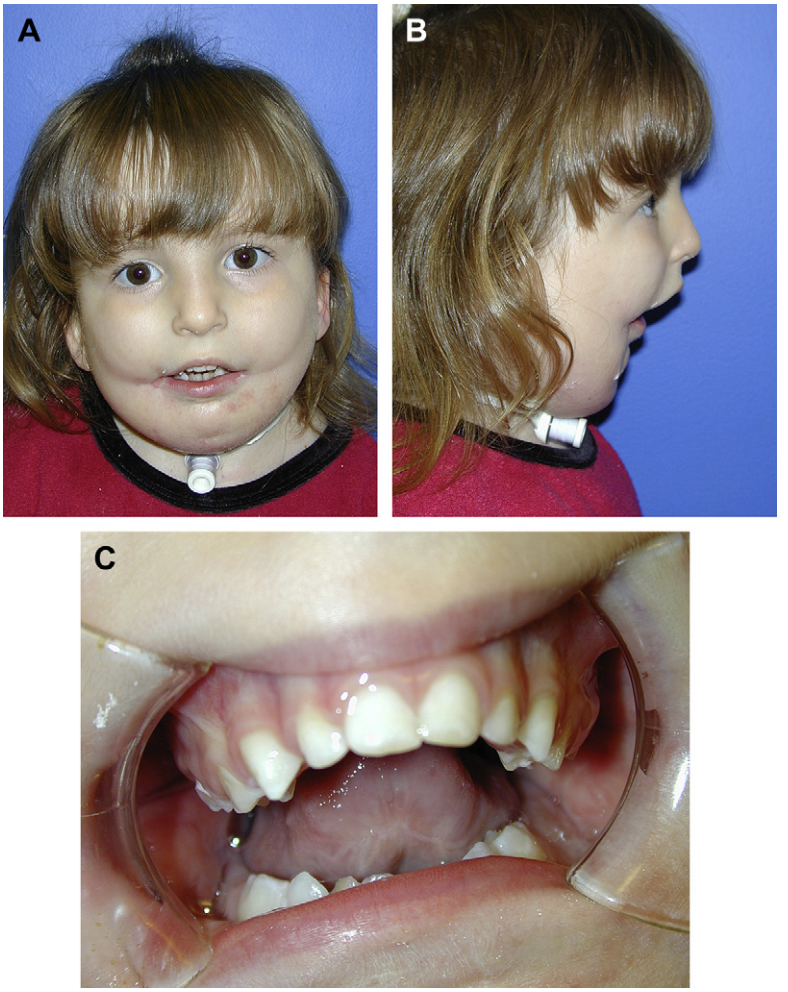

Fig. 1. Frontal (*A*), lateral (*B*), and intraoral (*C*) preoperative photographs of a 2-year-old girl with first and second pharyngeal arch deformity. The resultant micrognathia has necessitated a long-term tracheostomy to secure her upper airway.

PREOPERATIVE EVALUATION

History and Physical Examination

The diagnosis of OSA is established on the basis of history, physical examination, polysomnography, and the appropriate radiologic evaluation. History and physical examination in adults with OSA is similar, whether standard orthognathic surgery or DO is contemplated. When considering DO in patients with congenital or infant airway obstruction, specific elements in the history and physical examination should be evaluated.

Signs and symptoms of children with OSA vary with age.[12] These children may present with retarded growth, poor eating, crying spells, daytime fatigue, enuresis, poorly established day-night sleeping cycles, and so forth.[12–14] Parents may not associate these symptoms with abnormal sleeping or airway obstruction.[12]

The physical examination should include a thorough nasal and oropharyngeal evaluation. This is especially true because lymphoid tissue hypertrophy is a frequent cause of snoring and airway obstruction in infants and toddlers.[15] In these cases, soft tissue procedures, such as tonsillectomy and adenoidectomy, may be curative.[15] The craniofacial skeleton should be evaluated to identify anomalies that predispose to airway obstruction, such as maxillary or mandibular hypoplasia. The presence of excessive overjet, crossbite, and the morphology of the palate and tongue must be noted. The physical evaluation is often completed with fiberoptic nasopharyngoscopy.[16]

Radiographic Evaluation

Traditionally, lateral cephalograms have been used to evaluate the airway anatomy of patients