

ANTERIOR MAXILLARY DISTRACTION: A VIABLE SURGICAL ALTERNATIVE TO CONVENTIONAL ORTHOGNATHIC SURGERY OR TOTAL MAXILLARY DISTRACTION OSTEOGENESIS FOR MILD TO MODERATE CLEFT MAXILLARY HYPOPLASIA

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Abstract

Although cleft maxillary hypoplasia can be effectively managed using either Lefort 1 maxillary advancement with conventional orthognathic surgery or with total maxillary distraction osteogenesis, yet many studies have demonstrated velopharyngeal closure problems and distortion of speech post-surgery with either of the two modalities. Further more conventional orthognathic surgery is riddled with high relapse rates and requires completion of growth to perform the surgery. Therefore, the need for a surgical procedure that is not only stable but also has minimal or no effect on velopharyngeal function and speech becomes prudent. Anterior maxillary distraction is one such modality of treating cleft maxillary hypoplasia. This article presents a short comprehensive review about anterior maxillary distraction including the merits and demerits of the technique.

Keywords: Cleft maxillary hypoplasia, anterior maxillary distraction, orthognathic surgery, relapse, distraction osteogenesis

Introduction

Cleft maxillary hypoplasia especially in an anteroposterior direction with a relative class III malocclusion, is a challenging problem to deal with from the aesthetic and functional point of view.

Traditionally, surgical management has focused on the sagittal advancement of entire maxilla at Lefort I level by orthognathic surgery to correct anteroposterior relation. However, studies have shown this procedure to be highly unstable especially when maxillary advancement exceeds 6mm owing to soft tissue tension exerted by scar contracture

from multiple previous surgical interventions thereby contributing to higher relapse rates in cleft cases^{1,2}. Relapse noted in few studies ranges from 22 to 40% in a horizontal plane and from 19 to 70 % in vertical plane³. Furthermore, orthognathic surgery can be preferred only following growth completion in adolescence period usually at 16 to 18 years.

Distraction osteogenesis (DO) of the entire maxilla is another treatment option which allows for slow regeneration of bone accompanied by an expansion of surrounding soft tissue envelope, which

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makes larger movements possible with better long term stability thus lessening the risk of relapse. Horizontal relapse following DO has been found to be in the range of 5.5 to 23% in horizontal plane³. DO can be performed using either Rigid External Distraction or internal distraction which have their inherent merits and demerits⁴.

Although both these techniques produce desirable results in overall facial balance, aesthetics, and articulation, they both can alter the velopharyngeal relation because the movement of entire maxilla results in movement of the posterior border of hard palate with its soft tissue attachment. The effect of maxillary advancement on the velopharyngeal (VP) mechanism remains controversial. Although some studies have reported no evidence of meaningful changes in VP function⁵⁻⁶, others have observed VP closure problem after maxillary advancement surgery⁷⁻⁸

As speech is considered a primary outcome measure of cleft lip and palate management, it, therefore, makes sense to choose a surgical technique which not only provides stable long term results but also does not hinder VP closure and speech. The distraction of anterior maxillary segment is one such novel technique that not only brings about improvement in facial balance and aesthetics and provides stable occlusion but also has no detrimental effect on speech and VP function⁹⁻¹¹. In contrast to conventional orthognathic surgery and DO of the entire maxilla, only the anterior maxillary segment is advanced by distraction, keeping the posterior aspect of the maxillary segment in contact with the posterior pharyngeal wall.

Block and Brister first reported on the clinical application of AMD using intraoral tooth borne distraction in dogs in 1994 followed by Dolanmaz et al in humans in 2003¹². Anterior Maxillary Distraction (AMD) has the distinct advantage of not worsening or affecting the velopharyngeal function as muscles of

velopharynx are not affected by anterior maxillary advancement and the VP closure remains intact⁹⁻¹¹.

In a study by Richardson et al^{9,10}, a statistically significant improvement of 62%, 64 %, 50%, 68% and 70 % in VP incompetence, resonance, nasal air emission, articulation, and intelligibility respectively was noted. Worsening of speech parameter was noted only in a single patient. The improvement was greater in those 10 to 20 years old. When the lateral cephalograms pre and post distraction were compared in these patients, posterior movement of the posterior aspect of maxilla as evidenced by distal movement of molars was noted in 62.96 % of these patients. This movement helped in bringing the posterior border of soft palate close to the posterior pharyngeal wall, therefore, contributing to meaningful improvement in VP incompetence. Furthermore, one need not wait for growth completion like in Lefort I Maxillary advancement as AMD can be undertaken immediately following eruption of second premolars (at around 10 years of age)⁹⁻¹¹.

The results of AMD have been found to be stable with negligible relapse. In a study by Richardson et al⁹ in 147 patients, 140 patients demonstrated stable results with relapse noted in 7 patients (4.76%) over a 1 to 4 year follow up period. Advancement up to 13mm (range 4 to 13 mm with the mean advancement of 9.42 mm) was noted by the authors in the similar study. The authors were of the view that although small advancements up to 6mm are amenable to orthognathic surgery, yet they resorted to AMD in such cases as there is strong evidence to support that VP incompetence can occur with even smaller advancements. A study by Chua et al reported that an advancement as small as 4 mm can result in deterioration of VP function¹³. Furthermore, AMD contributes to unhampered if not improved speech and VP function⁹⁻¹⁰. The procedure also causes striking improvements in facial balance

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with increased tip support and normal protrusion of previously retruded lips. The pre-operative concave profile changed to straight or convex profile^{9-11, 14}.

AMD can be brought about using Rigid External Devices or internal distractors as well as intra oral palatal distractors^{9-11, 14}. Tooth borne distractors compared to RED or internal distractors offer the advantages of less conspicuousness, non-surgical fixing of the appliance in the mouth and a procedure that is financially, socially and psychologically acceptable to the patient. However, similar to internal distractors, the vector cannot be altered during the distraction phase. Furthermore, maintenance of oral hygiene can be difficult in the presence of the distractor.

Conclusion

Considering all these merits, AMD can be a suitable alternative for management of mild to moderate cleft maxillary hypoplasia (range 5 to 10 mm). Stable long term results have been observed in studies with negligible skeletal relapse with an added advantage of unhampered or even improved speech and VP function as compared to traditional orthognathic surgery or DO of the entire maxilla. This makes AMD an attractive treatment option considering all the merits that this treatment modality has to offer.

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