Surgically Assisted Maxillo-mandibular Transverse Expansion

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Introduction

The skeletal correction of transverse maxillary deficiency is difficult via orthodontics and orthopedics after 18 years of age and is successful until the age of approximately 13-15 years depending on the gender of the patient [1,2]. After the skeletal maturity, orthodontic treatment alone cannot provide stable widening of constricted maxilla. The area of increased skeletal resistance to expansion is indeed not the mid-palatal suture, but the pterygomaxillary, zygomatico temporal, zygomatico frontal and zygomatico maxillary [3,4]. The skeletal mandibular transverse deficiency is a difficult clinical situation to handle by orthodontic means alone. This case report highlights the successful management of transverse maxillo-mandibular discrepancy by combined orthodontic-surgical approach.

Case Report

A 16 year old male patient presented with inability to chew food, to pronounce certain words, poor dentofacial esthetics, repeated episodes of inflammation and bleeding gums, traumatic ulceration of lips and mild obstruction in breathing associated with snoring.

Clinico-cephalometric correlation of all findings in this case revealed skeletal maxillo-mandibular transverse deficiency (Fig.1).

The pre and post treatment model and cephalometric analysis are appended vide Table 1.

Maxillary intraoral tooth borne distraction device using hyrax expansion screw size 9, was fabricated and cemented as per standard protocol. In the mandible, intraoral bone borne distractor was used. The surgical procedure involved Le-fort I level osteotomy with midpalatal split and bilateral complete pterygomaxillary dysjunction in maxilla and symphyseal osteotomy in mandible under general anaesthesia. Conventional body distractor was placed across the

osteotomy site in the mandible (Fig. 2). Trial activation of distraction appliances was conducted intra operatively to ensure completeness of the corticotomies and confirmed by midline diastema which appeared after two turns. Latency period of five days was observed. Rhythmic distraction at the rate of 1mm and 0.8mm per day in the maxilla and mandible respectively was conducted. Consolidation period of six weeks was observed. After radiographic confirmation of neo-osteogenesis, the distractors in the maxilla and mandible were removed. During post consolidation period NiTi, beta titanium and stainless steel wires were used for orthodontic alignment of teeth. Standard wire sequence was followed to achieve leveling, alignment and torque.

Discussion

The skeletal transverse maxillo-mandibular deficiency with severe dental arch compensations were the salient feature of this dentofacial deformity. Therefore opening up of midpalatal suture along with dysjunction near zygomaticomaxillary and pterygomaxillary sutural system was incorporated as the first step of unlocking the malocclusion to bring about transverse correction. This integrated procedure where maxillofacial surgeon and orthodontist work in concert using the unique principles of distraction osteogenesis to bring about transverse maxillary correction is known as surgically assisted rapid maxillary expansion. The mandibular symphyseal osteotomy was conducted on conclusion of maxillary osteotomy for surgically assisted rapid mandibular expansion. There was a gross improvement in the masticatory and respiratory function along with improved tongue posture and better pronunciation of words. A recent study to compare the effects of rapid maxillary expansion and surgically assisted rapid maxillary expansion on nasal volume using acoustic rhinometric methods concluded significant increase in

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Table 1**Comprehensive treatment Evaluation**

Pre and post-treatment model appraisal			Pre and post-treatment lateral cephalogram analysis		
Parameter	Maxillary Pre/Post (mm)	Mandibular Pre/Post (mm)	Parameter	Pre-treatment	Post-treatment
Anterior arch length	52 / 57	36 / 42	SNA	80 degree	82 degree
Inter canine distance	32 / 38	22 / 30	SNB	76 degree	78 degree
Total arch length	102 / 108	90 / 94	ANB	4 degree	2 degree
Inter premolar width	32 / 38	22 / 32	SN-MP	34 degree	30 degree
Inter molar width	43 / 49	37 / 42	Maxillary length	97 mm	102 mm
Basal arch width	25 / 34	22 / 32	Mandibular Length	127 mm	130 mm
Arch length tooth material discrepancy	12	8	Upper anterior dental height (UADH)	40 mm	41 mm
Curve of Spee	Pre / Post = 6 / 2 mm		Lower anterior dental height (LADH)	47 mm	48 mm
Depth of palatal vault	Pre / Post = 34 / 30 mm		Lower posterior dental height (LPDH)	36 mm	36 mm
			Upper posterior dental height (UPDH)	28 mm	28 mm
Pre and post treatment appraisal of Postero-anterior cephalogram					
Parameter	Pre-treatment (mm)		Post-treatment (mm)		
Skeletal Maxillary width-(mx-mx)	64		66		
Maxillary intermolar width-(um-um)	57		60		
Skeletal Mandibular width-(ag-ag)	89		91		
Mandibular intermolar width-(lm-lm)	53		57		
Mandibular symphysial width- (mf-mf)	20		33

Fig. 1 : Pre-treatment intraoral photographs. **Fig. 2 :** Intra-operative photographs depicting osteotomy cuts and distractor device placement.

nasal volume and decrease in nasal resistance in two groups [5]. Improved transverse dimension of maxilla and mandible along with reduction in the depth of palatal vault in our case resulted in better respiratory function of upper airway, favourable tongue posture, better masticatory function and improved aesthetics.

Orthodontic arch expansion methods have their own limitations and a true skeletal expansion without the dysjunction of pterygomaxillary sutural system is very difficult to realize [3,4]. The anatomic limitations in the

Fig. 3 : Post-treatment intraoral photographs depicting maxillo-mandibular transverse expansion.

mandible permit minor dental movements in an adult patient by orthodontic means alone. Distraction osteogenesis produces the regenerate bone thereby adding to the innate basal bone hence potentially greater stability than previous expansion methods [6,7]. The transverse maxillary distraction has been suggested to increase 0.7 mm of arch length gain for every 1.0 mm of rapid maxillary expansion [8]. The technique of transverse mandibular distraction osteogenesis was pioneered by Guererro [9]. Currently, relationship between mandibular distraction and arch length gain is being investigated [10]. The osteotomy line is generally slanting slightly downwards from the nasal aperture to

the zygomatic buttress due to anatomic shape of maxilla and necessity to avoid root apices of dentition. The direction of expansion of the maxillary segments is guided by this osteotomy line and might result in some downward movement of maxilla besides its planned lateral movement. The bilateral complete pterygomaxillary dysjunction in addition to above mentioned osteotomy lines resulting in the decreased skeletal resistance with concomitant planned transverse expansion and mild vertical movement of the maxilla. Chung et al [11] found a forward movement of maxillary segments in addition to transverse movements with tooth borne distractor in surgically assisted rapid maxillary expansion. The sagittal movements of maxillary segments probably have increased post operative SNA in our case. We are of the opinion that in our present case the simultaneous surgically assisted transverse maxillo-mandibular expansion has resulted in the unlocking of malocclusion, autorotation of mandible resulting in the better sagittal repositioning of mandible and thereby decrease of SN-MP. The sagittal movements of maxillary segments probably have increased postoperative SNA in our case. We are of the opinion that in our present case the simultaneous surgically assisted transverse maxillo-mandibular expansion has resulted in the unlocking of malocclusion, autorotation of mandible resulting in the better sagittal repositioning of mandible and thereby decrease of ANB. The pre and post-treatment model and cephalometric appraisal vide Table-1 indicates negligible dental extrusion and alteration of occlusal plane (Figs. 1,3) suggestive of pure skeletal changes and light continuous forces exerted by orthodontic mechanics during post consolidation period.

Conclusion

The correction of adult skeletal transverse maxillo-mandibular discrepancy by orthodontic means alone is difficult. We have been able to manage an adult case of severe skeletal transverse maxillo-mandibular discrepancy using combined orthodontics and distraction

osteogenesis with resultant significant skeletal changes and optimal dental correction.

Conflicts of Interest

None identified

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