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Bimaxillary distraction osteogenesis - an effective approach for the transverse jaw discrepancies in adults.

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Rezumat

Osteodistracţia bimaxilară - o metodă eficientă pentru corectarea deficitului transversal. Prezentare de caz

Dizarmoniile dento-maxilare apar la pacienţii adulţi datorită discrepanţei dintre dimensiunea dinţilor şi a osului subjacent fiind mai frecvent întâlnite în cazurile cu hipodezvoltare transversală maxilară si mandibulară. Tratamentul ortodontic clasic utilizează ca metodă de creare de spaţiu extracţiile dentare sau expansiunea arcadelor, care însă au dezavantaje estetice majore pentru pacienţi. Expansiunea palatină rapidă asistată chirurgical împreună cu osteodistracţia mediană mandibulară reprezintă o metodă de avangardă în tratamentul ortodontic şi chirurgical al pacienţilor cu deficite transversale severe de dezvoltare al ambelor maxilare. Expansiunea obţinută prin această metodă este mai stabilă şi spaţiul generat este mult mai mare în comparaţie cu metoda convenţională ortodontică. Cazul de faţă ilustrează avantajele acestei proceduri chirurgicale, care asociată cu un tratament ortodontic produce modificări morfologice faciale majore şi ocluzale şi totodată permite o aliniere dentară armonioasă.

Cuvinte cheie: expansiune palatină rapidă asistată chirurgical, osteodistracţie mandibulară mediană, deficit transversal bimaxilar, tratament ortodontic

Abstract

Severe dental crowding in adult patients is one of the features of disparity between the size of the teeth and the jaws. It is most frequently found in cases with a transverse hypoplasia of the maxilla and the mandible. The traditional orthodontic approach is extraction of teeth or arch expansion, both of them with major esthetic disadvantages for the patients. The surgically assisted maxillary expansion (SARME) and the mandibular midsymphyseal distraction osteogenesis procedures open new horizons for the orthodontists and maxillofacial surgeons in the effort to solve the esthetic demands of the patients with dental crowding and severe transversal discrepancy. The amount of surgical expansion is of higher magnitude and stability then the one achieved in orthodontic cases. The case presented here highlights the importance of the surgical procedure followed by the orthodontic therapy due to the enhancement in occlusion, dental alignment and facial morphology.

Key words: transversal discrepancy, orthodontic treatment, surgically assisted maxillary rapid expansion, mandibular midsymphyseal distraction

Introduction

Dental crowding is usually associated with transverse discrepancies, but in reality occurs because of the disparity in the relationship between the size of the teeth and the jaw, resulting in a less-than-ideal position of the teeth in the basal bone (1). The incidence of the transverse maxillomandibular discrepancy is estimated to be between 8% and 18% among adult patients with an orthodontic malocclusion.

The traditional aproach for correcting bimaxillary crowding

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are extraction of teeth and arch expansion. With conventional orthodontic treatment, extractions are usually unavoidable in patients with severe crowding or severe protruding teeth (2). Excessive overjet, an unattractive convex profile, a deep curve of Spee or a combination of these also contributes to the extraction decision. Extraction treatment may induce negative changes in the facial profile, lack of improvement of dark corridors and sometimes are deferred by patients. Also adult patients traditionally treated with orthodontic expansion, frequently presented a transverse maxillomandibular instability and relapse following orthodontic appliance removal. Orthopedic or rapid maxillomandibular expansion was used to treat these transverse discrepancies in growing patients, but with aging, the upper and lower jaw bones become increasingly resistant to expansion (3,4).

The surgically assisted rapid maxillary expansion (SARME) and the mandibular midsymphyseal distraction osteogenesis procedure overcome this age limitation and are of great importance for the treatment of transverse discrepancies in adult patients (5). Together with orthodontic treatment they greatly improve the facial profile, eliminate the dark corridors and generate space for alignment of the teeth without extractions.The SARME consists of a Le Fort I osteotomy with 2 pieces, while the mandibular distraction osteogenesis procedure consists of a midline osteotomy, thus allowing the free movement of the segments in the transversal direction (6,7).

This case reports the results of SARME and mandibular midsymphyseal distraction together with orthodontic treatment in an adult patient with a severe transverse deficiency.

Material and Method

The patient, a 23-year – old female sought treatment at the orthodontic clinic of the University of Medicine and Pharmacy Iuliu Hatieganu, Cluj, Romania. The clinical examination showed a Class I bimaxillary protrusion with crowding.Both dental arches were constricted, she had a severe crowding with a lack of space of 10 mm in the upper jaw and 12 mm in the lower jaw, the overbite was 80% and was palatally impinging with an excessively deep mandibular curve of Spee. The maxillary tooth-to-lip relationship was normal for her age with 3 mm of incisal show at rest - Fig. 1. Radiographically, the entire maxillary and mandibular dentition were present. Neither bone loss, nor active periodontal disease was present. Cephalometrically, the maxilla and the mandible were slightly protruding and the upper and lower incisors as well. Facially, the profile was considered convex - Fig. 2,3,4.

The main treatment object was to solve the transversal discrepancy, eliminate the protrusion and the crowding, the dark corridors and improve the facial profile.

She was willing to do whatever was necessary to correct the malocclusion, except for the extraction treatment. To address the maxillary and mandibular transverse hypoplasia, a 2-stage surgical and orthodontic treatment approach was presented. The first and most important, the surgical stage included SARME and mandibular midsymphyseal distraction to widen the jaws and provide the required space to align the dentition,

Figure 1. *Pretreatment intraoral photograph with crowding and protruding upper and lower incisors*

Figure 2. *Pretreatment lateral cephalometric radiograph shows protruding upper and lower incisors*

retract the protruding teeth, eliminate the negative spaces between the teeth and the corner of the mouth. The second stage of orthodontic treatment would align the teeth and improve the profile. If the only considerations for this patient had been orthodontic, the treatment could have included extractions of the maxillary and mandibular first premolars. Extractions would have allowed alignement of the dentition but most likely would have not improved but worsened the profile, in addition the dental arches would have been further constricted. A written consent was signed by the patient to undergo this procedure and have her case presented as a reference for further studies.

Before the surgical procedure, a tooth-borne appliance attached to the premolars and molars was manufactured - Fig. 5. The mandibular distraction device was a custom-made one -

Figure 3. *Pretreatment extraoral photograph-dark corridors are present between the corner of the mouth and the buccal surfaces of the lateral teeth*

Figure 4. *Pretreatment extraoral photographs- the profile is convex due to a protruding upper lip*

Figure 5. *The maxillary device for the SARME (in place)*

Figure 6. *The mandibular device for the midline distraction osteogenesis (in place)*

Fig. 6,7 (Medicon, Germany). Also, bonded stainless steel wires were used from the mesial of the central incisor to the molars to prevent mesial migration of the teeth into the distraction gap.

The maxillary Le Fort I osteotomy was first done, with an incision in the maxillary vestibule carried out laterally and posteriorly. The approach was similar to the one described by Epker, with the addition of a 5-day latency period. The maxilla was separated from the pterygoid plates of the sphenoid bone. Finally, the midpalatal osteotomy from the central incisor all the way to the posterior aspect of the palate was done with a round bur and the fragments were separated carefully with a spatula osteotome. Care was taken not to damage or perforate the palatal vascular pedicle.

Figure 7. *Intraoral photograph at the end of active orthodontic treatment shows dental alignment and release of protrusion in both arches*

Figure 8. *Posttreatment extraoral photograph show any evidence of dark corridors between the corner of the mouth and the buccal surfaces of the lateral teeth*

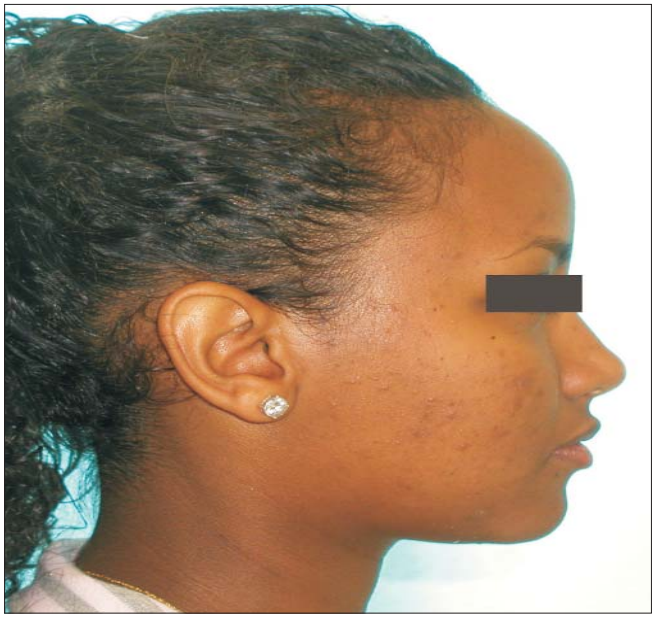

Figure 9. *Posttreament photograph highlights the final straight profile*

The mandibular initial vertical osteotomy was performed with a cylindric bur with irrigation and after the ompletion of the interdental osteotomy the mandibular halves were separated completely. The distraction appliance was attached to the surface of the bone halves with screws and the mucosa sutured in place, allowing the central part of the device to remain intraorally.

A latency period of 5 days was observed. The rate of distraction was 1 mm per day. The rhythm of distraction was 1 turn (0.5 mm) in the morning and 1 in the evening. The activation of the mandibular appliance was also done twice a day, 1 turn in the morning and 1 turn in the evening.The patient was seen once a week during active distraction. Both jaws have been slightly overexpended at the end, to avoid the relapse during bone formation. The appliances were removed after 4 months.

Conventionally orthodontic therapy was performed to solve crowding, reduce the protrusion, align the teeth, level the curve of Spee and coordinate the arches.The appliance used was a 0.022 slot one (Inspire Ice, Sybron Dental Specialties, Glendora, California).

Results

At the end of the 2-stage treatment a well-intercuspated Class I molar and canine relationship with a stable increase of the maxillary and mandibular base transverse dimension has been achieved. The facial aesthetics improved, the protrusin and the crowding have been released due to the space generated through the SARME associated to the mandibular midsymphiseal distraction - *Fig. 8,9,10.*

Figure 10. *Posttreatment lateral cephalogram shows a significant reduction of upper and lower incisors protrusion*

Discussion

Nonsurgical, 4-tooth extraction would have addressed the orthodontic aspect¢s of the patient's malocclusion and none of the esthetic problems, as the profile and the dark coridors. The lack of space in the transversal would have

been maintained and only dental crowding would have been solved. This conventional approach was used for almost a century by orthodontics as long as the main treatment goal was dental alignement (8,9,10). Expansion of the dental arches would have been considered if the patient would have denied extractions.The disadvantage in adult patients were instability and relapse following appliance removal due to the resistance of the sutures and cortical bones to the forces generated by the orthodontic devices. Surgery was also not considered due to the trauma it might have induced to orthodontic patients (11,12,13). A decade ago the main therapy goal in orthodontics was revisited and all the practitionars became aware of the face considering it as the most important parameter to be adressed.

With the SARME and mandibular distraction procedures, new horizons opened for the orthodontists and maxillofacial surgeons in the effort to solve besides the dental crowding the esthetic demands of the patients (14,15).

The amount of surgical expansion is of higher magnitude and stability then the one achieved with conventional orthodontic therapy. In our case, significant improvements were noticed and all treatment objectives were achieved. The patient was also extremely pleased with her new facial appearance and dental look.

Conclusions

The transverse dimenson is important for orthodontics and maxillofacial surgeons. This case illustrates the tremendous esthetic benefits of increasing it in patients with severe crowding associated with constricted dental arches. Maxillomandibular transverse distraction osteogenesis is a new and effective form of surgical treatment for patients with malocclusions or dento-facial deformities featuring severe transverse discrepancies, always done in conjunction with a carefully monitored orthodontic treatment.

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