Transverse Maxillary Asymmetry Treated with Unilateral Surgically Assisted Rapid Palatal Expansion – A Case Report

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Abstract
Transverse maxillary asymmetry is a relatively uncommon problem; which in adults requires unilateral surgically assisted rapid palatal expansion. This case report demonstrates the problem can be successfully treated with a limited amount of morbidity, and appears to be stable. The protocol should involve correcting the functional shift prior to diagnosing the problem as unilateral constriction.

Keywords
Maxillary asymmetry, surgically assisted RPE.

Introduction
Unilateral transverse maxillary deficiency, in adults, is a difficult problem for orthodontists. Traditionally, this problem is treated by accepting the crossbite, treating the crossbite with elastics or surgically correcting the crossbite. Treatment with crossbite elastics flares the teeth buccally; causing changes in loading pattern and compromising the longevity of teeth. Surgical correction has a higher degree of morbidity and its stability is unpredictable; for correction greater than 4mm. During the past 40 years, maxillary transverse discrepancy has been successfully treated with surgically assisted rapid palatal expansion. This procedure involves surgically creating an osteotomy in the mid palatal suture, the zygomatic buttress and the pterygoid plates; allowing time for callus to form at the osteotomy sites, and gradually stretching the callus to attain the proper width.

This case report describes the treatment of a patient with unilateral constriction; using a modified expansion appliance and a surgical technique to attain unilateral expansion.

Summary of treatment
Patient's name : Raymond Rosinski
Date of birth : 12/14/52
Age : 48 yr.

A. Pretreatment records

Date of Records : 05/2000
Diagnosis :
- Skeletal : Class I with tendency for Class III

Treatment Plan: 1. Ascertain centric relation and evaluate if the existing problem is
Treatment:
1. Centric relation splint
2. Mandibular full-coverage superior repositioning splint to deprogram the musculature and acquire correct centric relation.
3. Mandibular fixed appliance with pre-angulated, pre-torqued brackets to align the dentition and upright the mandibular buccal segment.
4. After the prematurity was alleviated, mounted models were attained to evaluate the extent of true maxillary transverse asymmetry. This process revealed a left side maxillary collapse.

Facial
Patient presents with a straight facial profile and slight increase in vertical facial height. Maxillary and mandibular midline was coincident with the midline of the face. Chin was deviated 2mm to the left.

Skeletal
Class I dental with tendency for Class III due to maxillary retrusion. Vertical facial height was normal, with tendency for slight increase in lower one third of the face. Chin prominence was normal. There was a unilateral crossbite extending from maxillary left lateral incisor thru the second molar; due to unilateral transverse maxillary deficiency.

Dental
Class I molars and cuspids. Overjet 4mm and end to end overbite at the central incisors. Crossbite maxillary left lateral incisor thru the left molar.

Anterior teeth were crowded with a 5mm space discrepancy. Maxillary and mandibular incisors were normally positioned anterior-posterior over their respective apical bases. Patient had multiple restorations with missing maxillary left first and second molars and maxillary right second molar. Edentulous areas showed significant bone loss with pneumatization of the maxillary sinuses.

Functional
Mounted models in centric relation showed minor functional shift with a prematurity on the maxillary left cuspid and the lateral incisor.

History and Etiology

48 year old Caucasian male was referred to the office by the general dentist for an evaluation for correction of left anterior crossbite; to enable restoration of the failing maxillary left central incisor. Patient has an unremarkable medical history. Patient had regular dental check-ups and a very high caries index with no extraneous habits. Etiology of the problem is unknown.

Diagnosis:
• Bonded maxillary Hyrax expander, with bite blocks thick enough to clear the vertical, enabled jumping the lateral incisor over the lower teeth.
• Maxillary fixed appliance, level and align the maxillary arch and reestablish arch form.
• Maxillary anterior aesthetic reconstruction. Replacement of the left maxillary posterior fixed prosthesis. Accept the left maxillary second molar space.

Specific Objectives of Treatment

Maxilla
- A-P : Maintain
- Vertical : Maintain
- Transverse : Increase maxillary width by expanding left maxilla 6mm

Mandible
- A-P : Maintain
- Vertical : Maintain

Maxillary Dentition
- A-P : Maintain
- Vertical : Maintain
- Inter-cuspid width : Maintain dental width, correct skeletal width
- Inter-molar Width : Constrict left third molar dental width by 2mm

Mandibular Dentition
- A-P : Maintain
- Vertical : Maintain
- Inter-molar : Upright left molar until the lingual cusp is 1mm below the buccal cusp
- Inter-canine Width : Maintain

Facial Esthetics:
- Face from Front : Maintain nasal width. Prevent nasal septal deviation during expansion. Improve anterior smile line.
- Profile : Maintain.

Appliances
- Mandibular full-coverage splint to deprogram the muscles and acquire centric relation.
- Mandibular fixed appliance therapy with GAC Straight-wire appliance. Wire sequence progressed from 0.014 nitinol thru 0.018 x 0.025 inch nitinol to 0.019 x 0.025 inch stainless steel. Buccal crown torque was applied on the left side to upright the left buccal segment.
- Hyrax type rapid palatal expander with occlusal blocks thick enough to create clearance to allow correction of lingual position of maxillary left lateral incisor and cuspid.
- Maxillary fixed appliance therapy with GAC straight-wire appliance. Wire progression was from 0.014 inch nitinol to 0.018 x 0.025 inch nitinol. Once in, 0.019 inch x 0.025 inch steel 45 degree palatal crown torque was applied on the left third molar to facilitate correction of the buccal flaring. Maxillary fixed appliance was placed with the expander in position to allow correcting crossbite and reorganize spaces to allow increasing the width of the left central incisor.
- Restorative phase included replacing the bridges on the maxillary left and right buccal segments and crowns on maxillary left central and lateral incisors. Direct bonding on maxillary right central incisor. Patient declined bone grafting and implant restoration; for reasons of cost.

Treatment Progress

Treatment progress was unremarkable. Patient wore the splint for 3 months. Mandibular appliances were on for 6 months prior to rapid palatal expansion. The expander was inserted using gold sealant and ceramic preparation.

Surgery was performed (Fig 1) in a unilateral Lefort I pattern leaving the nasal septum with the right maxilla. The pterygoid plates were separated to provide minimal resistance for movement of the left buccal segment. A five day latency period was allowed for soft tissue healing and initial osteoid formation. The appliance was turned 2 times (0.25x2=0.5mm) per day until the desired width was achieved. After completion of the expansion, the appliance was removed after 2 months to remove forces on the teeth of the un-operated side; to prevent undermining resorption and the width was maintained with a passive cemented full occlusal coverage 3mm Bio-Star splint.

Orthodontic realignment of the posterior teeth was initiated after 4 months. Thereafter, the orthodontic treatment was routine. Prior to de-banding, mounted models were attained to evaluate tooth position and for construction of a tooth positioner. Patient was
Table 1: Cephalometric summary

<table>
<thead>
<tr>
<th>Area</th>
<th>Measurement</th>
<th>A</th>
<th>B</th>
<th>*Difference A - B</th>
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<tbody>
<tr>
<td>Maxilla to Cranial Base</td>
<td>SNA</td>
<td>80.8</td>
<td>78.0</td>
<td>2</td>
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<tr>
<td>Mandible to Cranial Base</td>
<td>SNB</td>
<td>78.9</td>
<td>78.0</td>
<td>0.8</td>
</tr>
<tr>
<td>Maxillo-Mandibular Dentition</td>
<td>ANB</td>
<td>1.9</td>
<td>0</td>
<td>1.9</td>
</tr>
<tr>
<td>Maxillary Dentition 1 to NA (mm)</td>
<td>Witts</td>
<td>-2.1</td>
<td>-2.3</td>
<td>-0.2</td>
</tr>
<tr>
<td>Mandibular Dentition 1 to NB (mm)</td>
<td>1 to NA (deg.)</td>
<td>5.3</td>
<td>7.6</td>
<td>2.3</td>
</tr>
<tr>
<td>Mandibular Dentition 1 to Nb (mm)</td>
<td>1 to NB (deg.)</td>
<td>19.1</td>
<td>24.4</td>
<td>5.3</td>
</tr>
<tr>
<td>Soft Tissue</td>
<td>Esthetic Plane</td>
<td>-5.1</td>
<td>-4.1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Nasolabial angle</td>
<td>111.9</td>
<td>110.4</td>
<td>1.5</td>
</tr>
</tbody>
</table>

A: Pre-treatment records  B: Post treatment records

Table 2: Maxillary Arch Width Change

<table>
<thead>
<tr>
<th></th>
<th>Inter-canine width</th>
<th>Inter first molar width</th>
<th>Inter second molar width</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Treatment (T1)</td>
<td>29.60</td>
<td>44.00</td>
<td>50.70</td>
</tr>
<tr>
<td>Pre-Expansion (T2)</td>
<td>29.60</td>
<td>44.00</td>
<td>50.70</td>
</tr>
<tr>
<td>Immediate Post Expansion (T3)</td>
<td>38.90</td>
<td>47.42</td>
<td>57.80</td>
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<tr>
<td>Post Treatment (T4)</td>
<td>37.81</td>
<td>48.85</td>
<td>54.24</td>
</tr>
<tr>
<td>3 years Post Treatment (T5)</td>
<td>38.61</td>
<td>47.98</td>
<td>53.96</td>
</tr>
<tr>
<td>Change in arch width Pre-Treatment Final (T1-T4)</td>
<td>8.21</td>
<td>4.85</td>
<td>3.54</td>
</tr>
</tbody>
</table>

Table 3: Mandibular Arch Width Change

<table>
<thead>
<tr>
<th></th>
<th>Inter-canine width</th>
<th>Inter first molar width</th>
<th>Inter second molar width</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Treatment (T1)</td>
<td>25.7</td>
<td>41.03</td>
<td>47.17</td>
</tr>
<tr>
<td>Pre-Expansion (T2)</td>
<td>26.53</td>
<td>40.96</td>
<td>49.15</td>
</tr>
<tr>
<td>Immediate Post Expansion (T3)</td>
<td>26.53</td>
<td>40.96</td>
<td>49.15</td>
</tr>
<tr>
<td>Post Treatment (T4)</td>
<td>25.89</td>
<td>41.18</td>
<td>47.50</td>
</tr>
<tr>
<td>3 years Post Treatment (T5)</td>
<td>25.27</td>
<td>41.18</td>
<td>47.50</td>
</tr>
<tr>
<td>Change in arch width Pre-Treatment Final (T1-T4)</td>
<td>0.19</td>
<td>0.15</td>
<td>1.33</td>
</tr>
</tbody>
</table>

Table 4: Arch Width As Measured From Mid Palatine Raphae

<table>
<thead>
<tr>
<th></th>
<th>Pre Treatment</th>
<th>Post Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Right side</td>
<td>Left side</td>
</tr>
<tr>
<td>Canine to Raphae</td>
<td>14.73</td>
<td>14.73</td>
</tr>
<tr>
<td>First molar to Raphae</td>
<td>21.94</td>
<td>22.44</td>
</tr>
<tr>
<td>Second molar to Raphae</td>
<td>25.75</td>
<td>24.64</td>
</tr>
</tbody>
</table>
Fig. 1: Diagram showing surgical bone cuts

Fig. 2: Demonstration of arch width measurement from mid palatine raphae

Fig. 3: Pre-treatment Intraoral and Extraoral Photographs

Fig. 4: Pre-treatment models in centric occlusion
Fig. 5: Pre-treatment post-splint mounted models in centric relation

Fig. 6: Pre-treatment pan-tomogram

Fig. 8: Pre-treatment lateral cephalogram

Fig. 9: Pre-treatment lateral cephalogram tracing
instructed to wear the tooth positioner for three months after which the teeth were equilibrated. This concluded the active orthodontic phase of treatment.

**Results Achieved**

**Maxilla**
- **A-P**: SNA reduced by 2 degrees
- **Transverse**: Transverse dimension was increased by 6.12mm

**Mandible**
- **A-P**: Significant change was noticed
- **Vertical**: No significant change noticed

**Maxillary Dentition**
- **A-P**: Maxillary dentition was advanced by 2mm, maxillary molar angulation improved
- **Vertical**: Maxillary incisors were extruded by 2mm,
**Fig. 14**: Post-Treatment Intraoral and Extraoral Photographs

**Fig. 15**: Post treatment mounted models in centric relation

Maxillary molars were extruded 1mm
- **Inter-canine Width**: Dental width increased 2mm (Table 2)
- **Inter-molar Width**: Dental width increased 1mm due to tooth movement on the un-operated right side. (Table 2)

**Mandibular Dentition**
- **A-P**: Mandibular incisors had no significant bodily A/P positional change; but advanced angularly by 3 degrees. Mandibular molars showed significant uprighting.
Fig. 16: Post treatment pan-tomography

Fig. 17: Post treatment lateral cephalogram

Fig. 18: Post treatment lateral cephalogram tracing

Fig. 19: Post treatment P/A cephalogram

Fig. 20: Tracing post surgical P/A cephalogram
Vertical: Mandibular incisors had no significant vertical change, mandibular molars were extruded 1mm

Inter-canine Width: Dental width increase was insignificant (Table 3)

Inter-molar Width: Dental width increased minimally (Table 3)

Facial Esthetics: Overall, cephalometric facial aesthetics remained unchanged. There was, however, a significant improvement in his smile line.
Fig. 23: 3 years post treatment pan-tomogram

Fig. 24: 3 years post treatment lateral cephalogram

Fig. 24: 3 years lateral cephalogram tracing

Fig. 25: 3 years post treatment P/A cephalogram

Fig. 26: 3 years post treatment P/A cephalogram tracing
Fig. 27: Comparison occlusal views 1. Pre-treatment 2. Post treatment 3. 3 years Post treatment

Superimpositions

Fig. 28: Overall superimposition done on Sella -Nasion at Sella

Fig. 29: Regional superimposition:
1. Basion-Nasion at Nasion
2. Palatal plane at Anterior nasal spine
3. Corpus axis at PM, Point

Retention: Patient is retained with a 3-3 fixed retainer in the mandibular arch and a maxillary heat-cured splint to protect the restorative dental work.

Final Evaluation of Treatment: Final outcome of the case is very good. Patient is happy and restorations are more functional then would be otherwise. There was a significant improvement of the periodontal status on the non-operated side. This indicates that unilateral surgical expansion is a viable option of treatment for cases with true unilateral maxillary constriction. The important factor is to deprogram the patient with a splint and confirm that the situation is truly a unilateral constriction. If not, a bilateral expansion needs to be planned.
References: