Two phase treatment of a Class II division I patient complicated by traumatic upper incisor intrusion: A Case Report

By Dr. Roelien Stapelberg

A 7 years and 8 months old Caucasian female patient was presented at the age of 7 years and 8 months with the complaint that one of her upper teeth was absent. She had a mild thumb-sucking habit with a tongue thrust. She had a Class II division I incisor relationship on a Class II skeletal base with mildly decreased vertical facial proportions.

Extra-oral examination (Figure 1a-c)

Extra-orally the patient presented with a Class II skeletal pattern convex profile and accentuated labialmental fold. She had acceptable vertical facial proportions. The frontal examination revealed acceptable facial symmetry and balance, with the upper centralincidence with the midfacial axis. Soft tissue examination demonstrated thin upper and lower lips with mild incompetence, as well as an acute nasolabial angle. The lower lip was retrusive to Bickett’s E-line.

Intra-oral examination (Figure 1d-h)

The patient was in the early mixed dentition and had good oral hygiene. There was no history of dental caries, and no active dental caries. Mild generalized extrinsic staining was present. Furthermore there were no restorations present. The maxillary arch was symmetric and tapered, whereas the mandibular arch was square and symmetric. Both arches had no space deficiency and had well aligned buccal segments. The upper right central incisor was missing, and the upper left central incisor was projected. In occlusion, the overjet measured 10 mm with no overbite present. The molar relationship on the left was full Class II, and the right side was ¼ Class II. The lower centerline was 2 mm to the left of the upper centerline, which was coincident with the facial centerline. There was no crossbites or discrepancies.

The Dental Health Component (DHC) of the Index of Orthodontic Treatment Need (IOTN) was 5i, and the Aesthetic Component (AC) was 9.

Radiographic examination (Figure 2a,b)

The DPT demonstrated that all second molars were present and developing, as well as the lower third molars. The upper right central incisor seemed to be horizontally impacted. The cephalometric analysis confirmed our clinical findings of a Class II skeletal pattern with an ANB of 70°. The Wits appraisal affirmed the Class II skeletal pattern with a measurement of 7.5 mm. The vertical proportions were slightly decreased, demonstrated by the maxillary-mandibular plane angle of 89° and face height ratio of 52.1%. The upper incisors were severely proclined at 128.5°, as was the lower incisors at 109.0°. The lower incisors were retruded relative to the A/P line with a measurement of 0.8 mm.

Problem list

1. UR1 Horizontally impacted
2. Class II skeletal pattern due to mandibular retrusion
3. Convex profile
4. Increased overjet
5. Lower centerline 2 mm to the left of the upper centerline
6. Increased lower incisor overjet
7. Establish coincident centerlines
8. Maintain treatent until comprehensive orthodontic therapy
9. Treatment plan
10. Upper hybrid TPA - tongue crib appliance in breakthrough of thumb sucking habit and relieve the present tongue thrust, while reinforcing the anchorage of the UR1 and UL1.

After the manufacture of the upper hybrid TPA-tongue crib appliance, it was inserted and the bonding of the upper with 2x4 fixed appliances with MBT prescription was placed. An 0.016 SS utility arch was placed with elastomeric ties, and the patient was referred for surgical exposure and placement of an intermediate spring for traction of the UR1. After the surgical exposure, the UL1 and UL2 was ligated together, and an elastic chain tied to the gold chain attached to the UR1. The patient was then referred to a periodontist for a periodontal evaluation and treatment. The eruption encouragement was continued until the UR1 could be bonded and ligated with an elastic chain continuing the eruption process, to the same 0.016 SS. When the position of the UR1 was at an adequate level it was engaged on the 0.016 SS with an elastomeric tie. The time period from surgical exposure of the UR1 to alignment with the archwire was 5 months. The patient was continued in a bonded upper retainer until the UR1 was placed.

Treatment assessment (Figure 4a-g)

Case one was a 7 years and 8 months old Caucasian female presenting with a Class II division I incisor relationship on a Class II skeletal base with mildly decreased vertical facial proportions. The mandible was retrusive, and the maxilla normal. The malocclusion was complicated by a horizontally impacted UR1. The patient presented with no space deficiency. The upper centerline with on the facial midline, and the lower centerline was 2 mm to the left of the upper. The molar relationship was full unit Class II on the left and ½ unit Class II on the right.

Phase I treatment was deemed appropriate, and consisted of a hybrid TPA-tongue crib appliance with a 2x4 upper pre-adjusted edgewise fixed appliances (0.022x0.028 slot) with MBT prescription. Surgically
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cal exposure of the UR1 via the open technique with bonding of a gold chain and orthodontic traction to the archwire was done to facilitate eruption. Retention via a bonded upper fixed retainer UR1 to UL1 was placed until Phase II treatment. The patient was kept in retention and followed up frequently to establish the beginning of the adolescent growth spurt, in order to initiate phase II.

Phase II
A female patient presented at 9 years 4 months of age for a retention check of her fixed upper retainer, still in place from her previous orthodontic treatment (Phase I). She had a Class II division 1 malocclusion, on Class II skeletal bases, with decreased vertical proportions, bimaxillary protrusion and a lower lip trap.

Extra-oral examination
Extra-orally the patient had a severe Class II skeletal pattern with a convex profile and acceptable vertical proportions of the face. Frontal examination revealed no transverse asymmetry, and the upper centerline was on with the midfacial axis, with lower centerline being shifted 2mm to the left. Soft tissue examination demonstrated a retruded and incompetent lower lip of normal thickness. A lower lip trap was also present.

Intra-oral examination
The patient was in the late mixed dentition and had good oral hygiene. There were no restorations, and the patient was carried free. The maxillary arch was ovoid and symmetrical with no space discrepancy. The buccal segments were well aligned, with mesial buccal rotation on the UR6 and UL6 present. The mandibular arch with ovoid and symmetrical with no space discrepancy, with a deep curve of Spee present. The buccal segments of the lower arch was well aligned.

In occlusion the overjet measured 8.5mm, with an overbite of 5.5mm (50%). The left molar relationship was ⅔ unit Class II, and the right ⅔ unit Class II. The left canine relationship was full unit Class II, and the right was ⅔ unit Class II. No crossbites were present.

The dental health component (DHC) of the Index of Orthodontic Treatment Need (IOTN) was 4a, and the aesthetic component (AC) was 9.

Radiographic examination
The DPT demonstrated that all third and second molars were developing. No other abnormalities were found.

The cephalometric analysis (Table 1) confirmed a skeletal Class II antero-posterior discrepancy as demonstrated by an ANB of 3.8º and a Wits appraisal of 6.5 mm. Both the upper and the lower incisors were severely proclined (134.7º upper & 104.5º lower), with the lower incisor in a relative normal position in relation to A-Po line (0.6 mm).

Problem list
1. Class II skeletal relationship due to mandibular retrognathia
2. Convex profile with reduced lower lip protrusion
3. Lipo incisor pronclination
4. Overjet of 8.5 mm
5. Asymmetric Class II molar and canine relationship
6. 2 mm lower centerline discrepancy to the left of the upper dental midline
7. Incompetent lips at rest

Aim and Objectives
1. Utilize favorable mandibular growth for improvement of the Class II skeletal discrepancy
2. Improve facial harmony and increase lower lip protrusion
3. Reduce upper incisor proclination
4. Reduce overjet to normal values
5. Establish optimal buccal segment interdigitation bilaterally
6. Establish coincident centerlines
7. Obtain lip competence at rest
8. Maintain incisor display on smiling
9. Place teeth in a position conducive to favorable facial and dental esthetics and long-term stability
10. Retain corrected result

Treatment plan
1. Upper removable appliance while waiting for eruption of the upper second premolars and the growth spurt to occur. Appliance manufactured with an expansion screw to establish adequate maxillary dentoalveolar width to accomplish mandibular forward posturing without occlusal interferences from a crossbite tendency, with a 2-spring on the 12 to obtain initial alignment.
2. Andrews’ Activator appliance for mandibular growth stimulation with wax bite of approximately 5mm was given after the growth spurt was reached as evaluated by clinical examination. Capping of lower incisors was done on the Activator to minimize lower incisor proclination.
3. Full upper and lower pre-adjusted edgewise fixed appliances (0.022” x 0.028” slot) with MBT prescription was placed after Class I canine was achieved with the Activator.
4. Bonded upper fixed retainer individually from UR3 to UL3 and upper vacuum formed retainer to be worn at night time only and a bonded lower fixed retainer individually from LR5 to LL5.

Treatment progression (Figure 5 – 8)

Compliance was excellent with the upper removable appliance and expansion attained was sufficient to prevent crossbite occurrence when the mandible was postured forward into a Class I canine relationship. After the growth spurt was attained, an Activator appliance was manufactured with forward posturing into

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Figure 1 (a-b) Case 1. Pre-treatment extra- and intra-oral photographs

Figure 2 (a-b) Case 1. Pre-treatment radiographs

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Class I canine relationship bilaterally and a waxbite thickness of 5mm (Figure 5). The compliance with the Activator was excellent, and after 5 months of wear the patient was ready for fixed appliances. A cephalogram after the Activator treatment was taken and analyzed (Figure 6). The cephalometric analysis (Table 2) revealed a skeletal Class I antero-posterior relationship (ANB 3.6°, Wits appraisal 2.8 mm). The SNA reduced during the use of the Activator, which was the cause for the reduction in the ANB angle. The SNB remained almost the same. The vertical proportions indicated a mildly anterior growth rotation. The upper incisors retroclined, and the lower incisors proclined after the Activator use. The upper incisors were severely proclined with 120.0°, and the lower incisors as well with 111.5°. The lower incisors protruded in relation to APo (5.2mm), 0.022 slot preadjusted edgewise fixed appliances were placed, with the leveling and aligning phase initiated with 0.016” heat activated Nickel Titanium archwires in the upper and lower arches. The archwires progressed to 0.019 x 0.025” heat activated Nickel Titanium in the upper and lower arch, followed by customized and coordinated 0.019 x 0.025” stainless steel archwires with steel ligatures. At this stage the patient was advised to use Class II intermaxillary elastics (5/16” 3oz) bilaterally full time to correct our canine relationship after mild relapse occurred during the alignment and leveling phase of the fixed appliances. The intermaxillary elastics were continued for 4 months. During the torque expression of the rectangular steel wires, mild spaces opened in the upper arch, these spaces were closed with friction mechanics utilizing a closed elastomeric
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chain from upper right to left first molars.

A cephalogram was taken after correction of the anterior posterior relationship to check the incisor inclinations and evaluate the patient for the possibility of extraction. The upper incisors were proclined, as was the lower incisors, however the lower incisors did not procline more than the pre-treatment value, and the facial appearance accepted the increased proclination. Therefore no ex-

tractions were done to decrease the incisor proclination.

Finishing and detailing was done on a 0.018 stainless steel wire. The estimated treatment time for Case 1 treatment was 24-50 months. The actual treatment time was 22 months. Retention was initiated with an upper vacuum formed retainer and a lower fixed 5-3 retainer.

**Table Case 1. Pre-treatment cephalometric analysis**

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<th>Variable</th>
<th>Pre-phase II</th>
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<tr>
<td>Lower incisor to mandibular plane angle (°)</td>
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<tr>
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<tr>
<td>Maxillary mandibular plane angle (°)</td>
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<tr>
<td>Lower anterior face height (mm)</td>
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<td>Upper anterior face height (mm)</td>
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<td>Lower incisor to APo line (mm)</td>
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<tr>
<td>Lower tip to Ricketts E Plane</td>
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**Table Case 1. Post-treatment cephalometric analysis**

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Case 1 assessment (Figure 9)

Case 1 presented to the orthodontic clinic at the age of 7 years 8 months, with a Class II division 1 incisor relationship on a Class II skeletal base with mildly decreased vertical facial proportions. The mandible was retrognathic, and the maxilla normal. The malocclusion was complicated by a horizontally impacted UR1. The upper centric tip was on the facial midline, and the lower center line was 2mm to the left of the upper. The molar relationship was full unit Class II on the left and ¼ unit Class II on the right. The upper and lower incisors were severely proclined, with the lower incisors in normal position relative to the APo line.

Orthodontic camouflage for the underlying Class II skeletal discrepancy was carried out. On initial examination it was clear that the upper and lower incisors were proclined. Lower incisor proclination would indicate the amount of correction that can be attained by orthodontics only. For Case 1, the lower incisors were se-

**Table Case 1. Post-Activator cephalometric analysis**

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