รายงานผู้ป่วย
Case Report

การรักษาทางทันตกรรมจัดฟันในผู้ป่วยที่มีโครงสร้างกระดูกขากรรไกรแบบที่ 3 ที่มีการเจริญเติบโตด้วยการรักษาทันตกรรมจัดฟันอำพราง : รายงานผู้ป่วย

สิรินทิพย์ ศรีเศรษฐนิล* บัญชา สำรวจเบญจกุล**

บทคัดย่อ

วัตถุประสงค์ : เพื่อแสดงผลการรักษาทางทันตกรรมจัดฟันอำพรางในผู้ป่วยที่มีความสัมพันธ์ของโครงสร้างกระดูกขากรรไกรแบบที่ III และมีการสบฟันแบบแองเกิลประเภท III ฟันหน้าล่างสบคร่อมฟันหน้าบน ฟันบนและล่างซ้อนเกระดับรุนแรง

แผนการรักษา : รักษาโดยการจัดฟันร่วมกับการถอนฟันกรามน้อยซี่ที่ 1 จำนวน 4 ซี่ เพื่อแก้ไขปัญหาฟันซ้อนเก ผู้ป่วยและผู้ปกครองได้ทราบข้อมูลเกี่ยวกับการรักษาว่าเป็นการจัดฟันอำพราง มิใช่การแก้ไขที่สาเหตุโดยตรง ภายหลังการรักษาฟันหน้าบนจะมีลักษณะยื่นและฟันหน้าล่างจะมีลักษณะงุ้มไปทางใกล้ลิ้นเล็กน้อย และระหว่างการรักษาผู้ป่วยต้องให้ความร่วมมือในการใส่เครื่องมือเสริมและการเกี่ยวยางระหว่างฟันบนและฟันล่างเป็นอย่างดี

ผลการรักษา : ภายหลังการรักษามีการสบฟันแบบแองเกิลประเภท I ทั้งฟันเขี้ยวและฟันกราม ลักษณะใบหน้าในแนวหน้าหลังคงเดิม ความสูงของใบหน้าแนวดิ่งเพิ่มขึ้นเล็กน้อย

สรุป : รายงานผู้ป่วยนี้แสดงผลของการทันตกรรมจัดฟันอำพรางในผู้ป่วยที่มีความผิดปกติของการสบฟันและโครงสร้างกระดูกขากรรไกรแบบที่ III ที่ยังมีการเจริญเติบโต ซึ่งจะต้องมีการประเมินสภาวะการเจริญเติบโตของผู้ป่วยอย่างถูกต้องและวางแผนการรักษาอย่างเหมาะสมและระมัดระวัง เพื่อให้ได้การสบฟันที่ดี ทำหน้าที่ได้อย่างมีประสิทธิภาพ มีความเสถียรภายหลังการถอดเครื่องมือ และมีรูปร่างใบหน้าที่ดี โดยยอมรับความสัมพันธ์ของกระดูกโครงสร้างที่ผิดปกติ

* ทบ. วทม. วุฒิบัตรสาขาทันตกรรมจัดฟัน โรงพยาบาลชัยนาทนเรนทร

** ผู้ช่วยศาสตราจารย์: ภาควิชาทันตกรรมป้องกัน คณะทันตแพทยศาสตร์ มหาวิทยาลัยสงขลานครินทร์

* DDS. MSc. Thai board in Orthodontics: Jainad Narendra Hospital

** DDS. MSc. Ph.D. Thai board in Orthodontics Assistant Professor: Department of Preventive Dentistry, Faculty of Dentistry Prince of Songkla University

Camouflage treatment of skeletal and dental Class III malocclusion in growing patient: Case report

Sirintip Srisettanil* Bancha Samruajbenjakun**

Abstract

Objective: To describe a camouflage orthodontic treatment in a growing patient who had skeletal and dental Class III malocclusion with anterior crossbite, retroclination of lower incisors, severe crowding of upper and lower teeth.

Treatment plan: Four first premolars were extracted to correct severe crowding. Patient and parent were informed that this treatment was not able to correct the etiology of the malocclusion, the possibilities for the treatment were to displace the teeth which were relative to their supporting bone and to compensate for the underlying jaw discrepancy. The displacement of the teeth, as in the proclination of the upper teeth and retroclination of the lower teeth, is termed as Class III camouflage. Patient compliance was needed in using intermaxillary elastics for a satisfactory result.

Results: Class I canine and molar relationships were achieved. The lateral profile was maintained with slightly increased facial height.

Conclusions: This case report showed the outcome of orthodontic camouflage in growing patient with skeletal and dental Class III malocclusion. Evaluation of growth status, timing of camouflage orthodontic treatment and treatment plan are very important. A proper treatment plan will lead to optimal static and functional occlusion and stability, a good facial balance by accepting the skeletal discrepancy.

Case report

A 14- year-old Thai female came with the chief complaint of upper and lower anterior teeth crowding and anterior crossbite. The motivation that she came to consult orthodontic clinic was internal motivation. Her expectation was normal alignment of teeth. She had history of dust allergy. She got her first period 3 years ago.

Extraoral examination, from frontal photographic analysis, revealed a mesofacial type, symmetric face, proper vertical proportion and incompetent lips. When she smile, she had low smile line. From lateral photographic analysis, she had straight profile in rest position (Fig 1) and had slightly concave profile in maximum intercuspation (Fig 2). No family history of the Class III growth malocclusion.

Intraoral examination showed fair oral hygiene, normal frenum attachment and mild gingivitis. Severe crowding in the maxillary and mandibular arches, anterior crossbite, lower incisors retroclination, Angle Class III malocclusion, Class III canine relationship. In maximum intercuspation she, had negative overjet 3 mm., overbite 5 mm. with mandibular overclosure, right posterior teeth crossbite. (Fig 3) There was centric occlusion - maximum intercuspation (CO-MI) shift in sagittal plane 3 mm., edge to edge bite before overclosure (Fig 4). No sign and symptom of TMDs.

Figure 1 Pretreatment facial photographs. (Rest position)

Figure 2 Pretreatment facial photographs.
(Maximum intercuspation)

Figure 3 Pretreatment intraoral photographs.
(Maximum intercuspation)

Figure 4 Pretreatment intraoral photographs.
(Rest position)

Intraoral analysis

Frontal view

- Overbite 5 mm.
- Upper dental midline coincides with facial midline
- Lower dental midline shifts to the right 3 mm.

Occlusal view

Maxillary arch

- Asymmetric palaboloid-shaped arch form
- Severe crowding of upper teeth
- 53 prolonged retention
- 13 unerupted tooth
- Canines and molars are sagitally asymmetry

Mandibular arch

- Asymmetric palaboloid-shaped arch form
- Severe crowding of lower anterior teeth
- 45 impacted tooth
- Canines and molars are sagitally asymmetry

Lateral view

Angle's classification

Right: Class III molar relationship 5 mm.
Unclassified canine relationship

Left: Class I molar relationship 1 mm.
Class III canine relationship 2 mm.

- Overjet = -3 mm.
- Curve of Spee = 2 mm.

Arch perimeter

- Upper : intercanine width = 33 mm.
  intermolar width = 43 mm.
- Lower : intercanine width = 29 mm.
  intermolar width = 41 mm.

Tooth measurement

18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
-	10	11	7.5	8.5	-	8	9	9	8	8	8.5	7.5	11	10	-
-	10.5	12	-	8.5	7.5	6	6	6	6	7.5	8.5	8	12	10.5	-
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38

Space analysis

Type	Space lack / excess	
	Upper	Lower
Front	-12	-2
Left	-7.5	-5.5
Right	-5.5	-8.5
Sum	-25	-16

Bolton's analysis

Anterior ratio (normal; 77.2 ± 1.65 %) = 78 %

Conclusion: The size of upper and ower anterior teeth is consonant.

Overall ratio (normal; 91.3 ± 1.91 %) = 92.3 %

Conclusion: The size of upper and lower teeth is consonant.

Radiographic analysis

1. Panoramic radiograph (Fig 5)

- Permanent dentition stage
- 53 prolonged retention
- 13, 45 impacted tooth
- 18, 28, 38, 48 developing teeth
- No pneumatization of maxillary sinus
- Nasal septum is normal
- Normal morphology and symmetry of mandibular condyles
- Normal bone density and trabeculation
- No sign of airway obstruction
- No visible pathology

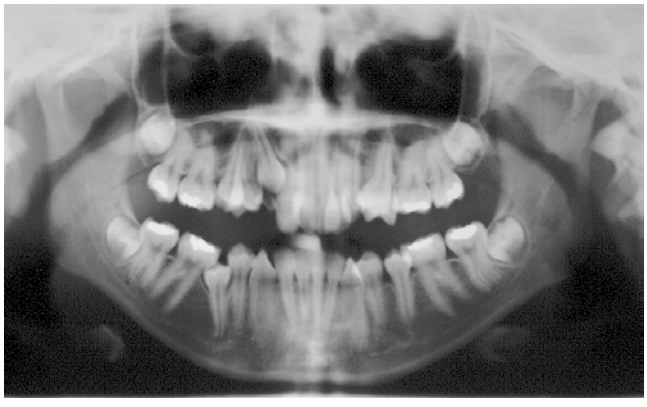


Figure 5 Pretreatment panoramic radiograph

2. Lateral cephalometric analysis (Fig 6 and Table 1)

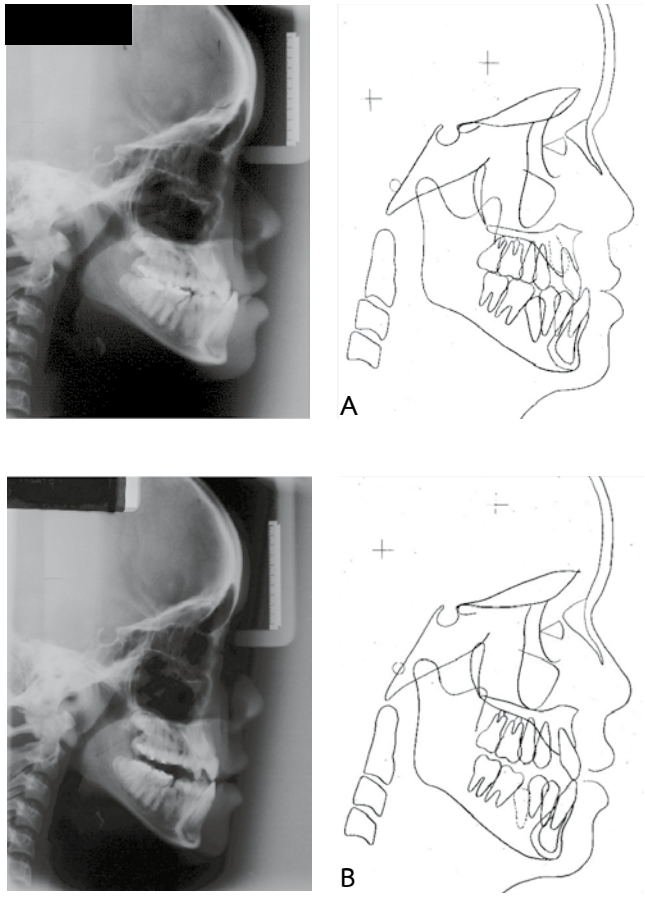


Figure 6 Pretreatment lateral cephalometric radiograph and cephalogram
(A) Maximum Intercuspation (MI)
(B) Centric Relation Position (CR)

Table 1 Cephalometric analysis (pretreatment)
*Numbers in parentheses = CR position

Area		Measurement	Norm Mean±SD	Pre-tx 09/10/12	Interpretation
Reference line		FH-SN (degree)	6±3	6	Normal SN plane
Skeletal	Maxilla to Cranial base	SNA (degree) SN-PP (degree)	84 ± 4 9 ± 3	77 10	Retrognathic maxilla Normal palatal plane
	Mandible to Cranial base	SNB (degree) SN-MP (degree) SN-Pg (degree) SN-Gn (degree)	81 ± 4 29 ± 6 82±3 68±3	82 (78) 34 (37) 82.5 (79) 67 (64)	Orthognathic mandible Normal mandibular plane Orthognathic mandible Normal mandibular plane
	Maxillo-Mandibular	ANB (degree) Wits (mm.) MP-PP (degree) FMA (degree)	3 ± 2 -3 ± 2 21±5 23 ± 5	-5 (-1) -15 24 (27) 28 (31)	Skeletal Class III Skeletal Class III Skeletal normal bite Skeletal normal bite
Dental	Maxillary dentition	UI to NA (degree) UI to NA (mm.) UI to SN (degree)	22 ± 6 5 ± 2 108 ± 6	21 4.5 98.5	UI normal inclination UI normal position UI retroclination
	Mandibular dentition	LI to NB (degree) LI to NB (mm.) LI to MP (degree)	30 ± 6 7 ± 2 99 ± 5	17 3 81	LI retroclination LI retrusion LI retroclination
	Maxillo-Mandibular	UI to LI (degree)	125 ± 8	146	Obtuse interincisal angle
Soft tissue		E line U. lip (mm.) E line L. lip (mm.) Naso-labial angle H-angle (degree)	-1 ± 2 2 ± 2 91 ± 8 14 ± 4	-2 (0) 2 (2) 113 (114) 10 (9)	UL normal position LL normal position Obtuse NLA UL normal position

Diagnosis

1. Skeletal

- Class III skeletal pattern
- Retrognathic maxilla and orthognathic mandible
- Normal bite configuration

2. Dental

- Severe crowding of upper teeth
- Severe crowding of lower teeth
- Upper incisors normal inclination and position
- Lower incisors retroclination and retrusion
- Right unclassified canine relationship and Class III molar relationship
- Left Class III canine and Class I molar relationship
- Overbite 5 mm., Overjet -3 mm.
- Upper dental midline coincides with facial midline
- Lower dental midline shifts to the right 3 mm.

3. Facial

- Symmetrical mesocephalic face
- Straight facial profile

4. Intraoral soft tissue

- Mild gingivitis with normal mucosa
- Normal frenum attachment and normal tongue size

5. Functional problems and abnormal habits

-

6. Other

- Growth status: post-peak pubertal growth spurt

Treatment objectives

The primary treatment objection for this patient were: 1. Maintain skeletal Class III relationship; 2. Establish Class I molar and canine relationship; 3. Eliminate crowding and correct anterior crossbite; 4. Improve facial esthetics.

Treatment plan

The treatment plan for this patient was orthodontic treatment only. Although the patient has a concave facial profile while teeth are in maximum intercuspation and anterior crossbite with mandibular overclosure. However, in rest position, there was straight facial profile and edge to edge bite can be achieved. It was found that there is little pre-existing dental compensation of upper and lower anterior teeth. Therefore, the treatment plan was conventional orthodontic treatment with four first premolars extraction.

The patient has severe crowding of upper and lower teeth. Therefore, the treatment plan was four first premolars extraction to obtain space to correct crowding. Since the patient is able to bite in edge to edge position, it was found that the relationship between canine and molar is Class I tendency in this position. The treatment was started with lower posterior bite plane to raise the bite and fixed appliance were bonded to the upper teeth to procline upper incisor until it has a positive overjet. Next, grinding the bite plane to reduce the height in each dental visit until the posterior teeth were occluded then removed the bite plane. Last, bonded fixed appliance to the lower teeth, intraarch elastomeric chains and interarch elastic were also used to close extraction spaces, creating Class I canine and molar relationship and maximum intercuspation.

Clinical examination (Intermediate) (Fig 7)

- Extraoral examination
  - The lower anterior facial height was slightly increased when compare with initial
  - When she smiles the incisal show was more than initial

Treatment progress (Fig 7)

Figure 7 Extraoral and intraoral photographs after anterior crossbite correction

  - Upper dental midline shifts to the left 2 mm.
  - In lateral profile, upper and lower lips were protrusion as same as initial
  - Nasolabial angle was decreased

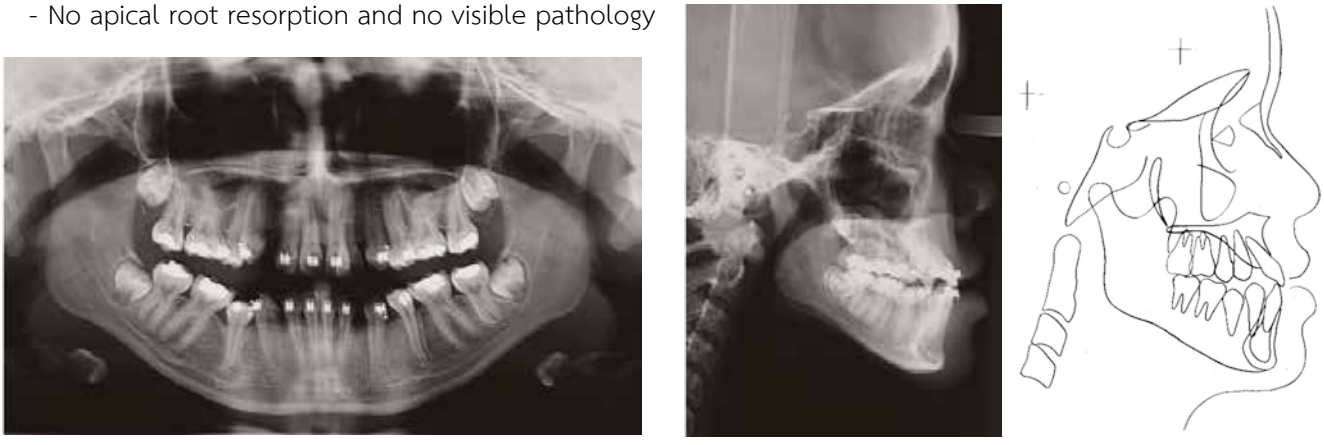
- Intraoral examination

When compare the occlusion between original and 15 months of treatment found that

  - Overjet 1 mm., overbite 1 mm. (overjet was increased but overbite was decreased)
  - Slightly Class III position on canines and molars.

Panoramic radiographic analysis (intermediate) (Fig 8)

- Normal morphology and symmetry of mandibular condyle
- No apical root resorption and no visible pathology



A B

Figure 8 Intermediate treatment x-ray of panoramic radiograph (A), lateral cephalogram radiograph and cephalometric tracing (B)

Posttreatment

Clinical examination (Fig 9)

- Improved overjet and overbite
- Class I canine relationship
- Aligned upper teeth
- Proclination of upper incisor and retroclination of lower incisor

Table 2 Clinical Pretreatment and Posttreatment

		Pre-treatment	Post-treatment
Overjet		-3 mm.	1 mm.
Overbite		5 mm.	2 mm.
Canine relationships	Right	Unclassified	Cl. I
	Left	Cl. III 2 mm.	Cl. I
Molar relationships	Right	Cl. III 5 mm.	Cl. I
	Left	Cl. I	Cl. I
Upper	Midline	Center	Center
	Arch form	Paraboloid	Paraboloid
	Intercanine width	32 mm.	37.5 mm.
	Intermolar width	43 mm.	45 mm.
Lower	Midline	Right 3 mm.	Center
	Arch form	Paraboloid	Paraboloid
	Intercanine width	29 mm.	29 mm.
	Intermolar width	46 mm.	47 mm.

Figure 9 Posttreatment extraoral and intraoral photographs

Figure 10 Posttreatment panoramic radiograph.

Posttreatment lateral radiographic analysis (Fig 11 and Table 2)

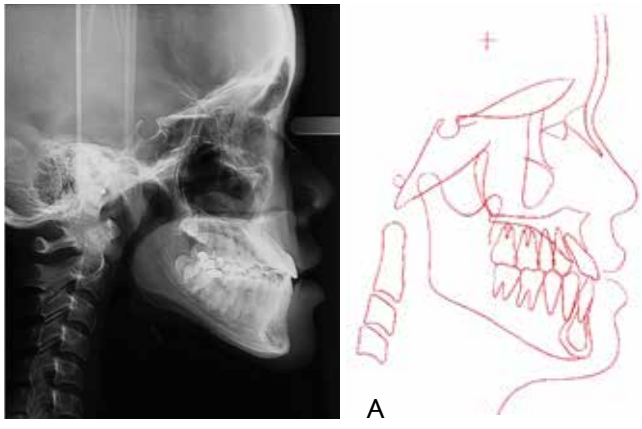


Figure 11 Posttreatment lateral cephalogram and cephalometric tracing

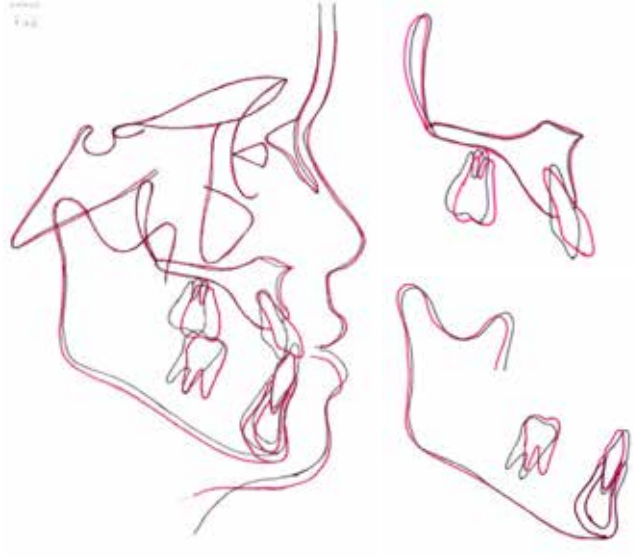


Figure 12 The superimpositions of the pretreatment and posttreatment cephalometric tracing. (Black line = Pretreatment, Red line = Posttreatment)

Discussion

The major problem in this patient was severe crowding. Clinical examinations found mesofacial type, Class III canine and molar relationship and concave facial profile in maximum intercuspation. However, when the patient was in rest position, she presented with an edge to edge bite, Class I canine and molar relationship, straight facial profile and incompetent lips. Diagnosis of this case was skeletal Class III normal bite, angle Class III malocclusion with upper incisors retroclination.

The etiology of Class III malocclusion were divided into 3 groups[1] 1. Funtional: included abnormal tongue position, respiration problems and neuromuscular conditions 2. Skeletal: maxillary and/or mandibular development imbalance 3. Dental: early loss of deciduous teeth or abnormal tooth bud position of upper anterior teeth.

Although, the patient presented with Class III malocclusion with anterior crossbite and skeletal Class III, but she did not have family history and genetics related with this type of malocclusion. The etiology of anterior crossbite in this case was early loss of deciduous teeth from severe early childhood caries. The premature loss combined with muscle forces results in the constriction of maxilla. As a result, the mandible will be moved forward into a comfortable position[2] and an anterior crossbite with mandibular overclosure results which not major caused by skeletal discrepancy.

Treatment plan for the patients who have skeletal and dental Class III malocclusion includes[3] (a) growth modification involving a chincup to restrain mandibular growth or a facemask to protract the maxilla, (b) dentoalveolar compensation or camouflage involving dental extractions and (c) orthognathic surgery. Even though, this patient has a skeletal Class III but only mild skeletal discrepancy. Also, the patient had acceptable soft tissue profile with skeletal normal bite in vertical configuration. Moreover, from envelope of discrepancies evaluation

Table 3 Posttreatment lateral cephalometric analysis.

Area		Measurement	Norm Mean±SD	Pre-tx 09/10/12	Post-tx 26/05/16	Difference
Reference line		FH-SN (degree)	6±3	6	6	0
Skeletal	Maxilla to Cranial base	SNA (degree) SN-PP (degree)	84 ± 4 9 ± 3	77 10	78 9	+1 -1
	Mandible to Cranial base	SNB (degree) SN-MP (degree) SN-Pg (degree) SN-Gn (degree)	81 ± 4 29 ± 6 82 ± 3 68 ± 3	82 34 82.5 67	82 37 83 69	0 +3 +0.5 +2
	Maxillo-Mandibular	ANB (degree) Wits (mm.) MP-PP (degree) FMA (degree)	3 ± 2 -3 ± 2 21 ± 5 23 ± 5	-5 -15 24 28	-4 -10 28 32	+1 +5 +4 +4
Dental	Maxillary dentition	UI to NA (degree) UI to NA (mm.) UI to SN (degree)	22 ± 6 5 ± 2 108 ± 6	21 4.5 98.5	35 10 112	+13 +5.5 +13.5
	Mandibular dentition	LI to NB (degree) LI to NB (mm.) LI to MP (degree)	30 ± 6 7 ± 2 99 ± 5	17 3 81	15 2 80	-2 -1 -1
	Maxillo-Mandibular	UI to LI (degree)	125 ± 8	146	134	-12
Soft tissue		E line U. lip (mm.) E line L. lip (mm.) Naso-labial angle H-angle (degree)	-1 ± 2 2 ± 2 91 ± 8 14 ± 4	-2 2 113 10	-2 1 108 9	0 -1 -5 -1

found that we could have possibly moved the teeth to normal overjet and overbite position. According to the patient's first menstruation history, she had first period 3 years ago (when she was 11-year-old), so the patient's development was in post pubertal growth spurt. So, this patient would have been benefit from camouflage treatment. According to Proffit[4], he stated that camouflage treatment was suitable for skeletal Class III in following indication

- Patient is too old for growth modification
- Mild skeletal Class III
- Extraction spaces could be utilized to correct teeth alignment in anteroposterior dimension
- Good vertical facial proportion

So, the main purpose of the treatment is to correct teeth crowding and anterior crossbite with camouflage treatment. Treatment plan was conventional orthodontic treatment with four first

premolars extraction. The purposes of dental extraction were[5] 1) gain space in order to align all teeth in proper position 2) compensate maxillary and mandibular discrepancies anteroposteriorly and vertically in skeletal Class II or III.

The objective of camouflage treatment in these patients was to normalize the underlying skeletal discrepancies and place the incisors in the medullary trough to prevent bony dehiscence[6]. In a Class III malocclusion compensation, upper incisor proclination and lower incisor retroclination is performed to obtain normal overjet, but it might not correct the underlying skeletal problem or facial profile.

Camouflage also can be used in patients with mild skeletal Class III promblems, in whom adjustment of incisor position can achieve acceptable occlusion and reasonable facial esthetics. Extraction of lower premolars combined with Class III elastics and extraoral force can improve the dental occlusion for many Class III patients, but the treatment rarely produces successful camouflage and frequently makes the facial appearance worse. Even minimal retraction of the lower incisors often magnifies the chin prominence that was a major reason for seeking treatment initially[4].

For this patient, bilateral first premolar extractions were planned since they were in the middle of arch curvature both sides and the position of first premolars were close to the problem area. Due to severe crowding, dental extraction and upper anterior teeth proclination were planned. Base on the evaluation, upper incisor proclination could possibly have been done since 1) existing position of upper incisors was retroclined 2) adequate bone support in the anterior region 3) not effect to soft tissue profile due to the patient originally had obtuse nasolabial angle and to procline the upper incisors will improve soft tissue profile of this patient. In the mandible, only bilateral first premolar extractions were planned in order to gain space.

In Class III cases, dental compensation results in proclination of upper incisors and retroclination of lower incisors which caused posterior movement of point A and anterior movement of point B respectively. In addition, mandibular growth remaining result in Pog moving forward. Concave profile or dish-in face after Class III camouflage treatment should be cautiously considered and patient should be informed before starting treatment.

The treatment was started with lower posterior bite plane to raise the bite and fixed appliance were bonded to the upper teeth to procline upper incisor until a positive overjet was achieved. While the patient have been wearing the lower posterior biteplane, the patient's occlusion was found to be the same position of centric relation (edge to edge bite) which this position was nearly close Class I canine and molar relationship. Also, we found that the patient's soft tissue profile was improved and lower facial height was increased due to clockwise rotation of mandible. Consistent with Woodside[7], he said that the key factor for Class III treatment success was the patients had to have short facial height and would have been able to increase facial height. Once, normal overjet achieved, grinding the bite plane to reduce the height in each dental visit until the posterior teeth were occluded then removed the bite plane. After first phase of treatment which anterior crossbite was corrected. We found that the patient had Class I canine and molar relationship bilaterally, however, posterior teeth openbite were still observed. Evidently, the patient's cooperation to wear the intraarch elastic in order to close openbite and achieve maximum intercuspation.

After treatment, anterior crossbite and severe crowding of upper and lower teeth were corrected, normal overjet and overbite. Also, the patient's lateral profile while smiling found that the upper incisor were in normal position, which slightly proclination.

In this case, patient exhibited straight profile after treatment. Even point A was moved posteriorly due to proclination of upper incisors and the remaining growth of mandible also allowed forward movement of point B and pogonion which might result in concave profile

but the amount of change was slightly. In addition, Class III elastic affected lower posterior teeth extrusion and clockwise rotation of mandible so this changes lead to pleasing esthetic profile. However long term retention period should be performed in growing Class III patients.

From lateral cephalometric pre and post treatment superimposition found the upper and lower first molars were move mesially 3 mm., upper incisor proclined but lower incisors slightly retroclined, upper and lower molar were extruded 1 mm. In the mandible, it was found that minor growth was still remained in slightly upward and backward growth rotation direction. From panoramic radiograph, root resorption was not found.

Based on the result of the treatment of this patient, the prognosis of this treatment was at fair level resulting from the following factors:

1. Skeletal discrepancy: Although, the patient had skeletal Class III and was still in the growth phase. However, the growth was only remained very little in mandible due to patient was in the post pubertal growth spurt.

2. Inclination of upper incisors: Relapse tendency of the orthodontic correction depended on the initial inclination of the incisors[8]. When proper treatment was performed, the overbite could have been treated successfully and relapse could have been prevented.

3. During treatment, it was important to maintain arch coordination between maxillary and mandibular dental arch to have a perfect functional occlusion and intercanine width should have been maintained as originally presented in order to minimize relapse[9,10].

4. Good patient cooperation was important in successful orthodontic treatment include wearing retainers in retention phase.

In retention phase, using a 3x3 fixed retainer in the upper arch due to severe crowding at the beginning and prevent flaring and spacing of the upper incisors which might occur from late mandibular growth[4] combined with wraparound retainers in upper and lower jaws. The advantage of wraparound retainer was no occlusal interference, especially if the wire crossing occlusal embrasures can cause space re-opening at extraction site[11]. Gradually reduce the time and frequency of retainers insertion until the patient has a stable occlusion.

Retention period in Class III camouflage is very important since this kind of treatment leads to some of periodontal problem such as, fenestration and/or dehiscences of bone from improper inclination of upper and lower anterior teeth in order to compensate the position of anterior teeth. From dental compensation, traumatic occlusion could be found which caused gingival recession, bone loss and tooth mobility accordingly. In the retention phase, the patients should be periodic recalled both clinically and radiographicly. Clinical assessment to evaluate gingival recession, fremitus (centric and eccentric position), tooth mobility. Radiographic assessment such as lateral cephalometric to evaluate teeth and jaw change position, periapical radiograph to evaluate periodontal status and fremitus signs of trauma from occlusion.

Conclusion

In this case reported herein, showed the outcome of camouflage orthodontic treatment in growing patient. Evaluation of growth status, timing of camouflage treatment and treatment plan is very important. This patient has good results, the severe crowding in both arches and an anterior crossbite were corrected after treatment.

The relations between the upper and lower jaws are appropriate, the mandible has slightly forward movement. Acceptable balance and harmony of the lateral profile. Intraoral examination revealed normal overjet, overbite and Class I canine and molar relationship on both sides. Root parallelism is achieved to promote a good periodontal prognosis and long-term maintenance of the correction obtained.

References

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