

Dental changes and space gained as a result of early treatment of pseudo-Class III malocclusion

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This study was designed to investigate the dental changes and the space gained following early treatment of pseudo-Class III malocclusion, using a simple fixed appliance. Twenty-one consecutively treated patients who had a pseudo-Class III malocclusion comprised the treated group. Fifteen untreated control subjects were used as matched controls for the three-year follow-up after completion of treatment. Lateral cephalograms and study models were analysed for the treated, the control and the follow-up group. The arithmetic mean and standard deviation were calculated for each variable, and paired *t*-tests were performed to assess the effects of treatment on the treated group. The Mann-Whitney test was performed to evaluate the difference between the follow-up group and the control group. Anterior crossbites and mandibular displacements were eliminated after the treatment. On average, the space gained as a result of the treatment was 4.7 mm in the upper arch ($p < 0.001$). Comparison of the space available as a result of early treatment with the space required for alignment of posterior segments in the upper arch of the untreated control group indicated that there was enough space for the eruption of the canines and premolars as a result of early treatment; whereas, lack of space was evident in the untreated controls. In conclusion, a pseudo-Class III malocclusion, proclination of the upper incisors and/or retroclination of the lower incisors contributed to the correction of anterior crossbite and the elimination of mandibular displacement. Proclination of the upper incisors, utilisation of leeway space, and arch-width increase provided the space required for eruption of the premolars and canines.

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Introduction

Pseudo-Class III malocclusion is characterised by the presence of an anterior crossbite due to mandibular displacement.^{1–2} Mandibular displacement, where upper incisors are usually retroclined and lower incisors are usually proclined, has been attributed to incisor interferences.^{1–6} Dental interferences lead to premature contact during the normal path of closure of the mandible and cause its displacement. The incidence of pseudo-Class III in a sample of 7,096 Chinese children has been estimated to be from 2 to 3 per cent, which is one and a half times that of skeletal Class III in the same sample population.⁷

With such incidence of pseudo-Class III when compared with skeletal Class III malocclusion, it is difficult to justify the lack of information in the literature on the timing of treatment of this malocclusion. In contrast, the timing of treatment of skeletal Class III has received extensive attention.^{2,4,6,8–12} In the case of skeletal Class III with maxillary deficiency, the use of reverse headgear has been advocated while the circum-maxillary sutures are still open.^{10–12} In the instance of a skeletal Class III due to mandibular prognathism, early intervention coincident with the eruption of upper permanent incisors has been recommended.^{8,9,13} However, since mandibular growth exceeds maxillary growth during adolescence, a degree of relapse has been found after early treatment¹¹ and several reports advocate delaying the treatment of skeletal Class III until mandibular growth is complete.^{14–15}

The timing of treatment of pseudo-Class III remains controversial.¹³ Some clinicians believe that, in many patients, it is best to allow the eruption of the permanent teeth before initiating orthodontic treatment. This way, a relatively

straightforward manner of treatment within a predictable period of time can be provided. However, delaying the treatment until the permanent dentition may cause a lack of space for the eruption of the canines.^{1,3,5} This lack of space could be due to the retroclination of the upper incisors frequently found in pseudo-Class III, as well as the loss of the leeway space, and a growing number of clinicians have advocated the advantages of early intervention.^{1-3,8-10,16-20} The benefits attributed to early treatment of pseudo-Class III focus on improving self-esteem of the growing child^{9,16-20} and on eliminating the traumatic occlusion to the incisors in crossbite.^{1-3,6,8} However, little research has been undertaken to evaluate the effects of treatment of pseudo-Class III cases in the mixed dentition and compare them with cases treated in the late mixed or permanent dentition. As such, the purposes of this study were: (i) to examine dental changes and the subsequent space gained following a short period of treatment of pseudo-Class III in the early mixed dentition; (ii) to follow up the effects of treatment until eruption of premolars and canines; and (iii) to compare a two-year follow-up of the results of early treatment with the matched untreated controls.

Subjects

The treated group consisted of twenty-one consecutively treated patients (12 males and 9 females; mean age: 9.6 ± 1.5 years), who were obtained from the graduate orthodontic clinic at the Hong Kong University. The average treatment time was 0.7 ± 0.4 years. The selection criteria were: (i) Class III incisor relationship (at least two incisors in crossbite) in centric occlusion; (ii) in the early mixed dentition and growing, without exfoliation of the second primary molars; (iii) exhibiting mandibular displacement; (iv) not having had orthodontic therapy of any type prior to treatment related to the study; and (v) of Chinese origin.

The follow-up group comprised twelve patients of the treated group, who were followed up until the eruption of all premolars and canines (mean age: 12.5 ± 2.1 years).

The control group was matched to the follow-up group and comprised fifteen patients (9 males and 6 females; mean age: 12.2 ± 1.9 years). The selection criteria were: (i) similar age to that of the follow-up group; (ii) Class III incisor relationship (at least two incisors in crossbite) at centric occlusion; (iii) in the late mixed dentition and growing, with second premolars erupted or in the permanent

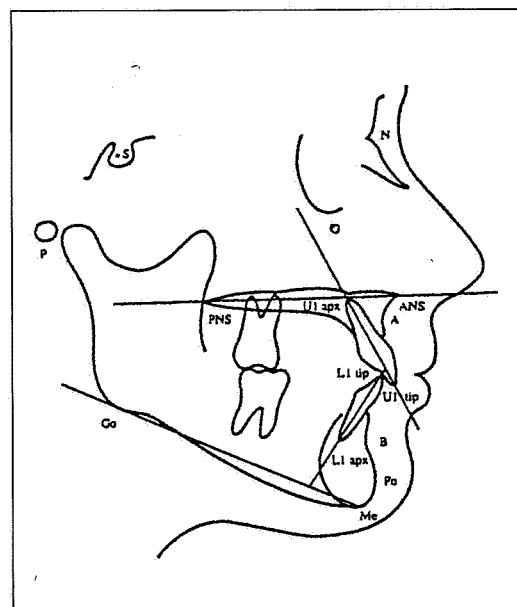


Figure 1a. Landmarks digitised in cephalometric analysis.

dentition; (iv) exhibiting mandibular displacement; (v) not having had orthodontic therapy of any type prior to this treatment; and (vi) of Chinese origin.

Methods

Lateral cephalograms and study models were taken at the beginning and end of treatment for each group. All radiographs used in the study were taken using the same cephalostat and were traced on acetate paper.

Dental measurements

The cephalometric landmarks were digitised with a sharp pencil by one observer as shown in Figure 1a. The evaluation was done with Dentofacial Planner 7.0* using the traditional cephalometric method.

Measurements for biometric analysis (Figures 1b and c)

Arch perimeter measurements:²¹ The arch perimeter of the following segments were measured: (i) anterior segment: distal contact point of left

* Dentofacial Software Inc., Canada.

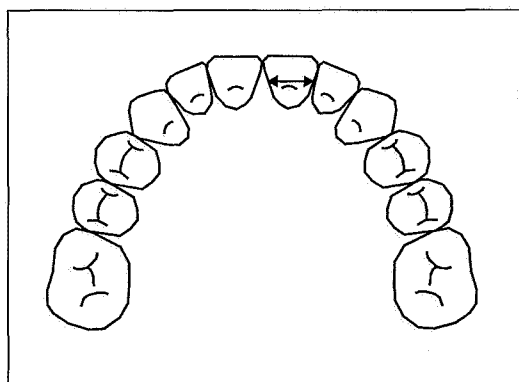


Figure 1b. Tooth width measurement.

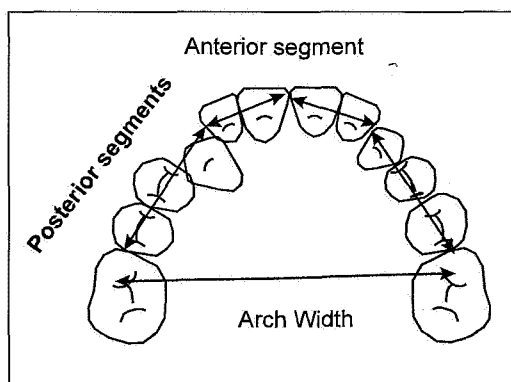


Figure 1c. Space analysis measurements.

lateral incisor to that of right lateral incisor; and (ii) posterior segment: distal contact point of lateral incisor to the mesial contact point of the first molar. The total and segmental arch perimeters in both the maxillary and mandibular dental arches were calculated.

Tooth size measurements: The mesiodistal widths of the maxillary and mandibular teeth were measured; if the teeth had erupted, the measurements were obtained from casts. A modified Tanaka and Johnston prediction method for the Chinese was used for the unerupted canines and premolars.²² Ling, in 1992, reported the following formula for prediction of canine-premolar sizes: halve the sum of the mesiodistal dimensions of the four mandibular incisors; to this derived size, add the respective constants for Chinese males and females in the two arches (male maxillary constant: 11.50 mm; male mandibular constant: 10.61 mm; female maxillary constant: 10.86 mm and female mandibular constant: 9.85 mm.)

Tooth-size/arch perimeter discrepancy: Space analysis was calculated for both the maxillary and mandibular arches by subtracting the sum of the width of teeth from the appropriate arch perimeter segment. Crowding was recorded as negative, spacing as positive.

Arch width measurements: The maximum rectilinear distance between the mesiobuccal cusp tips of the first permanent molars.

Statistical analysis

The arithmetic mean (mean) and standard deviation (SD) were calculated for each variable, and paired *t*-test was performed to assess the treatment in the treated group. Mann-Whitney test was used to evaluate the significant difference between the follow-up group and untreated control group. The levels of significance used were defined as: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

All cephalograms and casts were measured twice by an independent operator on two separate occasions, with a two-week interval between measurements. Measurements were undertaken by the same examiner in order to reduce method error. The mean difference between the results of the two occasions was calculated; the difference was found to be small and not statistically significant. The method error in locating, superimposing and measuring the changes of different landmarks was calculated by the formula:²³

$$ME = \sqrt{\sum d^2 / 2n}$$

where *d* is the difference between two registrations of a pair and *n* is the number of double registrations. All variables were traced and superimposed with measurements recorded on two different occasions. The combined ME was less than 0.8 mm for all linear variables and 1.2 degrees for all angular variables investigated.

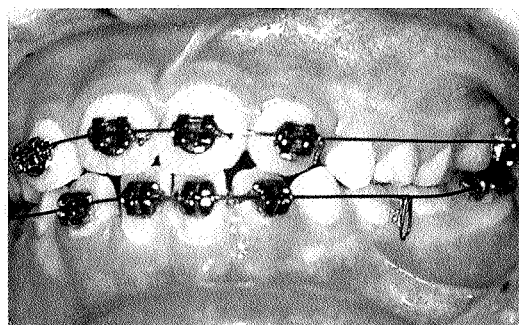


Figure 2. Advancing loops in the upper arch, and closing loops in the lower arch in the appliance used.

The appliance (Figure 2)

A 2 x 4 appliance comprising bands on the two molars and four 0.018" slot brackets on the incisors was used. A flexible 0.016" nickel titanium archwire was used initially to align the anterior teeth. A 0.016" stainless steel wire, with advancing loops mesial to the molar band was then used to procline the upper incisors. A 0.016" stainless steel archwire with closing loops was used for subjects whose lower incisors were proclined. A TMA (0.016" x 0.022") or stainless steel rectangular archwire was used for final detailed torque adjustments.

Results

The treated group

Incisor inclination changes: On average, the upper incisor inclination to maxillary plane at the beginning of treatment was 111.6 degrees (Table I), which indicated upright upper incisors.²⁴ Orthodontic treatment for a period of 4 to 8 months resulted in proclination of the upper incisors by an average of 9.7 degrees ($p < 0.001$)

(Table I). At the beginning of treatment, the average value of the lower incisor inclination to mandibular plane was 92.5 degrees (Table I). In nineteen out of twenty-one subjects, no treatment was required in the lower arch. However, the angulation of lower incisors was decreased on average by 5.0 degrees ($p < 0.001$) (Table I). The average post-treatment value for lower incisor inclination was 87.5 degrees (Table I), which indicated slightly retroclined lower incisors both before and after treatment.²⁴

Orthodontic treatment to retrocline the lower incisors with the closing loops was undertaken in two patients. In both the pre-treatment values of the inclination of the lower incisors were 100.2 degrees and 97.3 degrees, and after simple fixed appliance treatment were 90.1 degrees and 93.6 degrees.

Space analysis in the maxilla: Pre-treatment space analysis revealed, on average, no crowding in the anterior segment and 1.6 mm of crowding in the posterior segments. At the end of 4 to 8 months of treatment, an excess of approximately 4.7 mm of space was created in the upper arch; that is, 1.8 mm ($p < 0.01$) (Table II) of space was measured in the anterior segment and 2.9 ($p < 0.01$) (Table II) in the posterior segments. Measurement of the molar widths in the upper arch showed an increase of 0.9 mm after treatment ($p < 0.001$) (Table II).

Space analysis in the mandible: Pre-treatment space analysis revealed neither crowding nor excess space in the anterior segments but 5.3 mm of space in the posterior segments (Table II). At the end of the treatment, an excess of 4.9 mm of space was measured in the lower arch, of which 4.6 mm was found in the posterior segments. The spatial difference pre- and post-treatment was not statistically significant ($p > 0.05$) (Table II).

Table I. Cephalometric measurements of pre- and post-treatment results in the treated group

	Pre-treatment Mean	SD	Post-treatment Mean	SD	Diff./Sig. Mean	SD
SNA	82.0	3.5	82.2	3.5	0.2	0.6
SNB	80.5	3.5	80.4	3.5	-0.1	0.7
ANB	1.4	1.9	1.8	1.9	0.4*	0.7
U1/MxPL	111.6	6.1	121.3	6.5	9.7***	4.3
L1/MnPL	92.5	4.5	87.5	3.0	-5.0***	3.5

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Table II. Pre- and post-treatment space analysis results for the treated group.

Teeth	Pre-treatment		Post-treatment		~ Diff./Sig.	
	Mean	SD	Mean	SD	Mean	SD
16-26	-1.9	5.2	2.8	4.0	4.7***	3.6
12-22	-0.3	4.3	1.5	2.7	1.8**	2.4
16-12 to 22-26	-1.6	4.1	1.3	2.2	2.9**	4.6
Width (16-26)	49.2	2.2	50.1	2.5	0.9***	0.5
36-46	5.7	3.1	4.9	3.2	-0.8	0.5
32-42	0.4	1.6	0.3	1.0	-0.1	1.4
46-42 to 32-36	5.3	2.4	4.6	2.9	-0.7	2.6
Width (46-36)	43.2	2.1	43.5	2.4	0.3	0.7

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Table III. Comparison of cephalometric analysis results in the follow-up group (F) and the control group (C).

	F		C		p-value
	Mean	SD	Mean	SD	
SNA	83.2	3.3	80.7	3.2	0.04*
SNB	81.3	4.7	81.3	3.5	0.7
ANB	1.0	3.1	-0.5	1.7	0.2
U1/MxPL	124.8	5.9	119.0	8.1	0.07
L1/MnPL	90.1	5.4	94.9	8.9	0.1

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Comparison of the follow-up group and the control group

Cephalometric analysis: Comparison of the mean value of SNA in the follow-up group with that in control group showed a significant difference, with a mean value of 83.2 degrees and 80.7 degrees, respectively ($p < 0.05$) (Table III). No significant difference was found when the mean value of ANB and angulation of upper and lower incisors in the follow-up group were compared with that in untreated control group ($p > 0.05$) (Table III).

Space analysis in the maxilla: Space analysis of the three-year follow-up group revealed, on average, 1.2 mm of space in the anterior segment and 1.6 mm in the posterior segments (Table IV). In the untreated control group, no crowding in the anterior segment was noted. However, 4.3 mm of crowding was noted in the posterior segments. A comparison of the space available in the posterior segment of upper arch in the three-year follow-up group with that in the untreated control group

showed a significant difference ($p < 0.001$) (Table IV). The average value of the upper arch width in the follow-up group was 53.9 mm and that of the untreated control group was 49.0 mm, which was a significant difference ($p < 0.001$) (Table IV).

Space analysis in the mandible: Space analysis of the three-year follow-up group revealed, on average, 1.1 mm of crowding in the anterior segment and 3.5 mm of space in the posterior segments (Table IV). In the untreated control group, no crowding in the anterior segment was noted and 1.3 mm of space was noted in the posterior segments. In both the three-year follow-up group and the untreated control group, a significant difference was noted in a comparison of the space available in the anterior ($p < 0.01$) (Table IV) and posterior segments ($p < 0.05$) (Table IV) of the lower arch. The average value of the lower arch width in the follow-up group was 48.2 mm and that of the untreated control group 43.5 mm, which was a significant difference ($p < 0.001$) (Table IV).



Figure 3a. Right buccal segments in a subject in the control group.

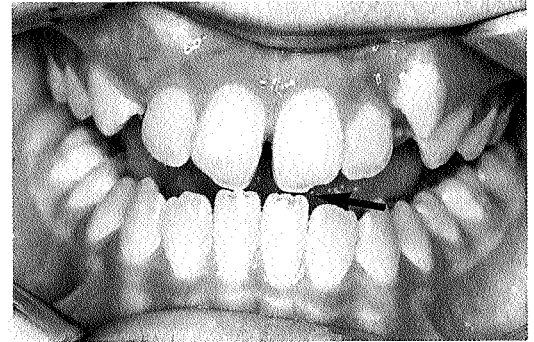


Figure 3b. Intra-oral frontal view at centric relation in a subject in the control group.

Discussion

The timing of treatment of pseudo-Class III could be either in the early mixed dentition or delayed until the late mixed or permanent dentition. For this particular study the early mixed dentition was chosen and results were compared with controls in the late mixed or permanent dentition. The early treated group was followed up for two years and the benefits of early treatment were assessed and compared with the untreated controls. In this way, the space available for the eruption of canines and premolars as a result of early treatment could be compared with the space required for alignment of the canines and premolars in the untreated control group.

Furthermore, while permanent teeth are erupting, functional shifts of the mandible can produce both transverse and anteroposterior deviations in tooth position.²¹ In this study, the effects of early correction of mandibular displacement on the

eruption guidance of the developing dentition was compared with the anteroposterior position of the premolars erupted at the displaced position in the control group. Eleven out of fifteen controls with anterior mandibular displacement showed a Class I molar and premolar relationship in centric occlusion (Figures 3a and c). At centric relation or after correction of the mandibular displacement, the occlusion of the buccal segments changed to a Class II premolar and molar relationship (Figure 3b). Correction of this anteroposterior dental discrepancy required distal movement of the upper posterior teeth into a Class I relationship. This comprehensive orthodontic treatment could be avoided by the correction of the mandibular displacement in the early mixed dentition so as to allow the canines and premolars to erupt into a Class I relationship at centric relation. At the two-year follow-up of all the follow-up cases, the canines and premolars had been guided into a Class I occlusion during eruption.

Table IV. Comparison of space analysis results in the follow-up group (F) and the control group (C)

	F		C		p-value
	mean	SD	mean	SD	
16-26	2.8	2.5	-4.1	3.1	<0.0001***
12-22	1.2	1.2	0.2	1.0	0.051
16-12, 22-26	1.6	2.5	-4.3	3.5	0.0002***
Width (16-26)	53.9	0.5	49.0	2.5	<0.0001***
46-36	2.5	3.8	1.5	2.8	0.6
42-32	-1.1	1.0	0.2	1.3	0.007**
46-42, 32-36	3.5	3.3	1.3	2.3	0.04*
Width (46-36)	48.2	3.5	43.5	1.8	0.0002***

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

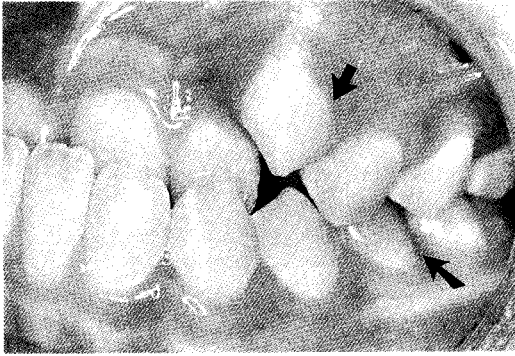


Figure 3c. Left buccal segments in a subject in the control group.



Figure 4a. Case 1: Pre-treatment. Right buccal segment.



Figure 4b. Case 1: Pre-treatment. Left buccal segment.



Figure 4c. The appliance.



Figure 4d. Case 1: Upper and lower occlusal.



Figure 4e. Case 1: Post-treatment. Upper and lower occlusal.

In both the treated and control groups, anterior mandibular displacement was caused by dental interference. Analysis of pre-treatment radiographs revealed that upper incisor inclination to the maxillary plane was either upright or slightly retroclined. The average value of upper incisor to maxillary plane was 111.6 degrees (Table I) (the normal value of the Chinese is 118 ± 6 degrees.²⁴ These results are similar to earlier reports in which the upper incisors were found to be retroclined in pseudo-Class III malocclusion.¹⁻⁵ Upper incisor retroclination contributes to crowding and arch length deficiency, which is manifested in lack of space for canine eruption.^{1,3,5} In this study,

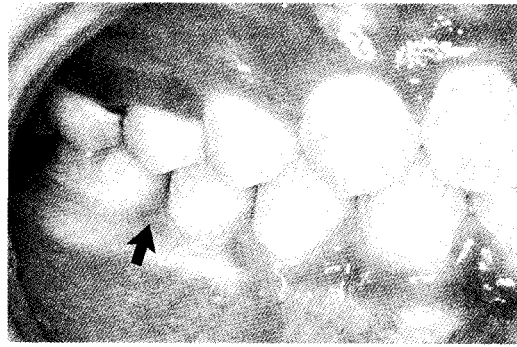


Figure 4f. Case 1: Three-year follow-up. Right buccal segments. Anterior intraoral.

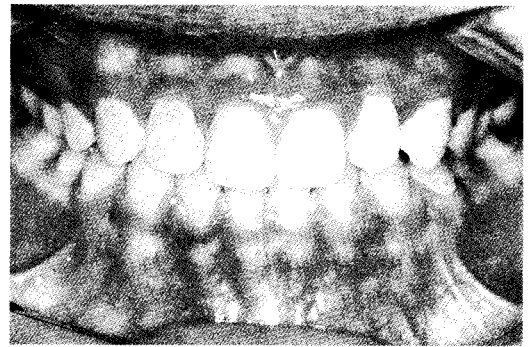


Figure 4g. Case 1: Three-year follow-up. Anterior.



Figure 4i. Case 1: Pre-treatment profile.

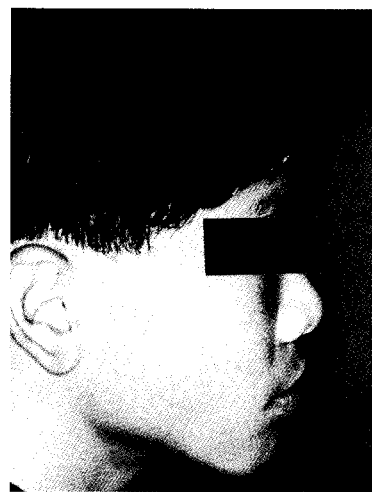


Figure 4j. Case 1: Post-treatment profile.

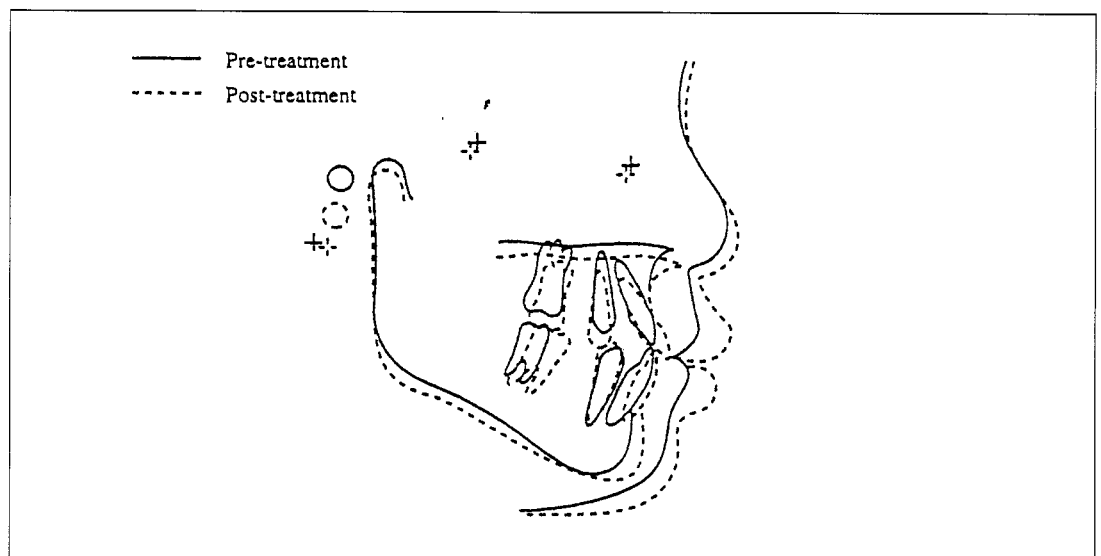


Figure 4k. Case 1: Superimposition of pre- and post-treatment lateral cephalometric films.

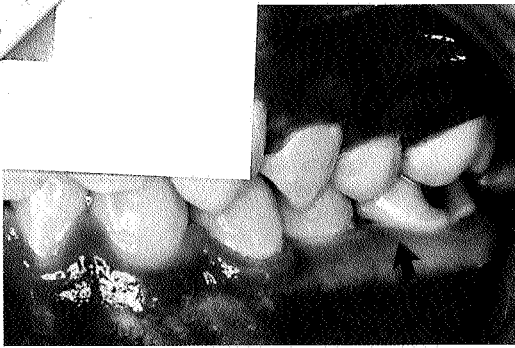


Figure 4h. Case 1: Three-year follow-up. Left buccal segment.

pre-treatment space analysis of the upper arch in the treated group showed 1.6 mm of crowding in the posterior segments (measured from distal of the lateral incisor to mesial of the first molar). In the control group, the upper arch showed 4.3 mm of crowding in the posterior segments (Table IV). As such, the increase of the crowding in the control group could have been the result of loss of leeway space. In a Chinese population, the amount of leeway space on one side of the upper arch has been reported to be 1.5 mm.²⁵ Therefore, delaying treatment until the permanent dentition could contribute to further crowding through loss of leeway space. In contrast, space analysis of the lower arch in the two-year follow-up group showed 3.5 mm of space in the posterior segments, compared with 1.3 mm of space in the same segments in the untreated control group. The difference was statistically significant ($p < 0.05$) (Table IV). Yuen *et al.*²⁶ reported that leeway space in the lower arch in a Chinese population was 2.2 mm on each side. The decrease of arch length seen in the control group was due to loss of leeway space as a result of mesial drift of the first molars, space analysis of pre-treatment and post-treatment study models in the lower arch showing a slight decrease in arch length of 0.8 mm. This change could have been due to the retroclination of the lower incisors by an average of 5.0 degrees as an indirect result of the treatment, even without orthodontic therapy in the lower arch. Furthermore, in the three-year follow-up group slight crowding in the anterior segment of the lower arch was noted as being significantly different when compared with the untreated control group ($p < 0.01$) (Table IV). This could have been due to dental compensation, the retroclination of lower incisors being a result of correction of mandibular displacement. Similar indirect effects on lower incisors after correction of anterior crossbite with reverse headgear have been observed.¹²

The mean value of SNA in the follow-up group showed significant forward movement of the maxilla after active treatment when compared with the control group. This result highlighted the advantage of early treatment of pseudo-Class III malocclusion by providing a favourable environment for maxillary growth.^{3,5,6,9,27-35}

Analysis of the pre-treatment records led to the diagnosis that the retroclined upper incisors caused dental interference during the closure path of the mandible. This dental interference resulted in a mandibular displacement in a forward and upward direction to achieve function. Also, the retroclination of the upper incisors contributed to the space loss in the upper arch. Therefore, the early treatment objectives were to procline the upper incisors, eliminate mandibular displacement and create space for the eruption of the canines and premolars.

The orthodontic treatment carried out on the patients in this study included the use of a simple fixed appliance in the upper arch with molar bands or buccal tubes on the first molars and four brackets on the incisors. Only two out of twenty-one patients in the treated group received both upper and lower arch treatment. In these two subjects, the mandibular displacement was caused by dental interference due to retroclination of the upper incisors (115° , 111°) and slightly proclined lower incisors (100° , 97.3°). As such, the objectives of treatment were to eliminate displacement by proclination of upper incisors using advancing loops, and retroclination of lower incisors using closing loops (Figure 2). The remaining nineteen patients received treatment in the upper arch only. On average, 2.5 degrees of incisor proclination creates 1 mm of space on each side.³⁶ In all twenty-one patients, the upper incisors were proclined on average 9.7 degrees, which might have resulted in, at most, 3.8 mm of space on each side. At the end of 4 to 8 months of treatment, space analysis showed a gain of 4.7 mm in the upper arch ($p < 0.001$) (Table II), of which 2.6 mm was in the posterior segments ($p < 0.05$) (Table II). Initially, it was thought that the reciprocal action of the advancing loops to procline the incisors had caused distal movement of the molars; however, radiographic superimposition showed no such effect (Figure 4k). Thus, the presence of the advancing loops mesial to the first molars prevented only the mesial drift of first molars, and allowed the utilisation of leeway space for the canines and premolars to erupt. Analysis of arch width showed that molar width in the upper arch increased on average 0.9 mm



Figure 5a. Case 2: Pre-treatment. Right buccal segment.

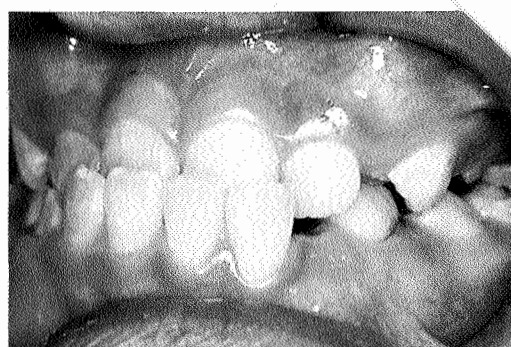


Figure 5b. Case 2: Pre-treatment. Left buccal segment.



Figure 5c. Case 2: Pre-treatment. Upper occlusal.

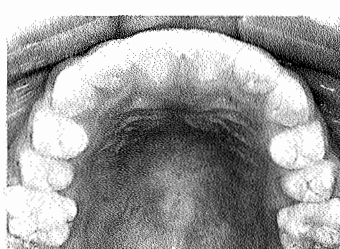


Figure 5d. Case 2: Post-treatment. Upper occlusal.

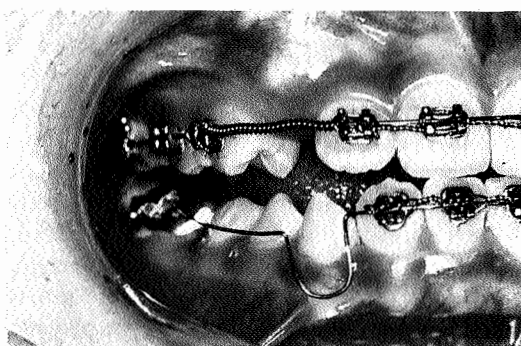


Figure 5e. Case 2: The appliance.

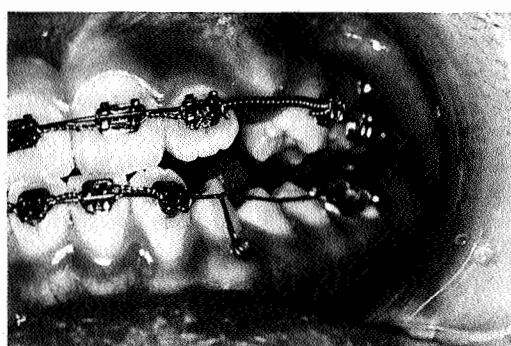


Figure 5f. Case 2: The appliance.

($p < 0.001$) (Table II). Therefore, the total space gained by a short period of treatment resulted from a combination of proclination of the upper incisors, utilisation of the leeway space and an increase in arch width. Comparison of the space created as a result of early treatment with that required for alignment of posterior segments in the upper arch in the untreated controls showed a difference of 5.9 mm ($p < 0.001$) (Table IV). Both the lack of space in the untreated controls and the excess of space in the follow-up group are direct evidence of the benefits of early treatment.

Case report 1 (Figures 4a to k)

Case 1 was a Chinese boy aged 10 years 10 months in the early mixed dentition whose chief complaint was that his upper teeth were biting behind his lower teeth (figures 4a and b). Pre-treatment cephalometric analysis showed upright upper incisors (-115°). Chinese normal value is 118 ± 6 degrees.²⁴ Space analysis showed approximately 6.5 mm of crowding in the upper arch, with 1.5 mm of this in the anterior segments and

5.0 mm in the posterior segments (Figures 4a, b and c). Intraoral photographs of the upper arch indicated a lack of space for the eruption of the upper canines, especially the upper left canine (Figure 4c).

Treatment was initiated in the upper arch with a simple fixed appliance. Two molar bands were fitted on the upper first molars and four brackets (0.018" slot) on the upper incisors. Initial levelling and aligning was undertaken using a 0.016" NiTi wire for two months, followed for three months by a 0.016" stainless steel wire with advancing loops to procline the upper incisors. A 0.016 x 0.022" TMA wire was used to torque the upper incisors for three months (Figure 4d). After eight months of treatment, the anterior crossbite was corrected and the mandibular displacement was eliminated, and the upper incisors were proclined by 7 degrees. Post-treatment radiographs showed that the angulation of the upper incisors to maxillary plane was 122 degrees. Post-treatment space analysis revealed 1.5 mm excess of space in the upper arch (Figure 4e) compared with 6.5 mm of crowding shown by pre-treatment space analysis (Figure 4d). The space gain was due to proclination of the upper incisors by 7 degrees. Leeway space must have contributed to the space needed for the eruption of the upper canines and premolars.

A three-year follow-up showed settling of the occlusion, no relapse of the anterior crossbite and eruption of the permanent teeth into a Class I relationship (Figures 4f, g and h).

Case report 2

(Figures 5a to k)

Case 2 was a Chinese boy aged 12 years 3 months in the late mixed dentition (the second premolars had erupted), with the same chief complaint as the previous case. Pre-treatment cephalometric analysis showed upright upper incisors ($\sim 115^\circ$) and space analysis showed an arch length deficiency of 10.0 mm in the upper arch. Intra-oral photographs of the upper arch showed lack of space for the eruption of the upper canines (Figure 5c). Pre-treatment photographs (Figures 5a and b) showed premolars and molars erupted into a Class I relationship at centric occlusion. At centric relation, the premolars and molars showed a Class II relationship. Therefore, the objectives of the treatment were to: (i) correct the mandibular functional shift by proclination of the upper incisors and retroclination of the lower incisors; (ii) create space for the eruption of the canines;

and (iii) distalise the buccal segments to a Class I relationship at centric relation.

Straight wire appliances (0.018" slot) were employed in both upper and lower arches. The initial levelling and aligning wire was 0.016" NiTi. A series of wires (0.016" stainless steel, 0.016" x 0.022" TMA and 0.016" x 0.022" stainless steel rectangular wire) was used during the course of treatment. The upper premolars and molars were distalised using an open coil spring against the incisors (Figures 5g, h and i). At the end of two years of treatment, the upper incisors were proclined by 11 degrees. Post-treatment radiographs showed that the angulation of the upper incisors to the maxillary plane was 126 degrees. This proclination of the incisors and retroclination of lower incisors contributed to correction of the anterior crossbite and elimination of the mandibular displacement. Distalisation of the buccal segments contributed to establishing a Class I relationship for the canines and premolars (Figures 5e and f). Furthermore, post-treatment space analysis showed that treatment resulted in a space gain of 11.0 mm in the upper arch, 8.0 mm of which was the result of proclination of upper incisors by 11 degrees. Therefore, the upper incisor proclination and distalisation of the premolars and molars resulted in creation of space for the alignment of the canines.

A three-year follow-up showed a stable occlusion with slight rotation of the upper left lateral incisor. Figures 5j and k show the profile change induced by treatment and growth.

Conclusions

The benefits of the early treatment of pseudo-Class III malocclusions can be summarised as:

1. The provision of space for the eruption of the canines and premolars in the upper arch.
2. The provision of a favourable environment for maxillary growth.
3. Early correction of mandibular displacement allows the erupting dentition to be guided into a Class I relationship at centric relation.

The disadvantages of delaying treatment until eruption of the permanent teeth are:

1. Increased crowding as a result of the loss of leeway space.
2. Retardation of maxillary growth due to the anterior crossbite.
3. Canines and premolars erupt into a Class I relationship at centric occlusion.

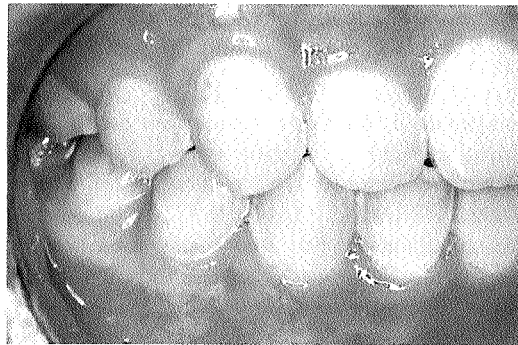


Figure 5g. Case 2: Three-year follow-up. Right buccal segment.



Figure 5h. Case 2: Three-year follow-up. Anterior intra-oral.

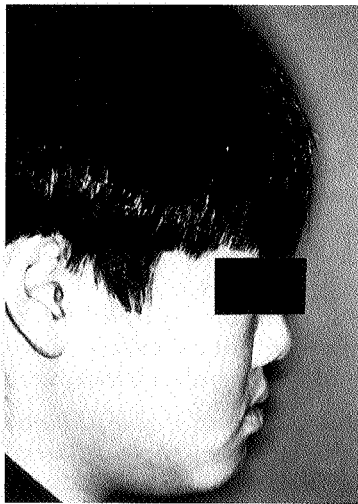


Figure 5j. Case 2: Pre-treatment profile.

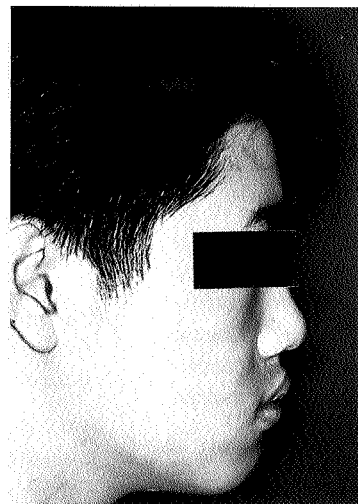


Figure 5k. Case 2: Post-treatment profile.

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Figure 5i. Case 2: Three-year follow-up. Left buccal segment.

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