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Class III malocclusions treated with the Begg technique

Akira Kameda, D.D.S.,PhD., Niigata, Japan

Abstract
Class III malocclusion is the commonest form of malocclusion requiring treatment in Japan. Three clinical cases are discussed to illustrate the principles of treating Class III malocclusions at particular stages in the development of the occlusion. In the mixed dentition, expansion mechanics allow accommodation of canines and premolars. The second case shows the use of an orthopaedic chin cap appliance during the pubertal growth period followed by fixed appliances to align teeth and form a stable occlusion. The third case illustrates the management of Class III malocclusion in the non-growing adult.

Key Words: Class III assessment, orthopaedics, differential extraction, treatment.

INTRODUCTION

Frequency of Class III malocclusions in Japan

Today, the most critical problem facing clinical orthodontics in Japan, is the treatment of Class III malocclusions.

For instance, in the 1950's, the proportion of orthodontic patients treated at university hospitals with Class III malocclusions was 15 to 17 percent. In the 1960's, however, patients became 32.4 percent in 1966 and 53.2 percent in 1967 at university hospitals in rural areas (Susami et al, 1972).

Furthermore, Ito et al, (1980) have reported that 39.2 percent of orthodontic patients at university hospitals in comparatively urban areas had Class III malocclusions. At the author's university hospital as many as 48.6 percent of orthodontic patients had Class III malocclusions (Figure 1).

In all probability the apparent rapidly increasing number of orthodontic patients with Class III malocclusions is due to increasing awareness towards 'health', together with changes in living and social environment rather than an increased incidence of Class III malocclusion.

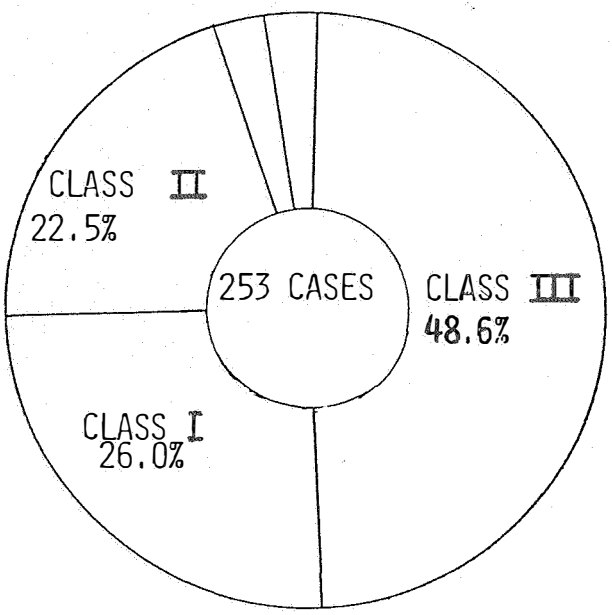


Figure 1 — Distribution of malocclusion cases

The incidence of Class III malocclusions among Japanese aged from 3 to 19 years old, inevitably differ depending on age, but both in urban and rural districts it is relatively uniform being 4 to 5 percent of the whole.

It is said that among Japanese, Class III malocclusions are common while among Caucasians, Class II malocclusions are more common. Since Caucasians have dolico-cephalic skulls, their dental arch length is comparatively longer compared with dental arch width. On the other hand, Japanese have brachy-cephalic skulls with the dental arch width similar to its dental arch length.

Japanese maxillary protrusion cases do not show any significant occurrence compared with normal occlusion. It is likely that the position of the anterior teeth, the procumbency of alveolar process as well as a backward rotation of the mandible are shown as special characteristics of Japanese malocclusions (Masaki, 1980).

The backward rotation of the mandible in Japanese allows antero-posterior co-ordination with the small maxilla. This may suggest that Class III malocclusions based on maxillary growth retardation, tend to be of high frequency in Japanese than in Caucasians.

Begg Class III treatment

The author has been trying to improve his utilisation of Begg technique begun in 1966 and particularly in bimaxillary protrusion cases and to improve and establish effective treatment methods for Class III malocclusions, based on the Begg technique (Kameda, 1982; Motohashi et al, 1968; Kameda, 1979; Kameda et al, 1972, 1973).

This paper will illustrate a number of dental and skeletal Class III malocclusions treated by the Begg technique.

CLINICAL CASE RESULTS

A TREATMENT OF DENTAL CLASS III MALOCCLUSIONS IN MIXED DENTITION

Clinical Assessment

The Begg technique can be applied routinely to patients in the permanent dentition but for younger patients early treatment is preferable from a viewpoint of growth and development and the treatment should be provided by taking erupting space available into consideration.

When treatment is initiated in the mixed dentition of a dental Class III malocclusion where there is no arch length

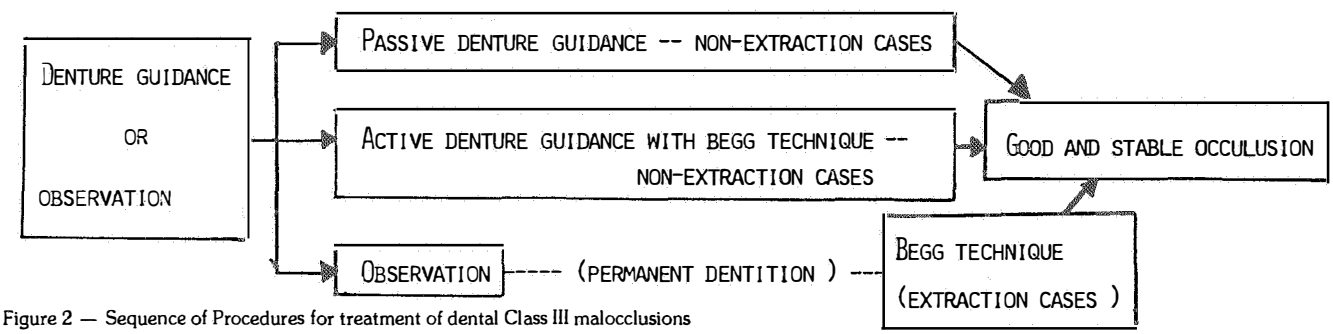


Figure 2 — Sequence of Procedures for treatment of dental Class III malocclusions

discrepancy, it is possible to obtain a stable non-extraction result by utilising space control procedures and maintaining space for erupting teeth.

However, when required space is a little more than available space the Begg technique should be applied vigorously to obtain and secure space for the successive permanent teeth. Even if there is a small amount of disharmony between tooth substance and basal bone, achieving a stable non-extraction occlusion is possible by creating space through active guidance (Kameda, 1982).

On the other hand, when available space is shorter than required space, teeth must be extracted prior to treatment, thus providing a satisfactory, stable occlusion (Figure 2).

When a true skeletal Class III malocclusion exists, however, it is difficult to treat completely with fixed appliances even beginning in the mixed dentition.

Clinical Management

Case 1 (Figures 3A-H)

The patient in Case 1 (Figures 3A-H) shows a 8 years and 5-months old boy with an apparent anterior crossbite. Analysis of lateral cephalograms revealed an ANB of minus 1°, a SN to mandibular plane angle of 34.5°, and U1 to SN angle of 90° and a L1 to mandibular plane angle of 90.5° and diagnosed as a dental Class III malocclusion. As initial orthodontic treatment, his anterior crossbite was improved by using an activator for 8 months (Figure 3B). However, since there was crowding in the upper anterior teeth, it was necessary to use a .016" looped arch wire for 8 months to eliminate the crowding (Figure 3C). Later, measurements of available space and required space of both upper and lower dental arches showed that available space was short of 4.8 mm in the maxilla and 4.7 mm in the mandible.

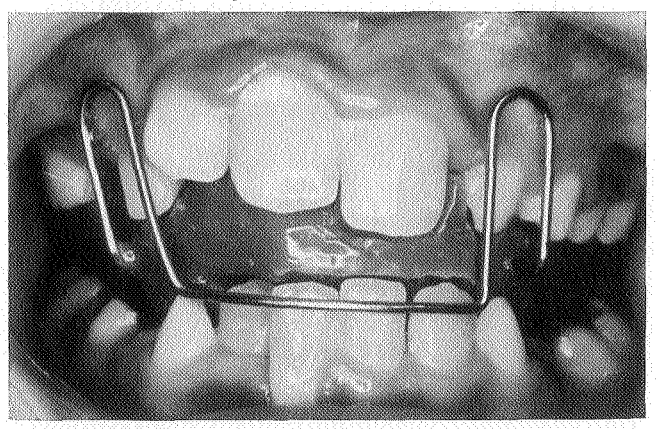
If arch length discrepancy is within 5 mm, all teeth must have brackets fitted and, by inserting arch wires, upper and lower molars are inclined distally so as to create sufficient space to enable canines and premolars to erupt before the second molars.

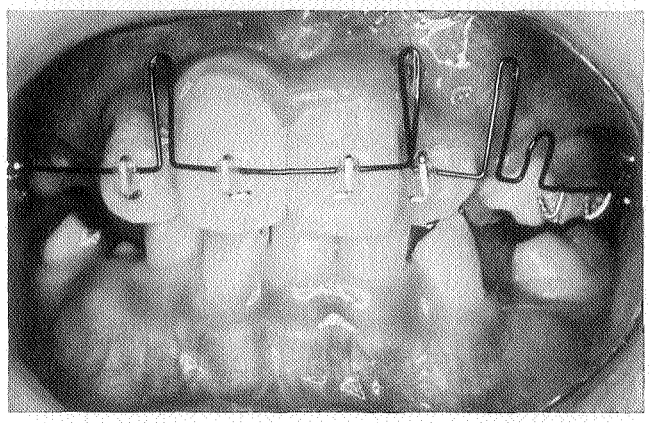
Brackets and buccal tubes were bonded on all maxillary and mandibular teeth, in order to regain space for unerupted upper right and left canines, open type coil springs were installed between lateral incisors and first premolars. In the mandibular arch in order to regain erupting space for the left second bicuspid, open type coil springs were installed between the first premolars and fist molars (Figure 3D).

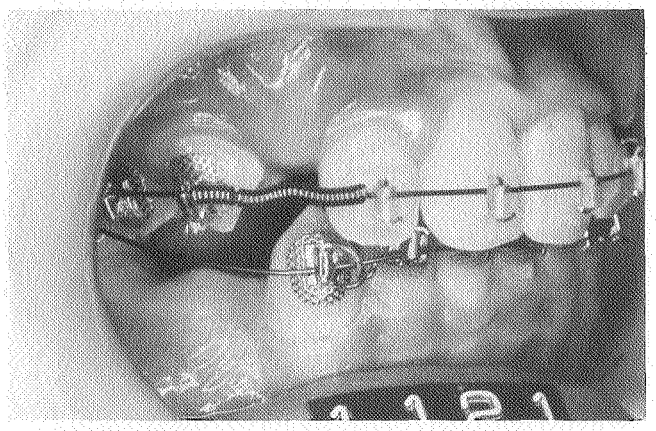
As the canines emerge, the coil springs were removed and by resilient force of looped arch wires, canines' eruption was assisted. Eight months later the looped arch wires on both the maxilla and the mandible were replaced by .016" plain arch wires and during ensuing six months all teeth were aligned (Figure 3E).

The appliances were removed after a satisfactory occlusion had been developed, and retention began using retaining plates with circumferential wires (Figure 3E). After treatment the ANB angle was improved to 1.5°, SN Mandibular plane angle of 39°, U1 to SN of 107.5° and L1 to Md 94° (Figure 3F, G). The method of making more or less space and inducing unerupted teeth to erupt into such space may result sometimes in a relapse, requiring later extractions. In this case, the intraoral photos three years later (Figure 9), demonstrate a well stabilized occlusion with the second molar completely erupted.









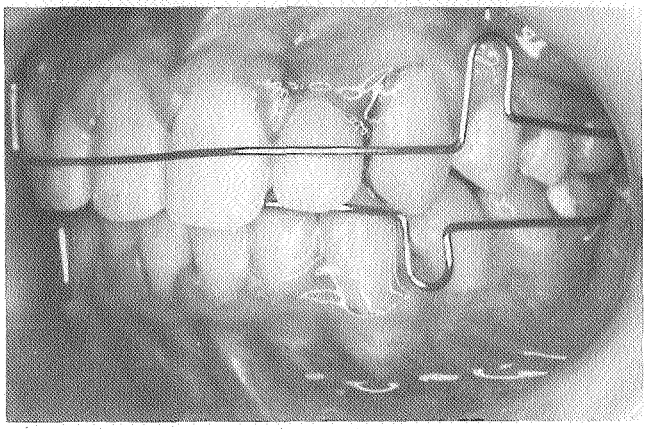
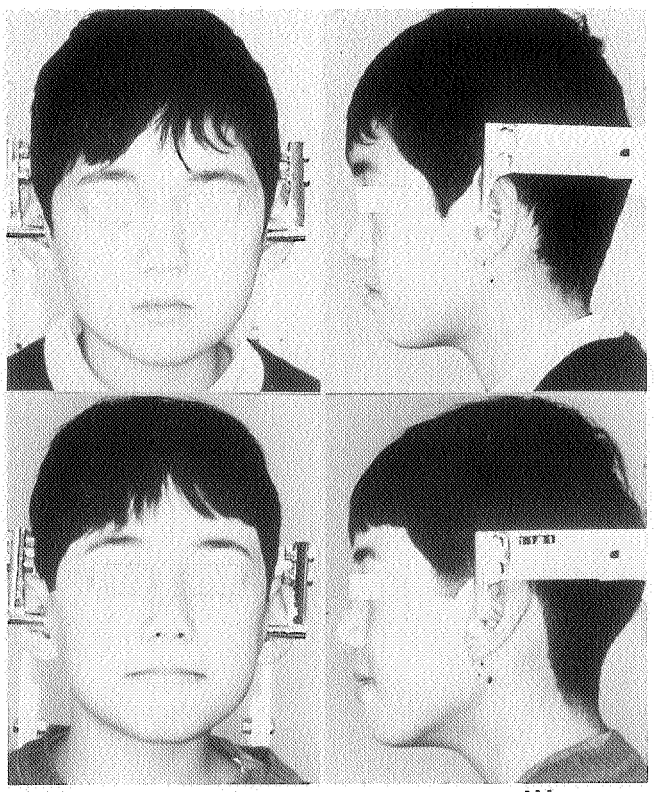
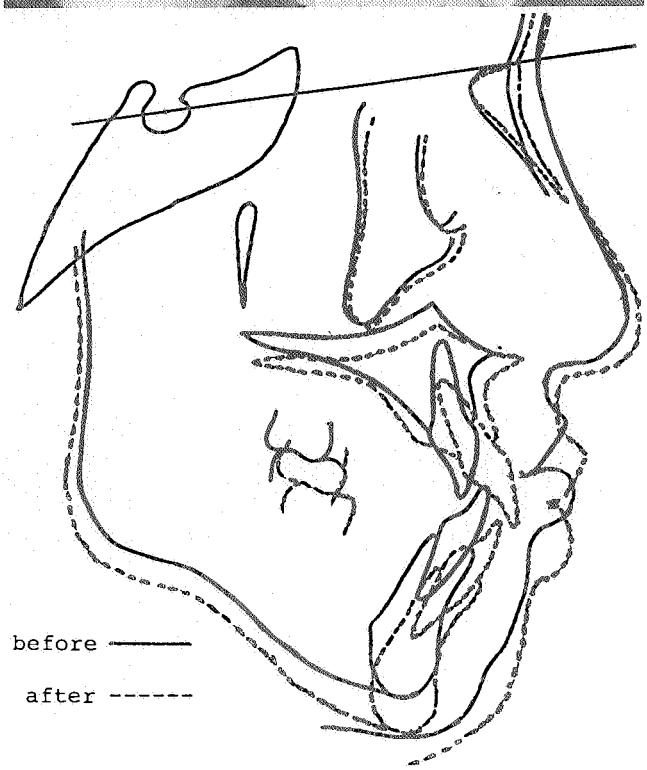


Figure 3 — Case 1, Class III mixed dentition aged 8 years 5 months
A — Intra oral photograph pretreatment
B — Intra oral photograph, pretreatment guidance
C — Begg appliances alignment looped arches
D — Begg appliances with compressed coil springs
E — Retention stage





	before	after	
SNA	75	75.5	+0.5
SNB	76	74	-2
ANB	-1	1.5	+2.5
SN-md	34.5	39	+4.5
SN-occl.	17.5	18.5	+1
Ul-SN	90	107.5	+17.5
Ll-md	90.5	94	+3.5
Ll-SN	55.5	48	-7.5
Ul-Ll	142	118	-24

F — Pre- and post-treatment photograph
G — Pre- and post-treatment tracings
— before 8 years 5 months
--- after

(B) ORTHOPAEDIC AND ORTHODONTIC TREATMENT OF PREPUBERTAL CLASS III MALOCCLUSIONS

Clinical Assessment

In prepubertal skeletal Class III malocclusion cases it is imperative to study the growth curve prior to proceeding with orthodontic treatment. Also orthodontic treatment has to be undertaken realising the possibility of a future growth spurt into consideration.

It is necessary to consider the use of orthopaedic appliances to improve apical base relationships in addition to those forces used to align teeth.

It is advisable not to place too much trust purely on appliances for aligning teeth or to use them prematurely, otherwise it may result in prolonged or repeated treatment periods related to spurts of mandibular growth.

Therefore, in skeletal Class III malocclusions in the mixed dentition, the patient's past mandibular growth both in increments and in direction, must be studied carefully. When indicated, a chin cap for restraining the growth and development of the mandible or an occipitomental anchorage for growth promotion of the maxillary bone, should be used as early as feasible. By such orthopaedic force the apical base relationships may be controlled for a long period of time. This may seem like a prolonged ordeal for both patients and operators alike.

At the end of pubertal growth, the Begg technique is applied, utilising tooth extraction if necessary, so as to establish both tooth alignment and a stable occlusion (Figure 4).



H — Intra oral photographs 3 years after appliances removed

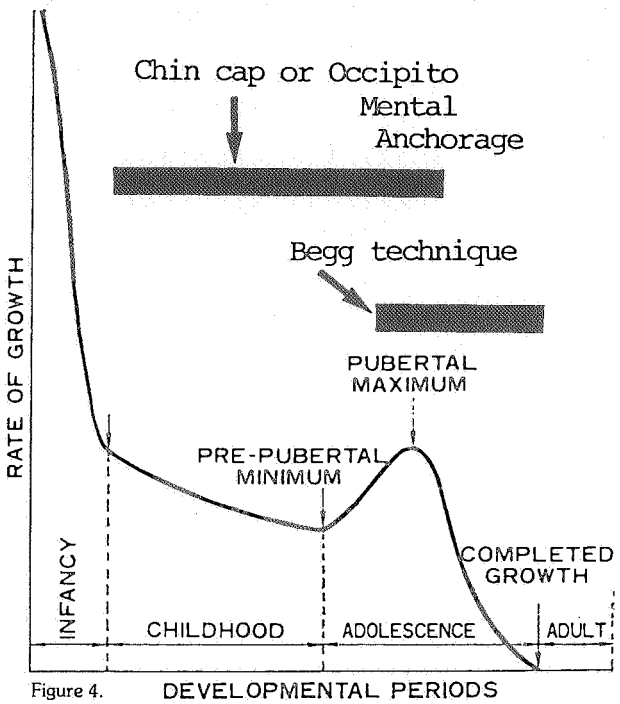


Figure 4.

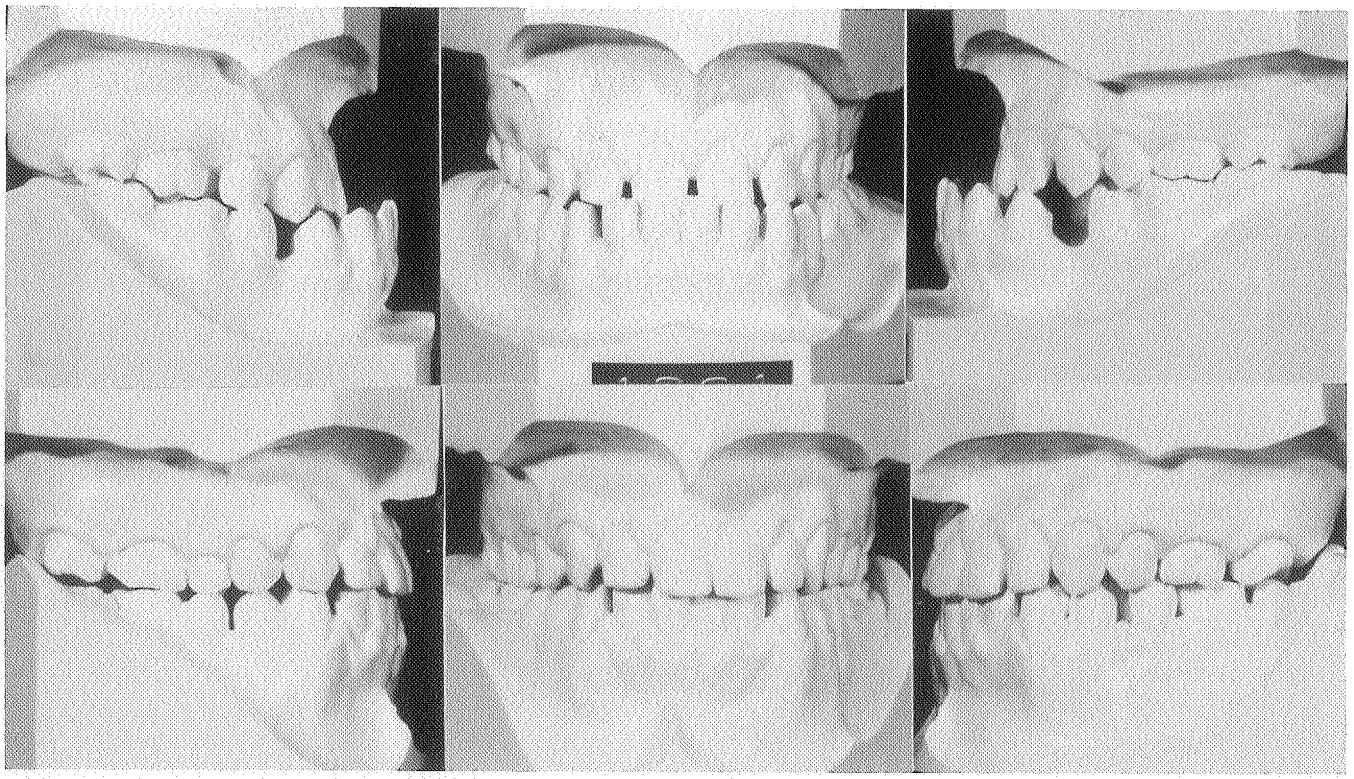
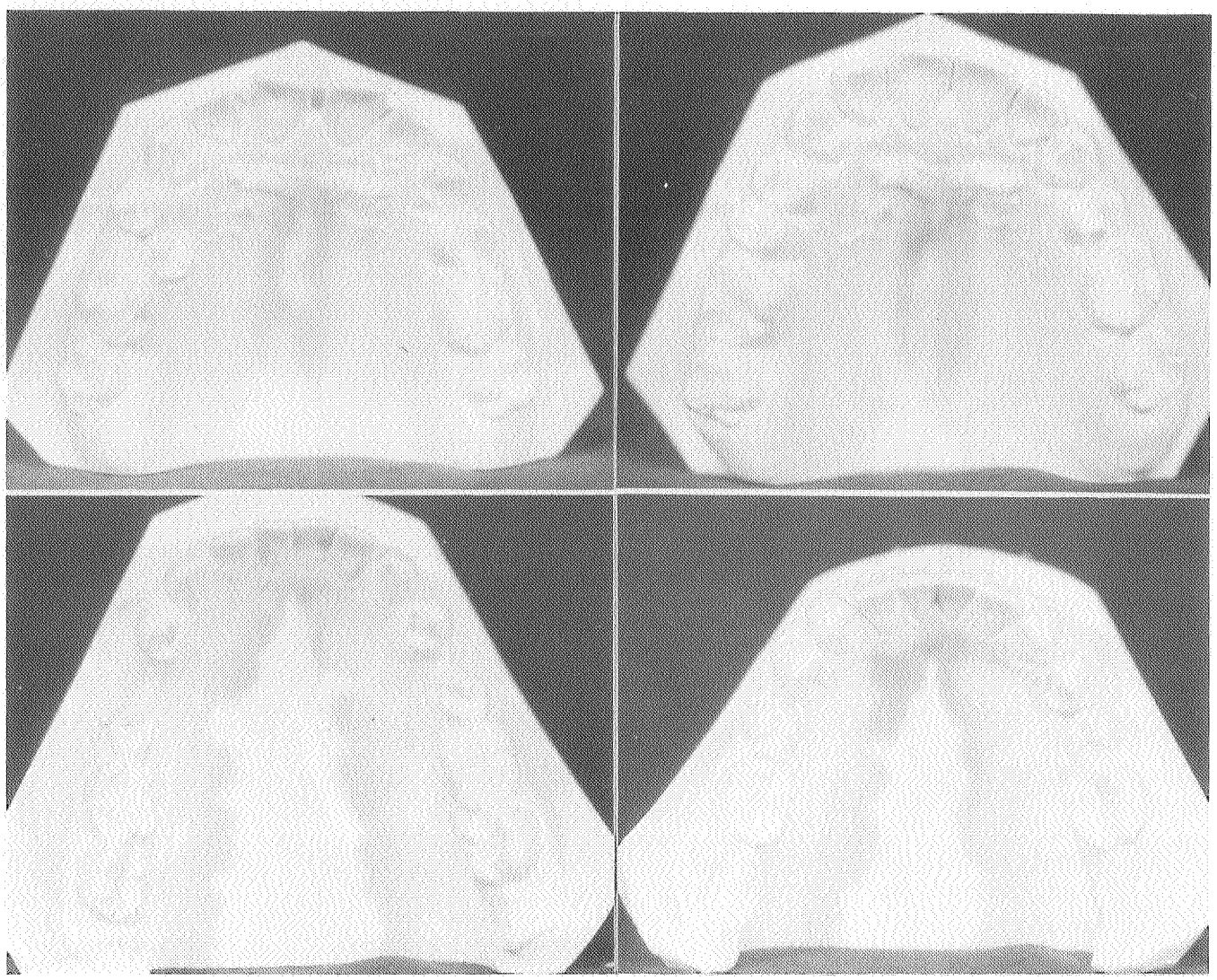


Figure 5 — Case 2, Class III malocclusion pre pubertal
A — Dental study casts, R & L profile & full face before and 18 months after treatment



B — Dental study casts occlusal view before and 18 months after treatment

At present, the author treats all skeletal Class III malocclusions in the mixed dentition stage by this manner.

Clinical Management

The patient in Case 2 (Figures 5A-K) is a female of 15 years and 8 months old and has a severe skeletal Class III malocclusion. The overbite was 3 mm and overjet was -9.5 mm and as shown in the lateral facial photos, possesses a severe concave facial type (Figure 5C).

Analysis of lateral cephalograms indicated an SNA angle of 76°, an SNB angle of 82.5° and an ANB angle of -6.5°.

On the other hand, the SN Mandibular plane angle was 34.5°, an U1 to SN angle of 103.5°, an L1 to Mandibular plane angle of 83.5°, an U1 to L1 angle of 138° and an L1 to SN angle of 62°.

Occlusally both maxillary and mandibular anterior teeth did not occlude at initial contact and there was rotation of mandibular premolars and also space between premolars. The maxillary arch had a congenitally missing right premolar (Figure 5A, B).

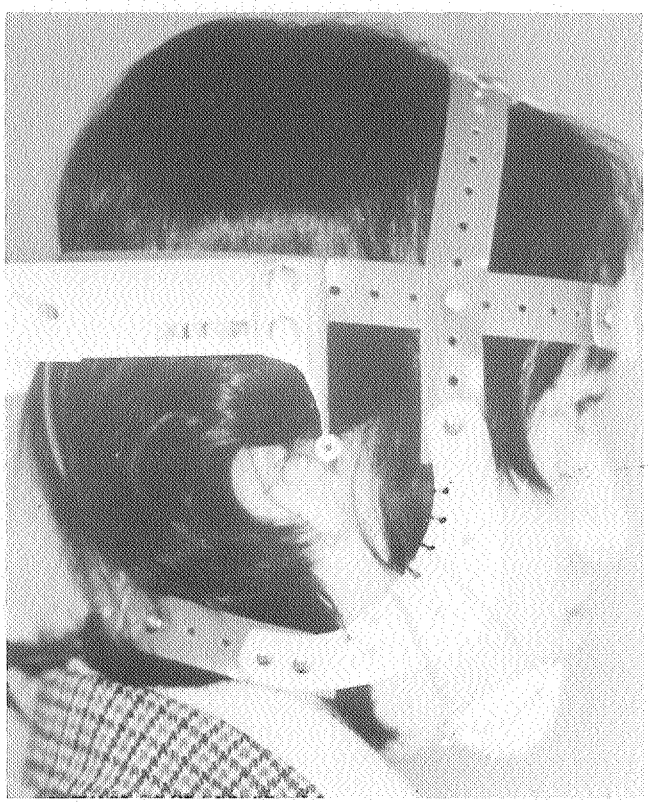
In severe skeletal Class III malocclusions similar to this case, the principle of a team approach by orthognathic surgery should be considered. However, because she was just 15 years and 8 months old, it was highly debatable that her pubertal growth had reached its peak and it was thought that the case could be managed as a prepubertal skeletal Class III.

Accordingly, chin cap was used 24 hours a day for nearly 18 months to minimise mandibular growth and also improve anteroposterior relationship of the maxilla and mandible (Figure 5D).

Changes seen on lateral cephalograms during growth inhibition of the mandible by use of the chin cap for that long period are as follows:—

(i) SNA angle no change.
(ii) SNB angle reduced by 1.5°.
(iii) L1 to Mandibular plane was decreased by 3.5°.
(iv) L1 to SN angle was decreased by 2°.
(v) U1 to L1 no change.
(vi) Overbite was decreased by 3 mm.
(vii) Overjet was increased by 5 mm to -4.5 mm.

At 17 years and 2 months of age it was reasonable to assume that her pubertal growth spurt was completed and thereupon Begg appliances were used on the maxillary and mandibular teeth, and improvements to overjet and tooth alignment were achieved by utilising Class III elastics (Figure 5E).



C — Photograph with chin cap, used 24 hours per day

Since the patient had a sufficient space available compared with required space, treatment was intiated as non-extraction. As this case was of severe skeletal Class III malocclusion, with an overjet was -4.5 mm and lingual displacement of maxillary premolars, active omega looped arch wires and Class III elastics were used on the maxilla, despite an U1 to SN angle of 105.5°.

Four months after commencing Stage 1, the overjet was 3 mm and the overbit 2.5 mm (Figure 5F).

Since rotation of mandibular premolars was not completed, a 0.14″ vertical looped sectional arch wire was used followed by 0.14″ rotation springs.

In order to close space between the first and second premolars on the side where rotations had been improved, mandibular horizontal elastics were added during Stage II. Four months after commencing Stage II, the inclination of mandibular incisors became excessive and accordingly 4 spurs' torquing auxiliaries were applied.

Six months after commencing Stage II, the spacing in the mandibular premolar region was closed, but Class III elastics had developed a vertical step between the maxillary first molars and second molars (Figures 16B, 17A). At the outset of Stage III, therefore, buccal tubes were bonded to the maxillary and mandibular second molars and then arch wires were placed for the purpose of improving the vertical step between the upper and lower first molars and second molars (Figure 5F, G).

This was a non-extraction case but as a substantial space developed between mandibular premolars, .014″ double uprighting spring-pins were used between the mandibular first and second premolars to upright the tooth roots.

After 13 months of Stage III mechanics, the tooth roots of the mandibular premolars were correctly uprighted as shown on orthopantomograph (Figure 5H, I) and the vertical step between the maxillary first and second molars had been eliminated. The 23-month-long active treatment was followed by retention with Begg's retainers.

As facial photos after treatment show, an improvement of facial profile is noteworthy and in particular an improvement of lower facial profile is significant (Figure 5J). According to superimposed tracings of before and after treatment, an ANB angle was increased by 3°, an SN Mandibular plan angle by 1° and an U1 to SN by 11.5° also, but an L1 to Mandibular plane angle was decreased by 13.5° and U1 to L1 by 1° also (Figure 5K). The patient was an adult of 19 years and 1 month old when active treatment was completed but because of a skeletal Class III, a chin cap was used during night only to minimise a relapse. Plaster models before treatment and 18 months after treatment are as shown in Figure 5A, B.

C TREATMENT OF ADULT (NON-GROWING) SKELETAL CLASS III MALOCCLUSIONS

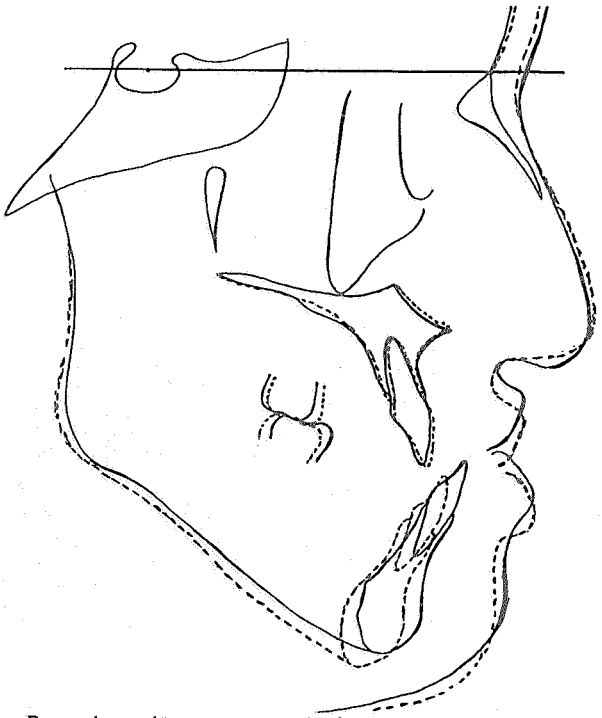
Clinical Assessment

Diagnostic criteria of mandibular protrusions in the permanent dentition include:—

(1) path of closure,
(2) degree of overjet,
(3) degree of overbite,
(4) inclination of maxillary and mandibular incisors,
(5) amount of crowding, and
(6) facial profile.

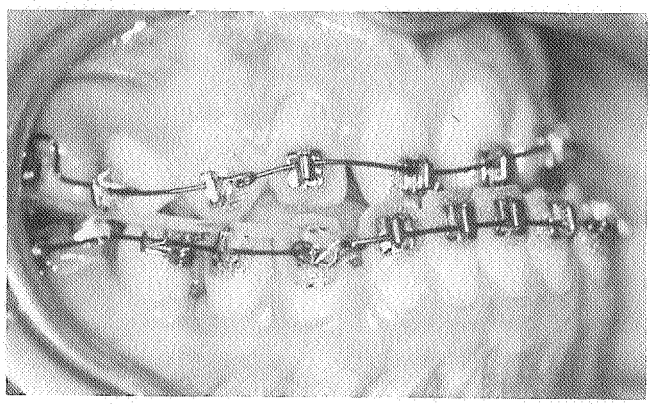
Depending on the specific needs of adult Class III patients, determined by diagnosis, many treatment plans are avaiable:—

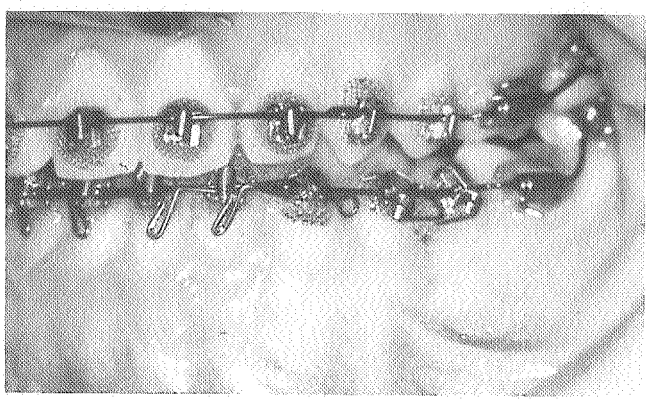
(1) non-extraction,
(2) four first premolar extraction,
(3) upper two first premolar and lower two second premolar extraction,



D — Pre- and post chin cap treatment tracings
— before chin cap therapy
--- after 18 months of chin cap therapy

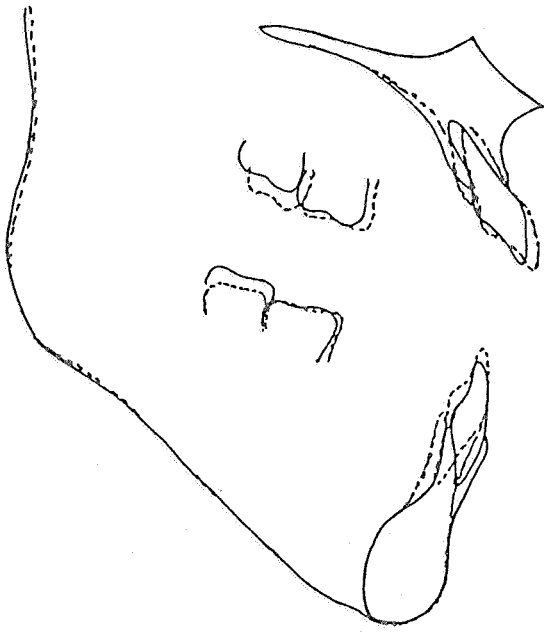
	before	end of chin retraction	
SNA	76	76	± 0
SNB	82.5	81	-1.5
ANB	-6.5	-5	+1.5
SN-md	34.5	36	+1.5
SN-occl.	14.5	19	+4.5
Ul-SN	103.5	105.5	+2
Ll-md	83.5	80	-3.5
Ul-Ll	138	138	± 0
Ll-SN	62	64	+2



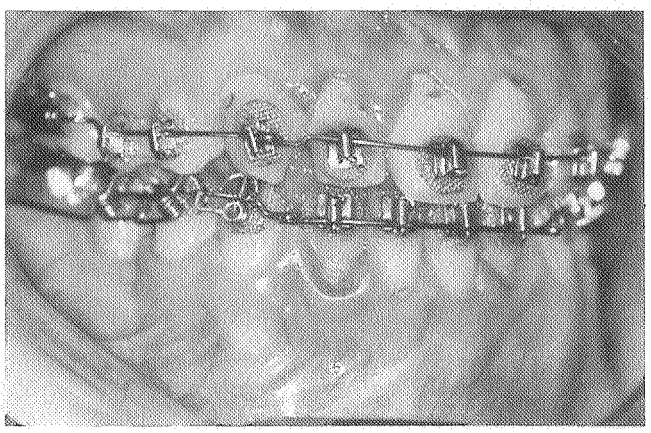


E — Intra oral photograph with Begg appliances and Class III elastics
F — Intra oral photograph with Begg appliances and torquing auxillaries





G — Treatment stage maxillary & mandibular superimposition
(i) — before treatment
--- End of Begg Stage II
(ii) — Start of Begg Stage III
--- End of Begg Stage III



H — Intra oral photographs of end of Stage III

(4) upper two second premolar and lower first premolar extraction, or
(5) differential extraction.

Case 3 is a typical case of differential extraction for orthodontic treatment of a skeletal Class III malocclusion. Differential extraction is the removal of mandibular premolars at the commencement of Class III treatment. When an overjet develops, the maxillary premolars are extracted, and the case is carried on through Stages II and III.

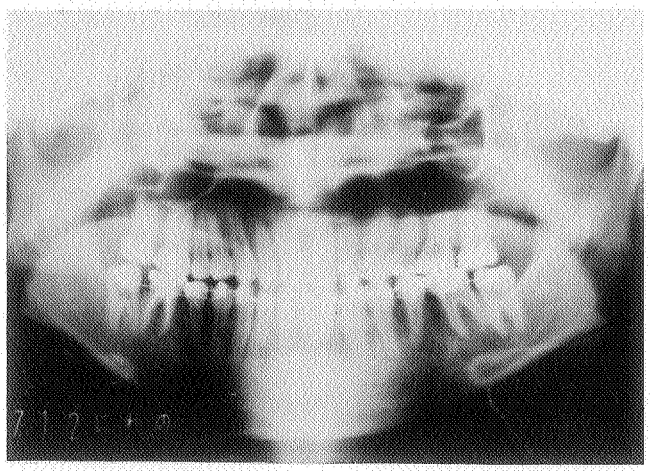
Clinical Management

The patient in Case 3 (Figures 6A-E) is a boy of 15 years and 1 month old shows an open bite with skeletal Class III malocclusion. His overbite showed -3.5 mm and overjet -3.8 mm and as is obvious from lateral facial photos, that he has a concave type of profile and having a long lower face height (Figures 6D, E).

Analysis of lateral cephalograms revealed that an SNA angle was 81°, an SNB angle of 77°, an ANB angle of 4° and an SN Mandibular plane of an excessive 51° and an U1 to SN angle of 109°, an L1 to Mandibular plane of 94° and an U1 to L1 angle of 105.5°. In initial occlusal contact, except for the upper and lower first and second molars, his teeth did not occlude.

The patient is a pre-pubertal skeletal Class III with an open bite. As the maxillary dental arch was contracted, his maxillary arch was expanded for nearly 10 months by expansion screws.

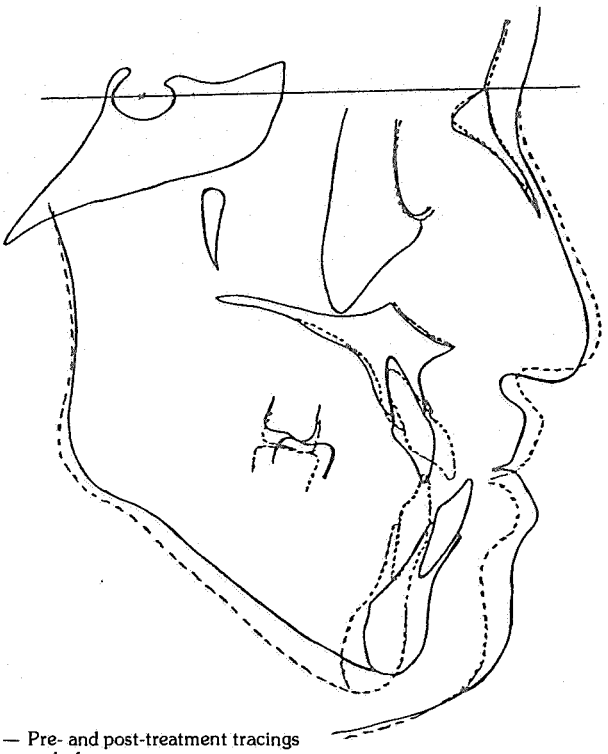
This case was envisaged as a growing skeletal Class III malocclusion, but while orthodontic treatment by differential extraction was continuing, it became clear that the pubertal growth spurt was completed and hence, a decision was made to utilise the Begg technique together with differential







I — Orthopantomograph at completion of Stage III
J — Extra oral photographs before and after treatment



K — Pre- and post-treatment tracings
— before
--- after

	before	after	
SNA	76	76	±0
SNB	82.5	79.5	-3
ANB	-6.5	-3.5	+3
SN-md	34.5	35.5	+1
SN-occl.	14.5	10	-4.5
Ul-SN	103.5	115	+11.5
Ll-md	83.5	70	-13.5
Ul-Ll	138	137	-1
Ll-SN	62	72	+10

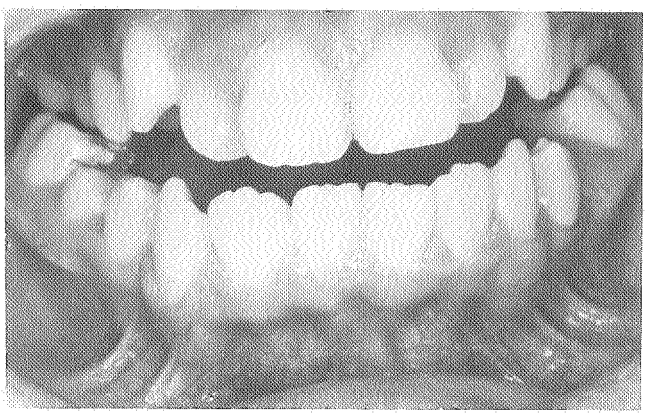


Figure 6 — Case 3, Class III non growing
A — Intra oral full face photograph before treatment aged 15 years 1 month

extraction. His two mandibular left and right first premolars were extracted and after bonding brackets and buccal tubes, a looped arch wire with 20° anchorage bend was used in the lower arch. By using box type elastics and Class III elastics (60-70gr) for improving open bite, Stage I treatment was commenced (Figure 6B).

Three months later both maxillary and mandibular arch wires were changed to plain archwires and Stage I step 2 was continued on (Figure 6C(i)). After nearly nine months of Stage I treatment, the overbite was 3.5 mm and overjet 3.0 mm. Two maxillary left and right first premolars were extracted followed by the start of mechanics Stage II (Figure 6C(ii) & (iii)).

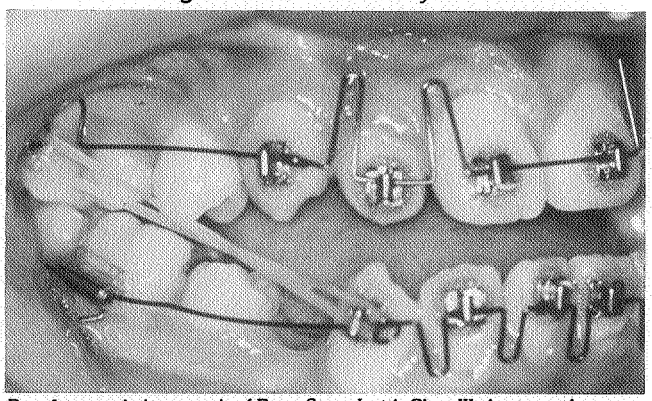
In Stage II, box type and horizontal elastics were used in addition to Class III elastics. Extraction space was completely closed after 10 months of Stage II treatment. In Stage III excessive labioclination of maxillary lateral incisors had occured so a 0.14" labial root torquing auxiliary was used on maxillary lateral incisors. To apply lingual root torque on mandibular anterior teeth, a 0.14" braking arch was activated as a torquing auxiliary (Figure 6C(iii)). For uprighting of canines and second premolars, double uprighting spring-pins were used (Figure 6C(iv) & (v)).

These teeth were over uprighted, the appliances removed and retainers were inserted (Figure 6C(vi)).

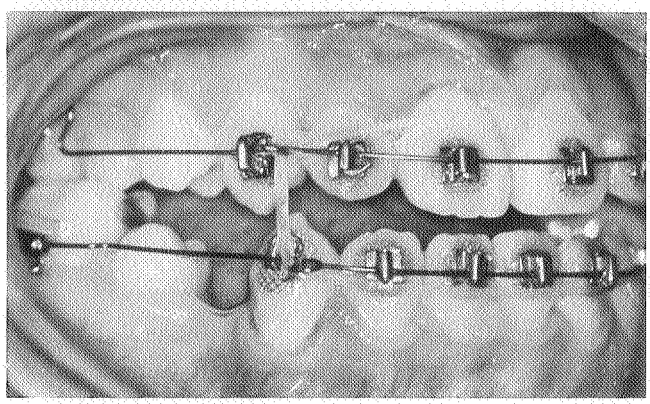
The active treatment time with the Begg technique was 34 months and when it was completed the patient was approximately 19 years old and was an almost non-growing adult (Figure 6D).

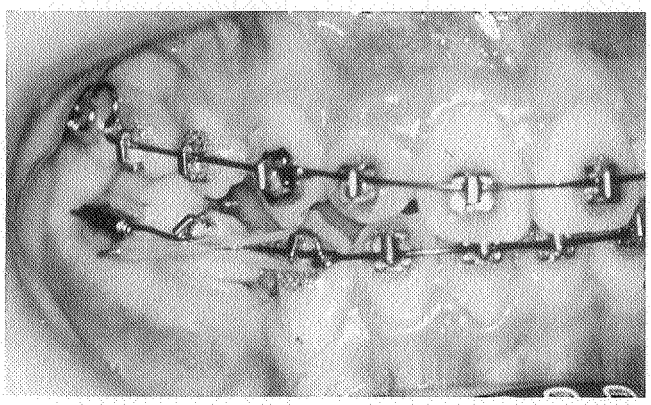
According to an analysis of lateral cephalograms after treatment, the SNA angle was increased by 1°, the U1 to SN angle was decreased by 8° and the L1 to Mandibular plane decreased by 25°. On the other hand, an U1 to L1 was increased by 32.5° (Figure 6E).

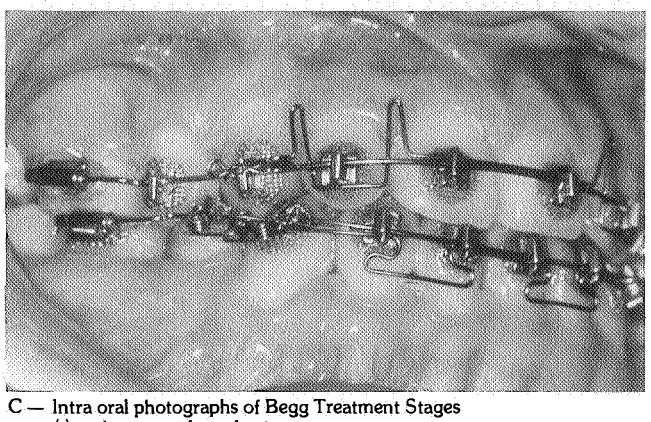
Whilst the patient was a 19-year-old adult, because he had open bite with skeletal Class III malocclusion, he was ordered



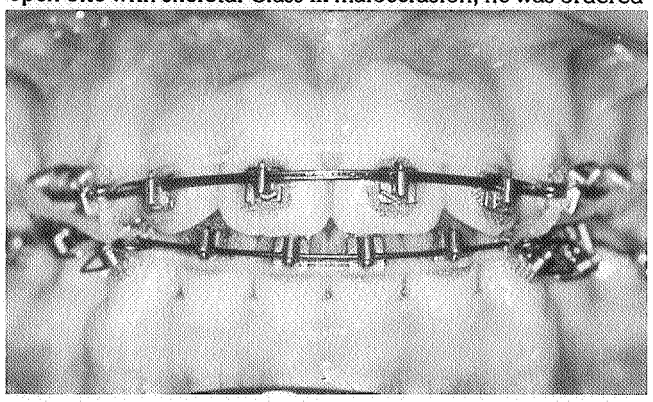
B — Intra oral photograph of Begg Stage I with Class III elastics and extraction of 4/4

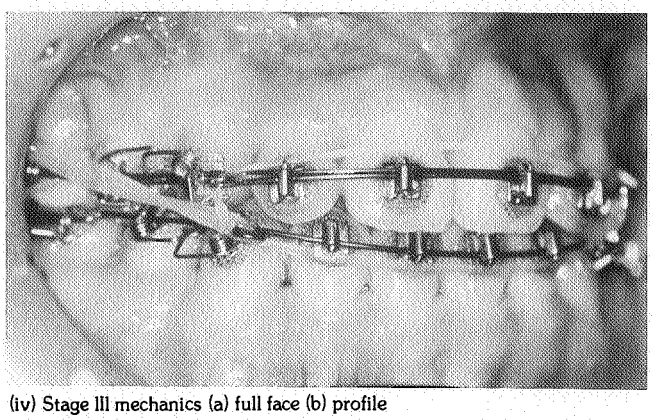






C — Intra oral photographs of Begg Treatment Stages
(i) with anterior box elastic
(ii) 9 months Stage 1 with lower intra horizontal elastics
(iii) 10 months Stage II and extraction space closure





(iv) Stage III mechanics (a) full face (b) profile



(v) Post-treatment stage

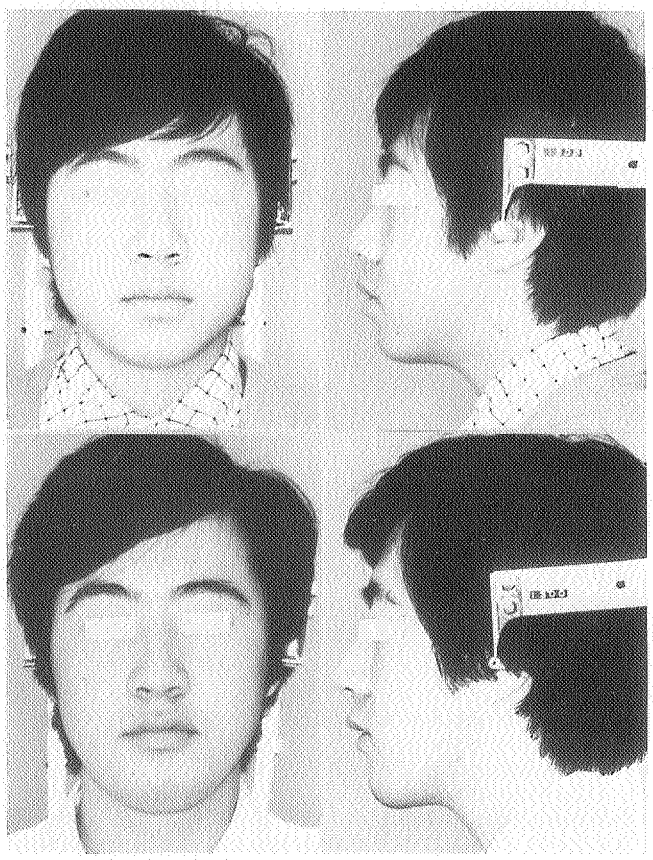
to use a chin cap during night only to prevent a relapse.

After treatment a stable result continues and without abnormal tongue habit developed.

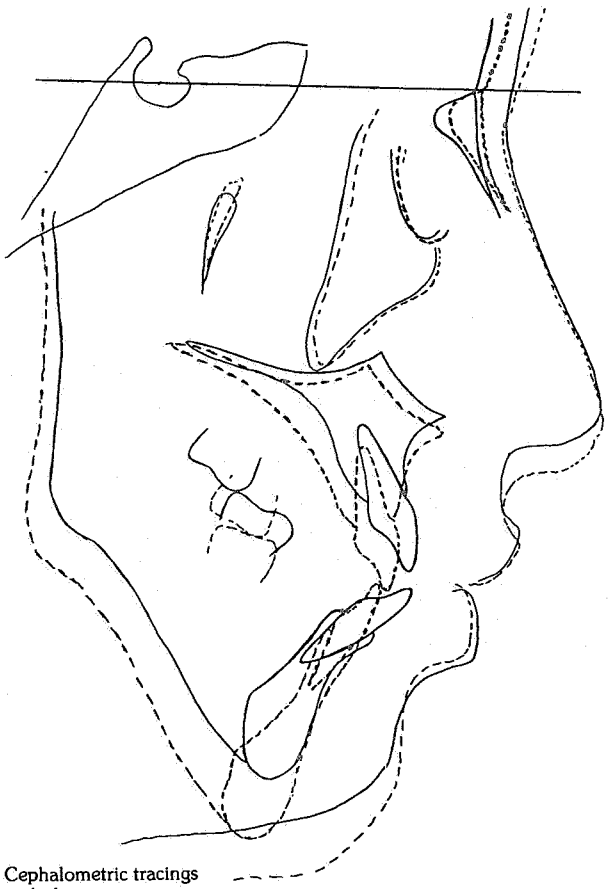
SUMMARY

By using three cases, the author described the treatment of Class III malocclusions by the Begg technique and in each case, Class III elastics were used. Accordingly, except for differential extraction cases, an U1 to SN angle increases more than 10° by influence of Class III elastics. In addition when Class III elastics are used, occlusal plane will change to superiorly. This is because Class III elastics would rotate the anchor molars downward and cause vertical uneveness between the first molar and the second molar. In order to avoid that, it is necessary to maintain vertical levels of the first molar and the second molar.

During the last several years, by reducing the use of Class III elastics as much as possible, we have been using horizontal elastics for the mandible only at the commencement of Stage I treatment of Class III malocclusions (EXTRACTION CASES). The treatment results are very favourable and at another opportunity, the author hopes to will describe such methods in another publication.



D — Extra oral facial photographs, before and after treatment



E — Cephalometric tracings
— before
--- after

	before	after	
SNA	81	82	+1
SNB	77	77.5	+0.5
ANB	4	4.5	+0.5
SN-md	51	52	+1
SN-Occl.	25.5	19	-6.5
UI-SN	109	101	-8
LI-md	94	69	-25
UI-LI	105.5	138	+32.5
LI-SN	36	60	+24

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Professor A. Kameda
Nippon Dental College
Niigata Faculty
1-8 Hamaura-cho, Niigata City
Niigata, Japan

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