

TREATMENT OF SKELETAL CLASS III MALOCCLUSION WITH MAXILLARY PROTRACTION APPLIANCE

Kyungho Kim¹⁾, Kwangchul Choy²⁾, Jiyeon Lee³⁾, Soyoun Park⁴⁾

The clinical cases presented here involve skeletal Class III malocclusion cases treated with maxillary protraction in a relatively short period of time with good results. When used on young patients, satisfactory results were obtained in a short period of time, but even for those with less growth potential remaining, skeletal enhancement was still evident. However, data on the criteria of diagnosis or relapse following maxillary protraction is limited despite the number of studies on the subject. The present study could not include the observations on retention and relapse, and further studies in the future may include such observations.

Key Words : maxillary protraction, orthopedic

Skeletal Class III malocclusion frequently appears in Asians in various forms and types, making the treatment difficult. The condition appears as a result of either maxillary undergrowth, mandibular overgrowth or a combination of both. In case of mandibular overgrowth, chin cap is used while in maxillary undergrowth, maxillary protraction appliance is used.

Cellier in 1802 first used the chin cap device in temporomandibular joint dislocation patients²⁴⁾. Since then, studies using this type of device have reported posterior rotation or posterior displacement of mandible, inhibited bone formation of mandibular condyles and reduction of prechondroblastic layer¹¹⁾. Despite these reports, inhibitory effects of chin cap on true mandibular growth

remain controversial. Sugawara et al.²²⁾ reported that those who used chin cap have shown enhanced profiles in early phases but the improvements did not last in the long run. They reported that the profile showed the tendency to return its original morphogenetical shape, and catch-up growth of mandible might also occur. According to a report by Mitani and Sakamoto¹⁵⁾, the tendency for skeletal Class III malocclusion may be set in an early age, and compensatory displacement of maxilla as a reaction to mandibular overgrowth or catch-up overgrowth do not occur. They said that the skeletal Class III malocclusion from mandibular growth had in many cases posteriorly displaced maxilla and emphasized the need for the maxillary protraction devices.

Maxillary protraction was first introduced by Oppenheim in 1944¹⁸⁾, and animal studies by Dellinger⁶⁾, Kambara¹²⁾, Nanda¹⁶⁾ reported maxillary protraction and bone formation at the suture areas. The effects of maxillary protraction have been documented in Korea and abroad^{1,2,3,8,11,15)}. Ko and Kim¹⁾ used adult skulls where they applied orthopedic force of 500g on molar and premolar

¹⁾ Department of Orthodontics, College of Dentistry, Yonsei University. Assistant professor

²⁾ Department of Orthodontics, College of Dentistry, Yonsei University. Fulltime Lecturer

³⁾ Department of Orthodontics, College of Dentistry, Yonsei University. Resident

⁴⁾ Department of Orthodontics, College of Dentistry, Yonsei University. Resident

areas to protract maxilla parallel to or 20 degrees downward to occlusal plane. In all cases, maxilla rotated counterclockwise, and rotation of maxilla was lesser when the pull was in 20 degrees downward direction as compared to the pull parallel to occlusal plane. Baik⁵⁾ examined 60 patients between the age of 8-13 with skeletal Class III malocclusion treated with maxillary protraction, and reported anteroinferior displacement of maxilla and upper dentition and posteroinferior rotation of mandible and lower dentition. Anterior displacement was greater for RPE group than for La-Li group with no age difference. Lim and Park⁴⁾ studied soft tissue changes following maxillary protraction in 93 patients. They reported the treatment changes to be greater than the amount of growth and no difference according to the age of the patient at the time of treatment initiation either male or female. They showed greater anterior displacement of A point in RPE group as compared to La-Li groups.

Mermigos¹³⁾ reported an increase in SNA and effective maxillary length using reverse headgears on 7 male and 5 female children with skeletal Class III malocclusion.

Using various appliances, anchor positions and directions of orthopedic force, Itoh¹⁰⁾ observed anterosuperior rotation and anterior constriction with especially pronounced anterosuperior rotation when the protraction was done parallel to the occlusal plane, and suggested that the maxillary expansion mechanics which could compensate the anterior constriction should be used. He recommended a downward pull from the occlusal plane in order to reduce such rotation. Shiva et al.²¹⁾ examined 25 Chinese children whose skeletal Class III conditions were treated either with or without maxillary protraction. He showed that the 6 months of maxillary protraction resulted in 2.4 mm of anterior displacement of A point and inhibited vertical growth of maxilla. He reported that 75% of the anterior movement of A point was skeletal. Peter Ngan, Urban Hagg et al.¹⁷⁾ examined 12 males and 18 females who used protraction headgear and fixed expansion appliances. They reported 6.2 mm improvement in overjet, 4.5 mm of sagittal molar relationship, 1.7 mm of labial movement of upper anterior teeth, 0.2 mm of linguoversion of lower anterior

teeth, extrusion of upper and lower molars and increase in mandibular plane angle.

Maxillary protraction is known to result in anterior displacement of maxilla and posteroinferior rotation of mandible which correct skeletal disharmony^{1,12,16,17)}, but treatment timing remains controversial. Ellis and McNamara⁷⁾ suggested that the best time for the treatment was the early phase of mixed dentition which he defined as the time of eruption of upper central incisors. Hickham⁹⁾ said that the best results were obtained when the treatment was started before the age of 8. Proffit¹⁹⁾ suggested that the treatment should be started before the age of nine for skeletal response rather than dental response. Takada²³⁾ reported that maxillary protraction and chin cap therapy were effective for patients in puberty. Merwin et al.¹⁴⁾ reported similar skeletal responses between the two groups which started treatment before and after the age of 8.

For growing children, early detection of skeletal discrepancy and intervention which takes advantage of growth will reduce the chance for surgery and psychological effects. It is, of course, difficult to accurately predict the growth pattern of an individual and the amount of growth potential which can be modified is limited, and thereafter accurate diagnosis is essential.

The present case report includes successful cases of maxillary protraction therapy in various age groups.

CASES

Case 1

1. Patient : 4Y 11M, Female

2. Intraoral Findings (Fig 1, A-C)

The examination revealed crossbite, lower anterior crowding, and midline shift to the right side.

3. Cephalometric Analysis (Fig 1, I)

SNA	80.5	SN to MP	31.5
SNB	83.0	1 to SN (A)	93.5
Wits	-7.5	IMPA (A)	75.5

4. Treatment

Maxillary protraction was planned using an elastic force from a facemask to the deciduous dentition. Intraoral anchorage was provided via molar bands

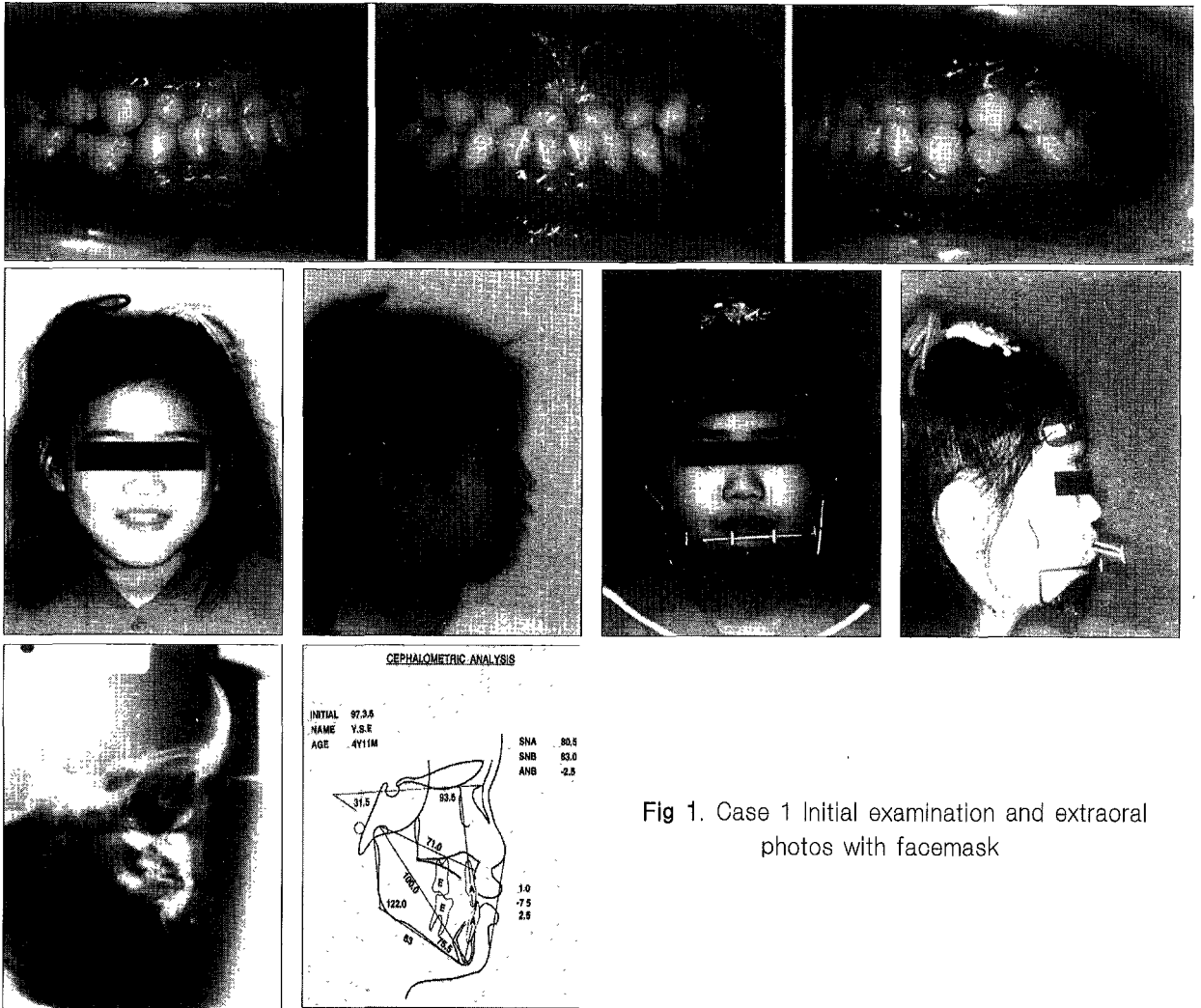


Fig 1. Case 1 Initial examination and extraoral photos with facemask

cemented to the deciduous first and second molars. The patient was instructed to wear the facemask for periods ranging from 12 to 14 hours a day. After 4 months, the characteristically concave profile was changed to more normal profile.

5. Post-Treatment Cephalometric Analysis (Fig 2, G)

SNA	82.0	SN to MP	32.5
SNB	81.5	\perp to SN (A)	109.5
Wits	-1.8	IMPA (A)	75.5

Case 2

1. Patient : 13Y 0M, Female
Menarche : 8 Months ago

2. Intraoral Findings (Fig 4, A-C)

The patient complained of mandibular prognathism. She was presented with skeletal Class III with retrusive maxilla and protrusive mandible. The examination showed anterior crossbite, spacing between lower canine and first premolar, and midline shift to the left side.

3. Cephalometric Analysis (Fig 4, I)

SNA	75.2	SN to MP	40.3
SNB	77.9	\perp to SN	96.0
Wits	-10.5	IMPA	77.2

4. Treatment

The 13 years old female patient showed a skeletal Class III with retrusive maxilla and protrusive mandib-

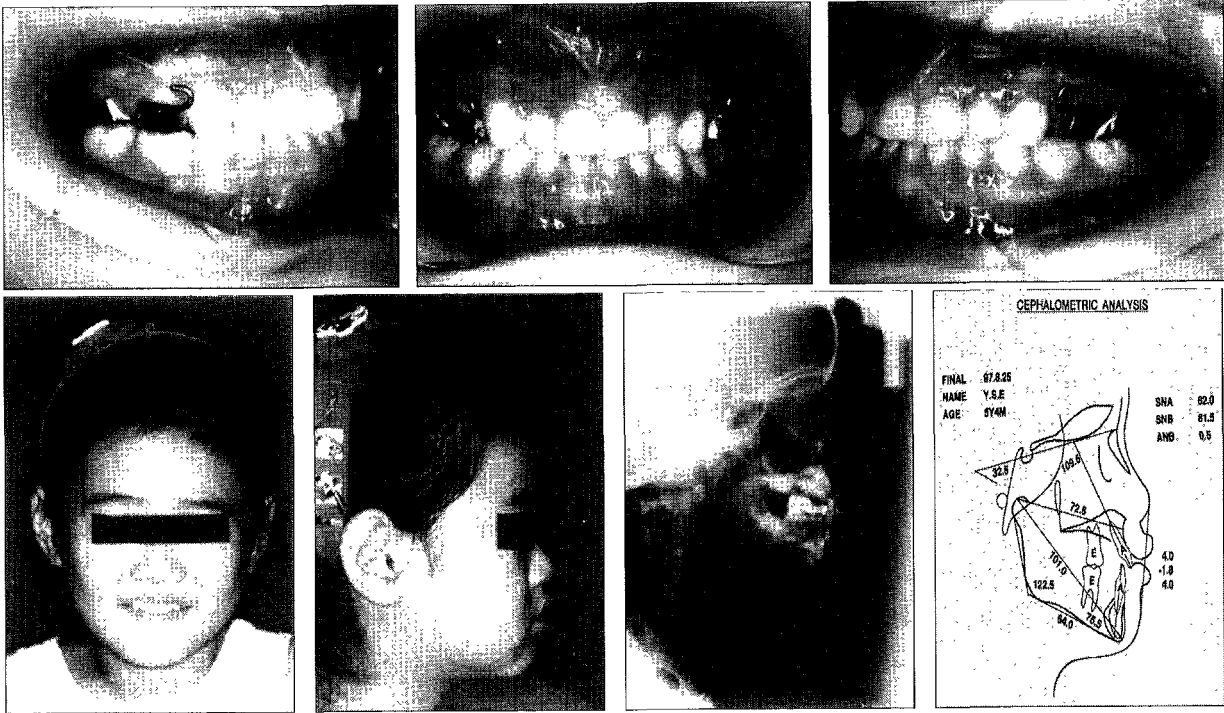


Fig 2. Case 1 After protraction

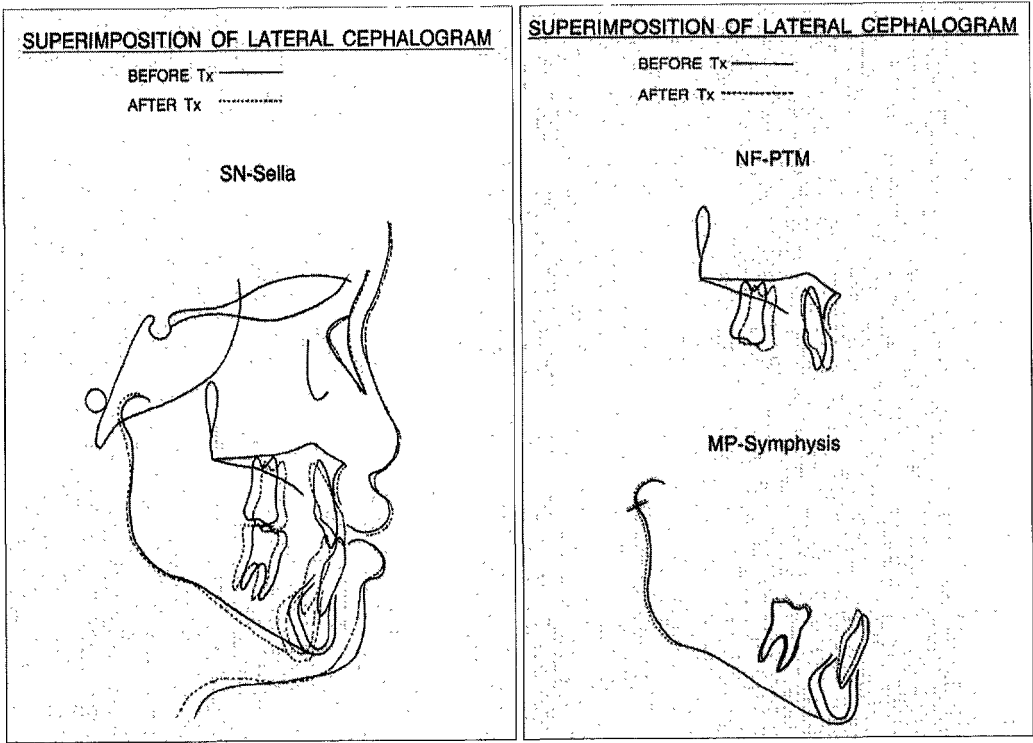


Fig 3. A,B. Superimposition of lateral cephalograms : initial and after protraction

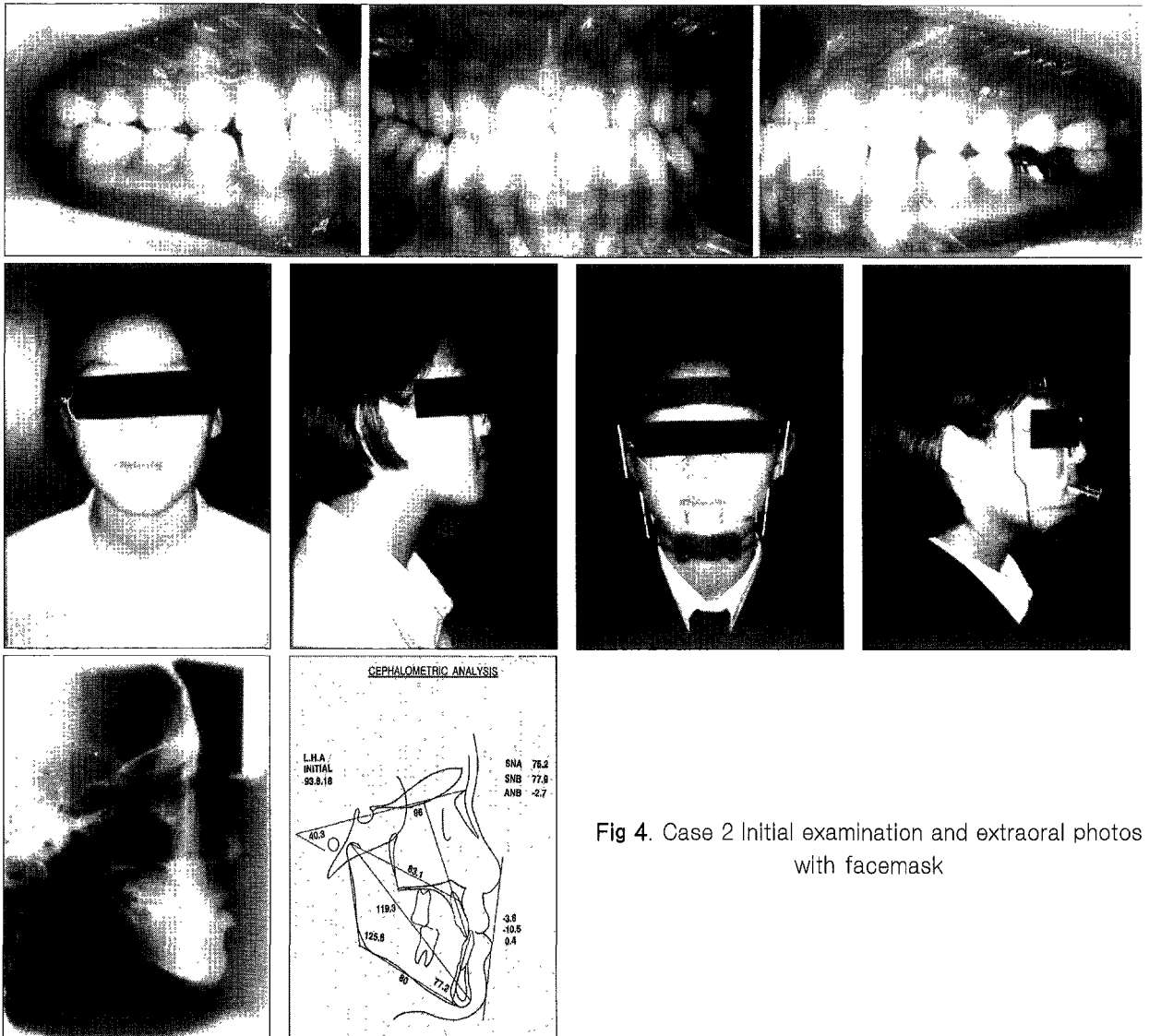


Fig 4. Case 2 Initial examination and extraoral photos with facemask

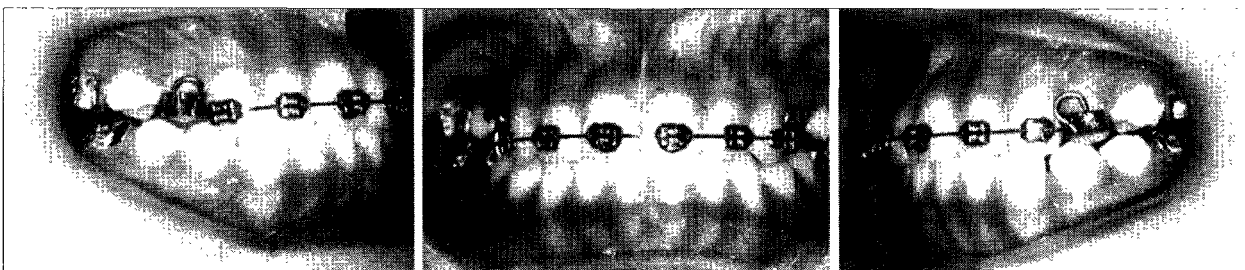


Fig 5. Case 2 After protraction, she was treated with fixed appliance

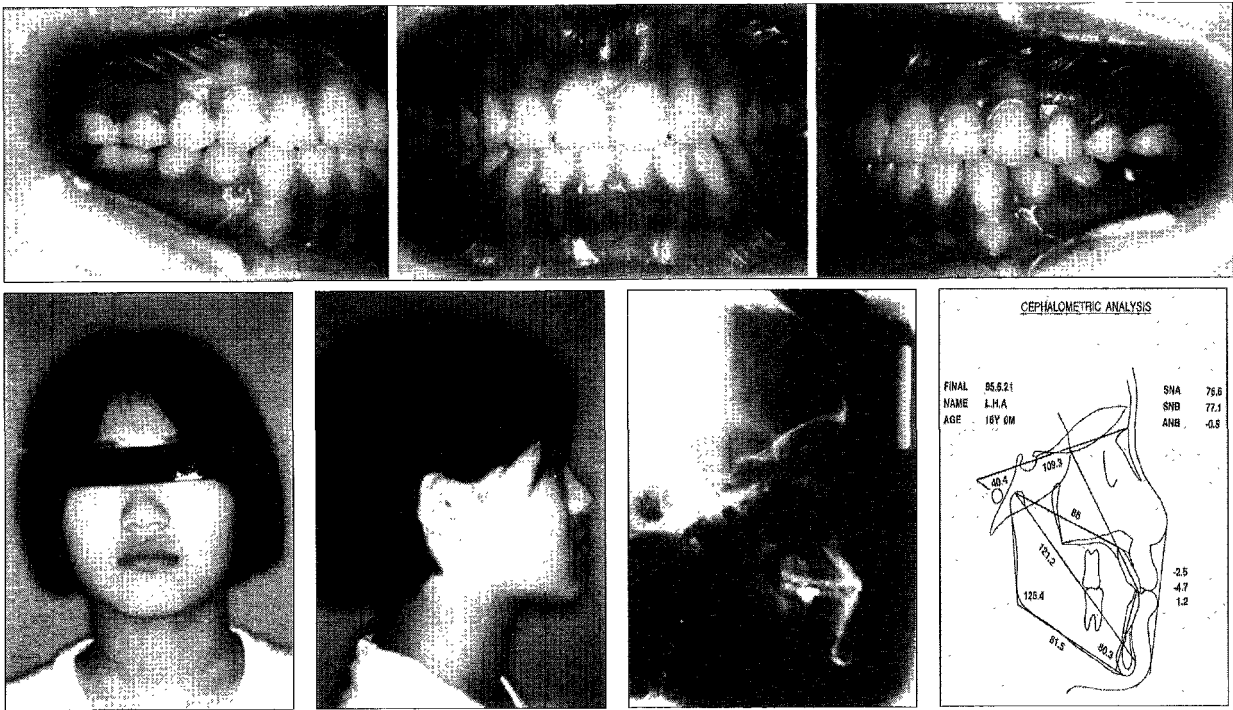


Fig 6. Case 2 At the end of treatment

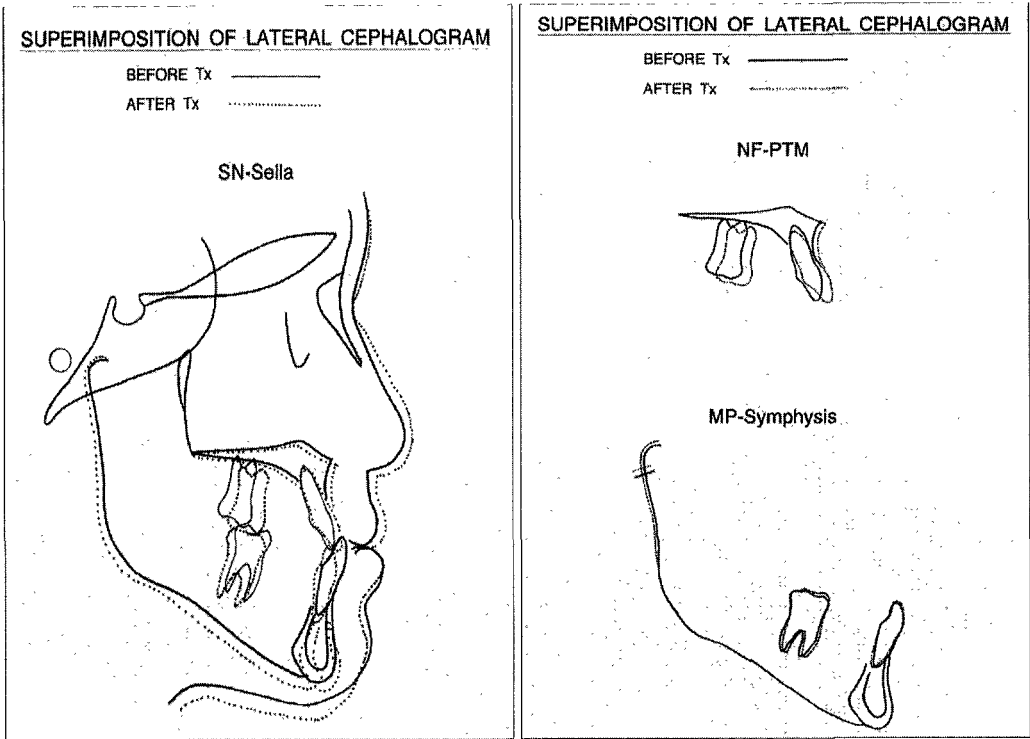


Fig 7. A,B. Superimposition of lateral cephalograms : initial and after treatment

ble. Her growth potential was dimmed but her parents didn't want their daughter to have a surgery to correct the problem. So it was planned to try palatal expansion and maxillary protraction. After 11 months of protraction, sagittal molar relationship was improved and then was treated with fixed appliance.

5. Post-Treatment Cephalometric Analysis (Fig 6, G)

SNA	76.6	SN to MP	40.4
SNB	77.1	1 to SN	109.3
Wits	-4.7	IMPA	80.3

SUMMARY

The clinical cases presented here involve skeletal Class III malocclusion cases treated with maxillary protraction in a relatively short period of time with good results. When used on young patients, satisfactory results were obtained in a short period of time, but even for those with less growth potential remaining, skeletal enhancement was still evident. However, data on the criteria of diagnosis or relapse following maxillary protraction is limited despite the number of studies on the subject. The present study could not include the observations on retention and relapse, and further studies in the future may include such observations.

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국문초록

상악골 전방견인 장치를 이용한 골격성 III급 부정교합 환자의 치험에

연세대학교 치과대학 교정학교실

김 경 호 · 최 광 철 · 이 지 연 · 박 소 연

골격성 III급 부정 교합은 동양에서 발생 빈도가 높으며 그 양상과 유형도 다양하며 치료가 까다로운 것으로 알려져 있다. 성장기 아동의 경우 조기에 골격 부조화를 발견하고 성장을 통해 골격의 부조화를 개선하여 수술의 가능성을 감소시키고 환자의 심리적 위축감을 감소시킬 수 있다면 그 치료는 매우 중요한 의미를 가질 것이다.

본 증례는 골격성 III급 부정교합 환자를 상악골 전방견인 장치를 이용하여 비교적 짧은 전방 견인기간으로 안모의 개선을 얻을 수 있었던 임상적 증례이다. 비교적 어린 나이에 시도한 경우에 더 짧은 전방견인 기간 동안에 만족할 만한 결과를 얻었으나 성장잠재력이 미약한 연령에서도 골격적 개선을 얻을 수 있었다. 그러나, 상악골 전방견인 장치의 효과에 대한 많은 선학들의 연구가 있었음에도 불구하고 아직 진단에 대한 criteria나 재발에 관한 연구는 매우 미약한 실정이고, 본 보고에서도 재발에 관한 관찰을 하지 못하였음이 아쉬움으로 남아있으며 향후에 본 증례들에 대한 retention과 relapse에 관하여 지속적인 관찰이 필요할 것이다.

주요 단어 : 골격성 III급 부정교합, 상악골 전방견인 장치, 전방견인 효과