

Treatment of Maxillary Deficiency with Reverse Chin Cup: A Case Report

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ABSTRACT

Introduction: This case report aims to illustrate the dentoalveolar changes of a 13-year-old class III patient with maxillary deficiency treated with a Reverse Chin Cup appliance. one of the popular appliances for treating class III patients with deficient maxilla is facemask. In class III growing patients, treatment options include extraoral and intraoral devices. chin and forehead are used for extraoral anchorage supports.

Case Presentation: The patient is a 13-year-old girl with a mild maxillary deficiency. She had an Angle Class III molar relationship. She refused to use a face mask due to its highly bulky size. The Reverse Chin Cup is attached to a removable appliance in the upper jaw, with Adams clasps on the first molars, the first premolars, and C-clasps on the upper central and lateral incisors for additional anchorage.

Results: After the sixth month of treatment with a chin cup, SNA increased by 2°, and a positive overjet was achieved.

Conclusion: This case demonstrates that the reverse chin cup appliance is a suitable alternative to facemasks in class III and maxillary deficient cases.

Keywords: Cephalometric analysis, maxillary deficiency, orthodontics, reverse chin cup, skeletal class III.

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I. INTRODUCTION

Class III malocclusion is a problem in the sagittal relationship of the mandible and maxilla, which is caused by a backward position or deficiency of the maxilla or forward position or prognathism of the mandible [1]. It is stated that the incidence rate of this malocclusion in the white population is 1 to 5%, increasing to 9-19% in Asian populations [2]-[7]. The etiology of class III malocclusion is multifactorial and has genetic, ethnic, environmental, and habitual components. (8) Ellis and McNamara reported that 65-67% of all Class III malocclusions are due to maxillary deficiency [9].

Treatment with a face mask has been popular for treating class III patients with the deficient maxilla. In class III growing patients, treatment options include extraoral and intraoral devices. as an extraoral anchorage supports the chin and forehead are used [10]. The functional Frankel III appliance is an intraoral appliance in which pads are used for stretching the upper lip and the periosteum forward,

stimulating the upper jaw's forward growth [11]. Class III elastics with skeletal anchorage, in which mini-plates are placed in the zygomatic crest of the maxillary buttress and between the canines on both sides of the mandible, are used for the treatment of maxillary deficiency [12]. Maxillary protraction appliances effects on skeletal and dentoalveolar are mainly the forward displacement of the maxilla, protrusion of the upper incisors, clockwise rotation of the mandible, and retrusion of the lower incisors.

This case report of a patient with Class III malocclusion and maxillary deficiency aimed to illustrate the effect on the maxilla of this simple extraoral appliance named the "Reverse Chin Cup".

II. CASE REPORT

The patient was a 13-year-old girl who was referred to the orthodontic department for the treatment of her reversed

overjet. She had no underlying medical problems, and no signs of temporomandibular joint dysfunction were detected. Clinical examination revealed a Class III malocclusion with a mild maxillary deficiency. Facially, soft tissues partially

masked the maxillary position. A mild paranasal deficiency was noticed in the profile (Fig. 1).

Intraoral examination revealed a reverse overjet in maximum occlusion. She had an Angle Class III molar relationship (Fig. 2).

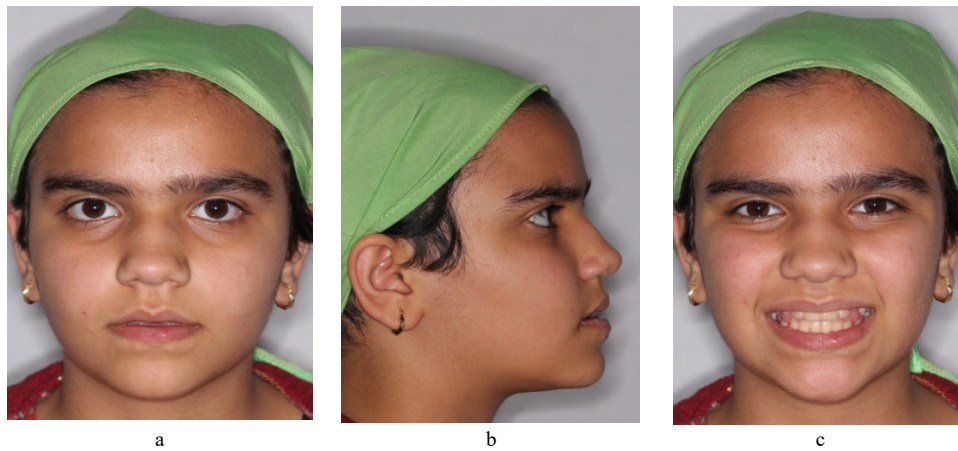


Fig. 1a-c: Pre-treatment extraoral photo of the patient.



Fig. 2 a-e: Pre-treatment intraoral photo of the patient.

The cephalometric analysis showed a skeletal Class III anteroposterior relationship with an ANB angle of -1° . In the clinical examination, the patient did not have any edge-to-edge bite and also any displacing forwards into maximum intercuspation (Table I) (Fig. 3).

TABLE I: CEPHALOMETRIC ANALYSIS

Cephalometric Data	Pre-treatment	Post-treatment
SNA $^\circ$	79	81
SNB $^\circ$	80	80
ANB $^\circ$	-1	1
GOGN-SN $^\circ$	28	29
I-SN $^\circ$	107	114
IMPA $^\circ$	93	85
Interincisal angle $^\circ$	137	133
Y-Axis $^\circ$	56	54

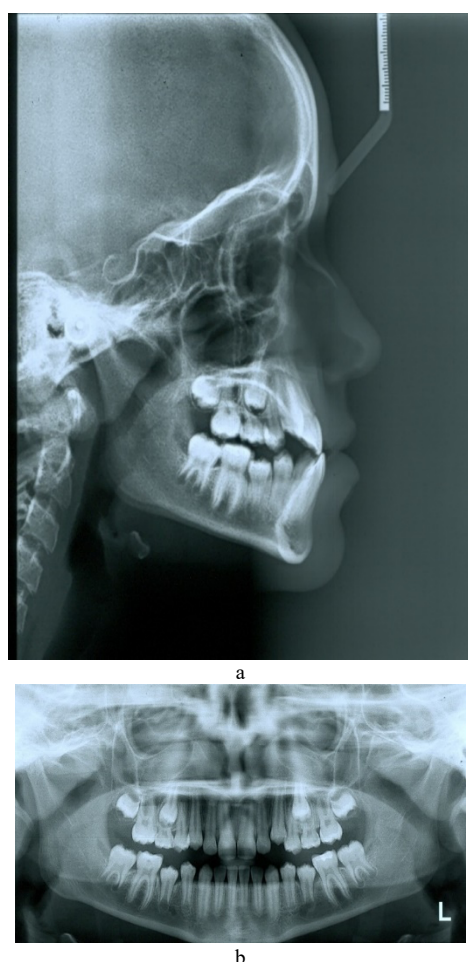


Fig. 3 a,b: Pretreatment lateral cephalometric and panoramic image of the patient.

III. TREATMENT OBJECTIVES

The objectives of treatment for this patient were to:

1. Forward repositioning of the maxilla in order to correct the deficient maxillary arch
2. Obtain an ideal overbite and overjet.

IV. TREATMENT ALTERNATIVES

Extraoral appliances, such as facemask [13], Class III functional appliance [14], modified maxillary protraction devices [15], tongue appliance [16], tongue plate [17], class 3 elastic with miniplate [18] or miniplate [19] and bone

anchored device [20] were considered as possible treatments for the correction of this Class III malocclusion. Orthognathic surgery at 18 years of age was also considered in case of unfavorable treatment results. Regarding the uncertainty of the patient's compliance with facemask because of its bulk, reverse chin cup was attempted.

V. TREATMENT PROGRESS

The reverse chin cup attaches to a removable appliance in the upper jaw, Adams clasps on the first molars and first premolars, and two C clasps on the upper central and lateral incisors for further anchorage. These clasps, if well made, provide excellent retention for the removable appliance. Two hooks are mounted behind the upper incisors in the palatal acrylic for hooking on the elastics. An acrylic chin cup with two hooked vertical arms (1 mm stainless steel) was fabricated for the patient. Two 4.5 oz orthodontic elastics connect the hooks on the palate to the hooks of the reverse chin cup, to deliver 12oz of force. To hold the reverse chin cup a high-pull head cap was used. We instructed the patients to use the appliance full-time except during tooth brushing for eating and contact sports. The reverse chin cup can be seen in Fig. 4a-4c.

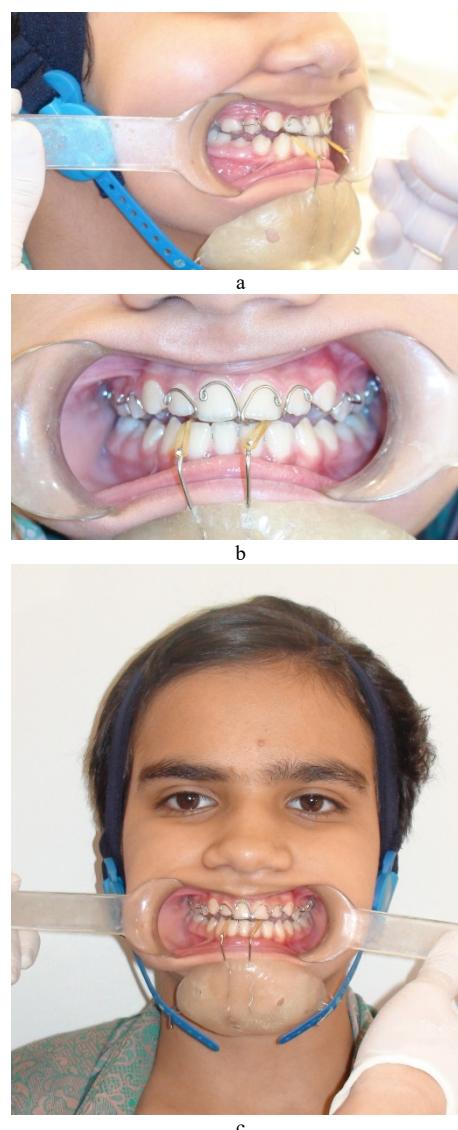


Fig. 4a-c: Reverse chin cup appliance.

VI. TREATMENT RESULTS

After the 'orthopedic' stage of the treatment, favorable facial changes were observed (Fig. 5, 6).



Fig. 5a-c: Post-treatment extraoral photo of the patient after reverse chin cup.

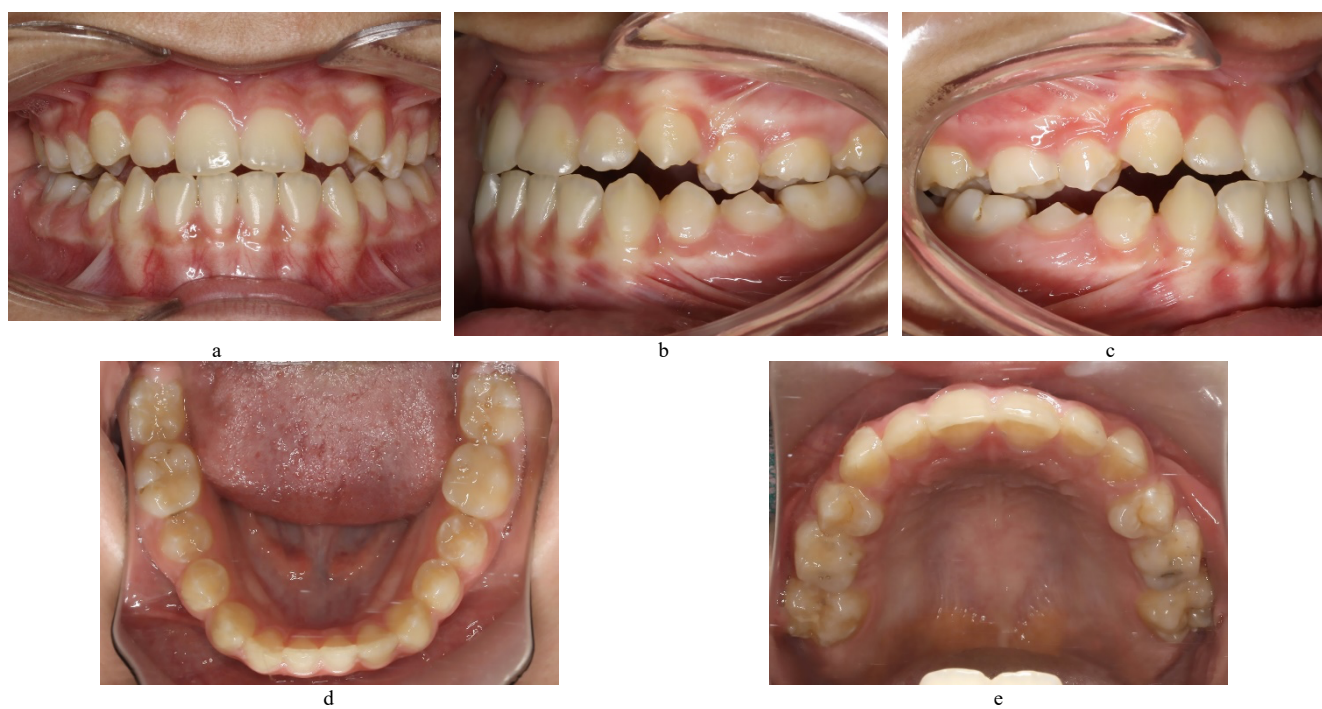


Fig. 6a-d: Posttreatment intraoral photo of the patient after reverse chin cup.

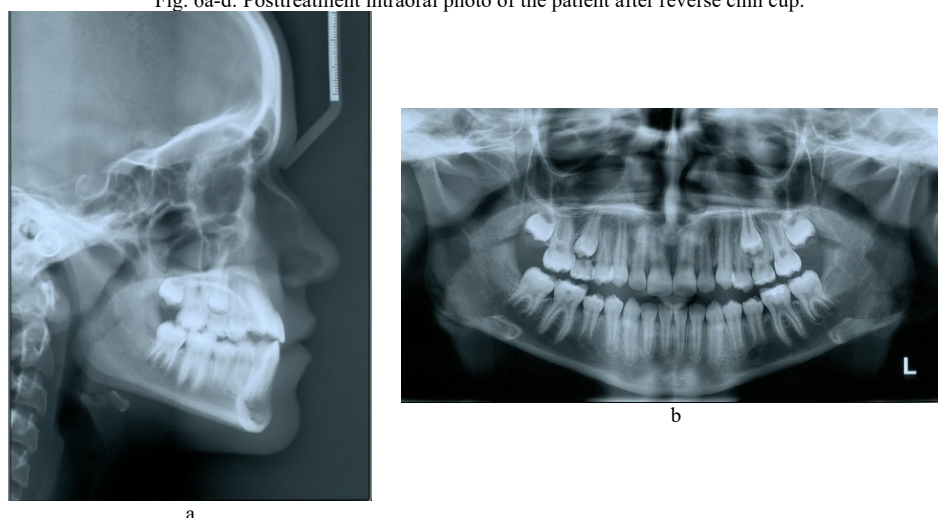


Fig. 7a-b: Posttreatment lateral cephalometric and panoramic image of the same patient after reverse chin cup

A positive 2 mm overjet was achieved after six months of reverse chin cup therapy. Lateral cephalogram and OPG of the same patient after reverse chin cup can be seen in Fig. 7a and b, respectively. Reverse chin cup was followed with a fixed orthodontic appliance to achieve interdigitation and

alignment. Fig 8 d-h show the photos of the patient after the treatment.

Post-OPG and lateral cephalograms of the same patients can be seen in Fig. 9a and b, respectively.

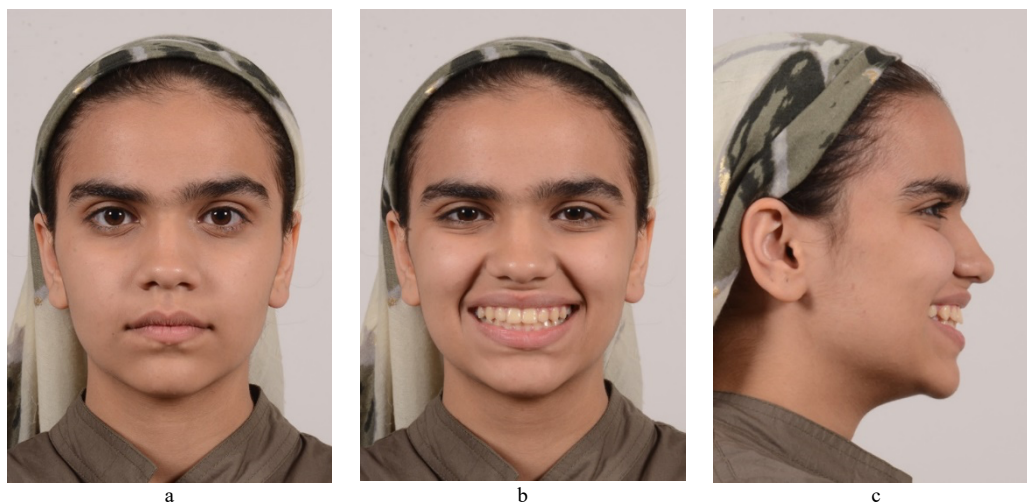


Fig. 8a-c: Posttreatment extraoral photo of the patient after fixed appliance therapy.



Fig. 8d-h: Posttreatment intraoral photo of the patient after fixed appliance therapy.

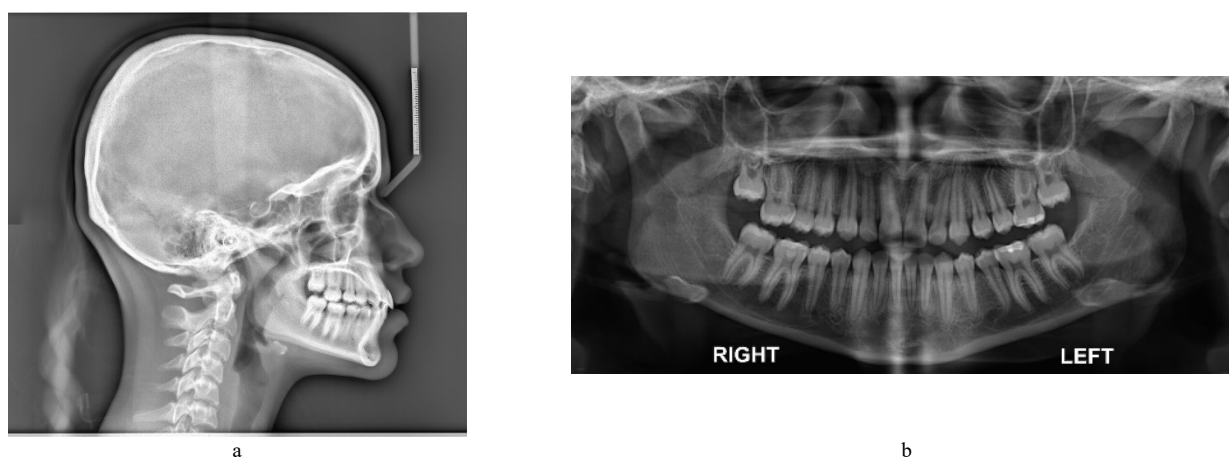


Fig. 9a-b: lateral cephalometric and panoramic image of the same patient after fixed appliance therapy.

VII. DISCUSSION

This case represents the clinical application of reverse chin cups in treating a 13-year-old girl with maxillary deficiency. After treatment, the correction of sagittal discrepancy is demonstrated by increasing the angles SNA and ANB. The upper incisors were proclined, and the lower incisors moved lingually due to the pressure of the chin cup. A reverse chin cup was applied to the anterior part of the maxilla. However, through the appliance, the forces are also applied to the posterior part of the maxilla. Although previous studies [21], [22] have shown the effectiveness of maxillary protraction appliances in treating maxillary deficiency, these face masks have been inconvenient for patients due to the device size, which interferes with sleep and with wearing glasses. If the appliance used is uncomfortable for the patient, it reduces cooperation during the treatment. The simpler design of all intra-oral appliances, such as tongue plate [17] and tongue appliance [16], might confer some beneficial advantages compared to extraoral appliances. Due to the bulky size, almost all patients prefer to use intra-oral appliances such as class 3 elastic with miniplate appliances [19] or miniscrew [18] in comparison with extraoral appliances.

VIII. CONCLUSION

In this study, the reverse chin cup was effective in treating maxillary deficiency. In addition, the reverse chin cup was preferable for patients compared to larger extraoral appliances.

CONSENT

Written informed consent was obtained from the Parents of the patient for the publication of this case report and accompanying images.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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