Case Report

VERSATILITY OF SKELETAL ANCHORAGE IN SKELETAL CLASS III MALOCCLUSION TREATMENT: A CASE REPORT

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ABSTRACT

Skeletal class III malocclusion is one of the most complex, with severe complications including deterioration of function and aesthetics. The aim of this paper is to report the versatility of skeletal anchorage (SA) during the treatment of a skeletal class III hyperdivergent patient with anterior crossbite with severe space discrepancy due to the mesial movement of the maxillary first permanent molar. The patient was 12.8 years old and in the late mixed dentition stage. Treatment began with bone-borne maxillary expansion with 4 palatal mini-screws. After expansion, a mandibular plate was inserted, and class III elastics were attached to the hooks incorporated in the maxillary expansion appliance. At the subsequent visit, a molar band was bonded on the first permanent molar on the left with a distalizing spring. Nine months later, all the permanent teeth erupted, and fixed orthodontic treatment was initiated.

KEYWORDS: *skeletal class III, malocclusion, skeletal anchorage, maxillary expansion*

Orthodontists are aware of the difficulties of treating skeletal class III malocclusion. Skeletal class III malocclusion is one of the most complex, with severe complications, including deterioration of function and aesthetics. Such complexity seems related to the multifactorial etiology and various combinations of morphologic traits (1, 2). Moreover, during growth, the continuous advancement of the mandible relative to the maxilla worsens the skeletal class III malocclusion (3). Skeletal class III malocclusion is included among malocclusions that may benefit from early treatment. In addition to greater skeletal changes (4-6), early treatment improves dental and facial aesthetics and promotes a more favorable environment for normal growth (7, 8).

Results from various studies show that the combination of rapid maxillary expansion (RPE) with the forward pull of the maxilla by the protraction facemask (FM) is effective in treating maxillary retrusion in growing children (9, 10). They report similar outcomes such as forward movement of the maxilla and A-point increase of SNA and ANB angle, clockwise rotation of the mandible, and decrease of SNB angle. However, anchorage loss and dental compensations occur (11). A recent study observed a tendency for reestablishment of the skeletal Class III growth pattern after maxillary protraction therapy, which was caused by more significant protrusion of the mandible relative to the maxilla (12).

Clinical application of temporary skeletal anchorage (SA) constantly shows improved results in treating skeletal class III malocclusion (13, 14). Using miniplates or mini-screws helps overcome the side effects of the commonly used protocol consisting of rapid maxillary expansion and protraction facemask (RPE-FM) (15-17).

Received: 25 January 2025
Accepted: 3 March 2025

Known to have a concave profile (18), these patients will benefit from improved facial esthetics provided by SA. Moreover, a favorable psychosocial effect is expected by improving facial esthetics in teenagers rather than postponing a surgical approach until the completion of growth (19).

The aim of this paper is to report the versatility of SA in the treatment of a skeletal class III hyperdivergent patient with severe space discrepancy due to the mesial movement of the maxillary first permanent molar.

CASE REPORT

A 12.8-year-old boy sought orthodontic treatment at the School of Specialization in Orthodontics Albanian University, Tirana, Albania. He was in overall good health without any systemic disease. Apart from not being satisfied with his front teeth, he reported difficulty during mastication. Intra-oral examination revealed anterior crossbite and missing space for teeth nr 13, 23, 25. Extra orally, the profile was concave, and the lower lip protruded (Fig. 1).

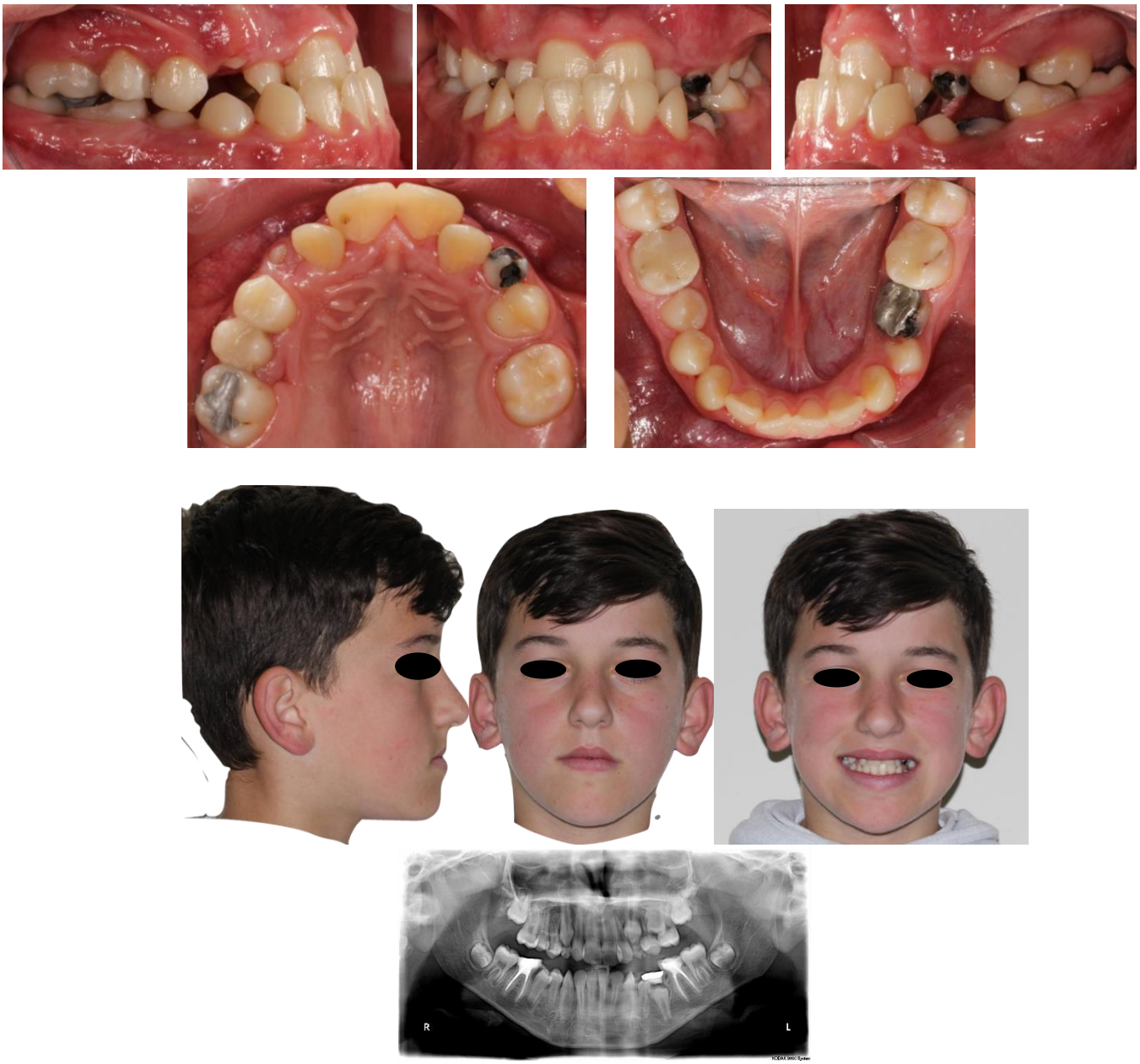


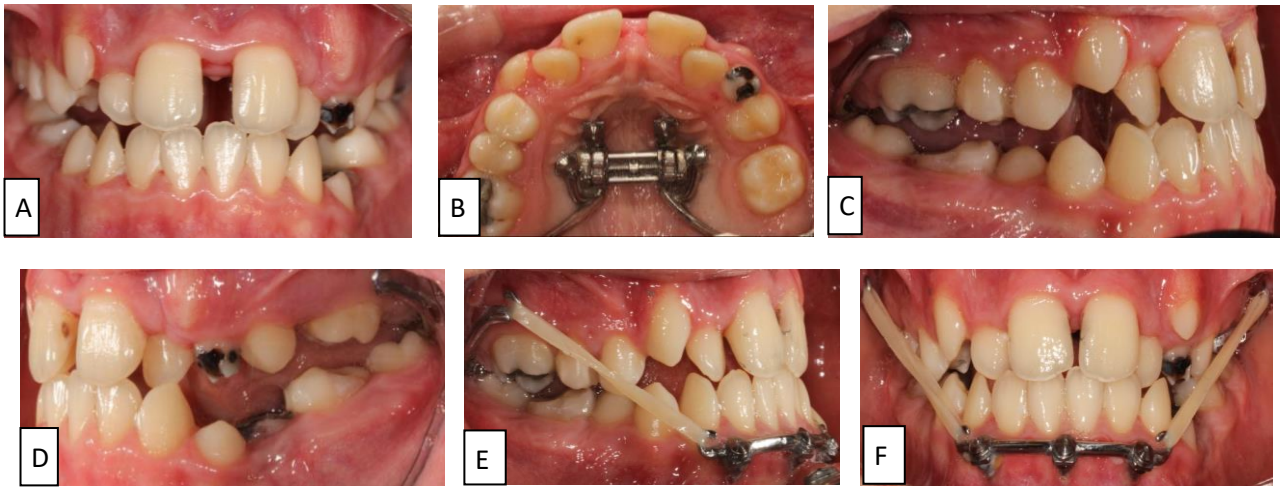
Fig. 1. *Pretreatment intraoral, extraoral and panoramic radiograph.*

Radiographic examination confirmed that space was partially missing for teeth nr 13 and 23 and completely for nr 25. The patient was in the late mixed dentition stage, and skeletally, the maturation stage was CS2. Pretreatment cephalometric analysis (Table I) confirmed the diagnosis of skeletal class III malocclusion (ANB angle -1.45°, Witts -7.45mm) with hyperdivergent vertical pattern (GoGn^Sn 39.30°, FMA 33.43°).

Table I. *Pre and post-treatment cephalometric measurements.*

Cephalometric measurement	Pretreatment	Post-treatment
SNA	78.83°	82.38°
SNB	78.28°	80.80°
ANB	-1.45°	1.58°
A-N|FH	-5.24mm	-1.48mm
Po-N|FH	-11.08	-5.86mm
Wits Index	-7.45mm	-0.21
GoGn^Sn	39.30°	38.68°
FMA	33.43°	33.23°
MM	30°	31.04°
U1-APo	1.9mm	4.6mm
L1-APo	4.75mm	5.30mm°
U1^MAX	110.3°	114.7°
L1^MAND	84.19°	87°

Rapid maxillary expansion was performed with the bone-borne (BB) appliance as described by Annaruma (20). A removable plate was given to eliminate occlusal interferences. The parents were instructed to activate the screw twice a day for one week. The following activation protocol was required: twice a day for 2 weeks. At the next appointment, the mid-palatal was opened, so it was decided to continue with the digitally planned mandibular plate with 2 mini screws and hooks for class III elastics. 5/16-inch (16oz) class III elastics were delivered to the patient (Fig 2. A-D). The patient was instructed to change elastics once per day and wear the elastics 24 hours per day. A customized molar band was bonded on the maxillary first permanent molar one month after protraction. A pendulum spring was then attached to the expander (Fig 2. E-H). Nine months after concomitant use of maxillary protraction and unilateral distalization, all maxillary permanent teeth erupted (Fig 2. I-L); therefore, it was decided to start fixed orthodontic treatment to create space for tooth nr 12 and 22. Night use of class III elastics was recommended. It took 23 months to finish orthodontic treatment.



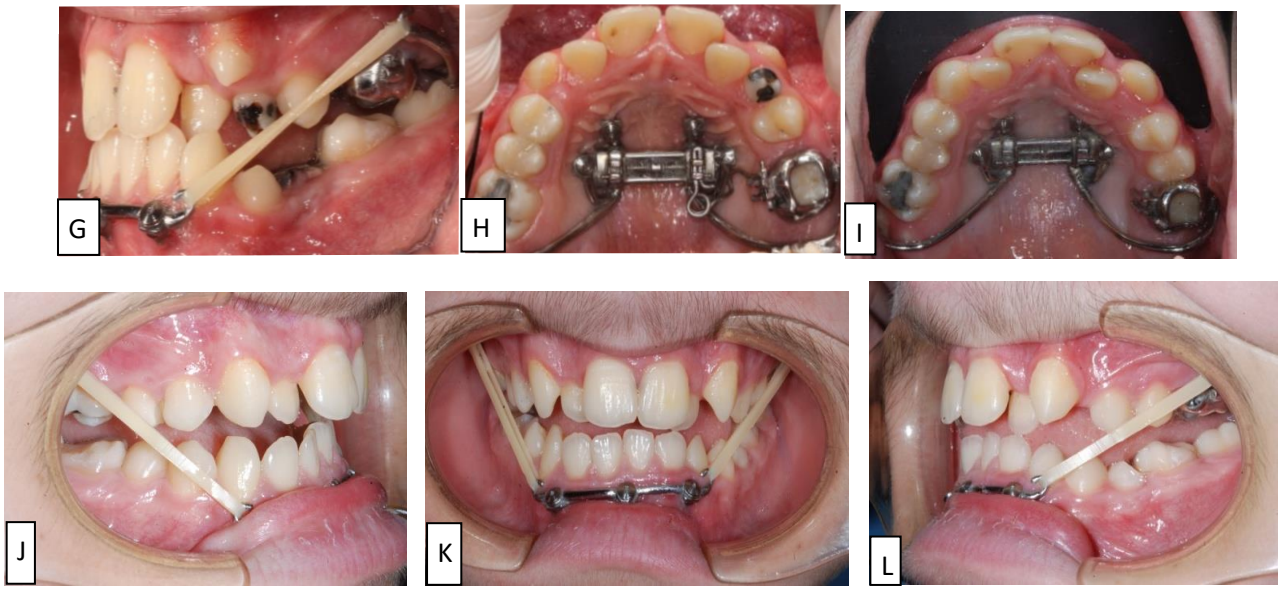


Fig. 2. *Clinical photos during treatment.*

Treatment results

At the end of the treatment, all objectives set at the beginning were achieved. As shown in Fig. 3. A-E, intraorally optimal overjet and overbite, class I canine, and molar relationship were obtained. Moreover, the patient achieved and appreciated a significant smile and profile improvement (Fig. 3. F-H). The panoramic X-ray showed good root parallelism with no signs of resorption. Cephalometric measurement performed at the end of treatment (Table I) confirms that the profile improvement was due to skeletal maxillary protraction using MARPE (3.55° of change in SNA angle, 3.76mm of Point A advancement). Furthermore, the applied protocol did not worsen the pretreatment hyperdivergent pattern except for a slight increase (1.04°) of MM angle.

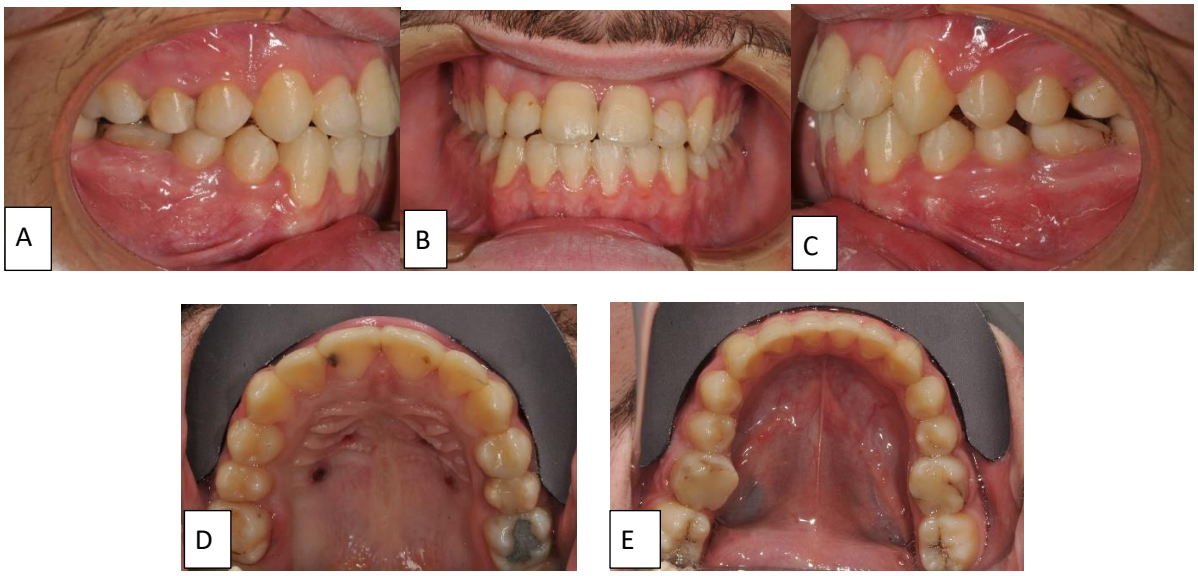


Fig. 3. *Intraoral, face, and profile post-treatment; panoramic radiograph.*

DISCUSSION

Alongside being in the late mixed dentition stage, which is not considered the optimal time to start treatment of skeletal class III malocclusion with the RME-FM protocol (21), his skeletal discrepancy would not be corrected with orthodontic camouflage (22). Hence, it was decided to use the BAMP protocol, which among favorable skeletal (14,17) outcomes reduces patient compliance to wear a face mask (23).

Post-treatment cephalometric measurements indicating that the selected protocol produced significant maxillary protraction (3.76mm of point A and 3.55 increase of SNA angle) are similar to other studies (24-26). According to De Clerk (23), the anterior displacement of the maxilla and the minimal mandibular growth resulted in a clear reduction in facial concavity. Moreover, correcting an anterior crossbite, the patient's main complaint, contributed to better facial esthetics. Such improvement, part of the treatment's objectives, increases self-esteem (8).

The reported advantages of BAMP, such as better control of vertical changes, lack of clockwise rotation of the mandible, and (17) retroclination of the lower incisors, were observed in our patient. Moreover, lower incisors were proclined at the end of the treatment. A similar result observed in a previous study was attributed to the increased tongue pressure after the elimination of anterior crossbite and the increased distance between the upper and lower incisors, which in turn allowed the lower incisors to tip forward (26). In line with previous studies (27, 28), the upper incisors were found to be more proclined in our patient but without exceeding normative value.

Of particular importance for the success of orthodontic treatment, especially complex cases, as in the present study, is the generation of a list of specific problems (29). Consequently, interaction among possible solutions to specific issues is likely so that solving one problem may make another worse. In addition to preventing unwanted side effects, SA allows multiple simultaneous or sequential tooth movements (30). Hence, we took advantage of the palatal screw of the bone-borne expander to simultaneously expand and distalize on the left side. Without interrupting class III elastics and by the activation of the pendulum spring, impaction of tooth nr 25 was avoided. Another important factor to be added among the advantages obtained in the present case report is that the surgical guides and the BB expander were digitally planned, avoiding complications, decreased chair time, and greater patient comfort (31).

CONCLUSIONS

Skeletal Class III malocclusion presents significant treatment challenges, particularly in hyperdivergent patients with severe maxillary constriction. This case report demonstrates that the combined use of BAMP and a multibracket fixed appliance allows for effective maxillary expansion and protraction while providing a versatile approach to comprehensive orthodontic correction. Skeletal anchorage enhances treatment efficiency, offering a non-surgical alternative for selected cases. Long-term follow-up and further studies are needed to confirm the stability of the results and refine treatment protocols.

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