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Case Study

Case Study: Facemask Protocol for Growing Patient

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Abstract

This case report describes the orthodontic treatment of a 9-year-old Egyptian male with a Class III incisor relationship and skeletal Class III base, characterized by a -3 mm reverse overjet, 70% reverse overbite, and masticatory difficulties. The patient exhibited full unit Class III molar relationship, unclassified canine relationship, lower and upper crowding, concave profile, acute nasolabial angle, and competent lips. Treatment involved two phases: Phase 1 utilized an orthopaedic appliance (facemask) with banded hyrax and posterior acrylic bite planes, while Phase 2 employed upper and lower fixed pre-adjusted edgewise appliances with MBT prescription and class III elastics. This comprehensive approach aimed to address the malocclusion effectively and achieve improved dental alignment and facial aesthetics.

***Keywords:** Orthodontic; Class 3 maxillary deficiency; Malocclusion*

Introduction

This case exemplifies a comprehensive treatment approach that successfully addressed the patient's chief complaint, leading to significant improvements in facial aesthetics, smile aesthetics, skeletal alignment, and dental relationships. By achieving a straighter facial profile, enhanced smile aesthetics, and optimal jaw relations, the treatment not only met the patient's expectations but also improved mastication comfort. With meticulous attention to detail in correcting dental issues such as alignment, overjet, and overbite, as well as implementing retention strategies for long-term stability, this case showcases a successful orthodontic intervention tailored to enhance both function and aesthetics. [1-5]

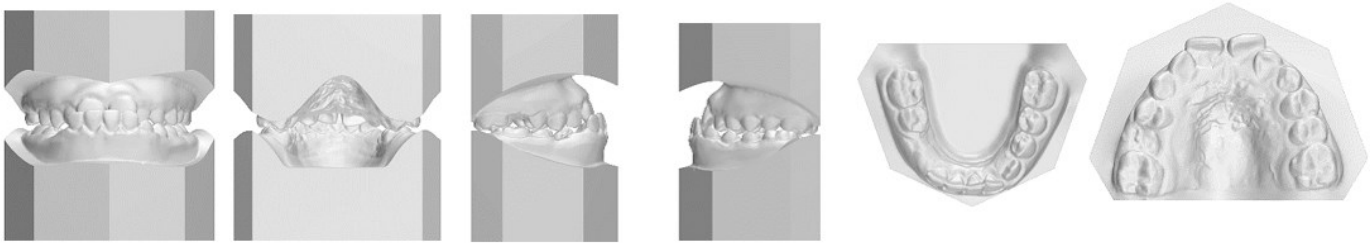
Clinical Case

The patient, aged 9 years and 7 months, presents with bottom teeth protrusion and difficulty biting. Family history includes similar malocclusion. Skeletal assessment reveals Class 3 maxillary deficiency, average vertical and transverse proportions. Soft tissue assessment shows brachycephalic features, decreased incisal show, competent lips, concave profile, and acute nasolabial angle. Intraoral assessment indicates mandibular and maxillary arch crowding, Class III incisor relationship, reversed overjet and overbite, shifted lower centerline, Class III molar relationship on the left side, increased lower Curve of Spee, retained upper primary canines. Bolton analysis shows ratios indicating mandibular excess. General dental condition includes caries in specific teeth and fair oral hygiene. Radiographic examination reveals normally developed teeth with some absent or poor prognosis teeth.

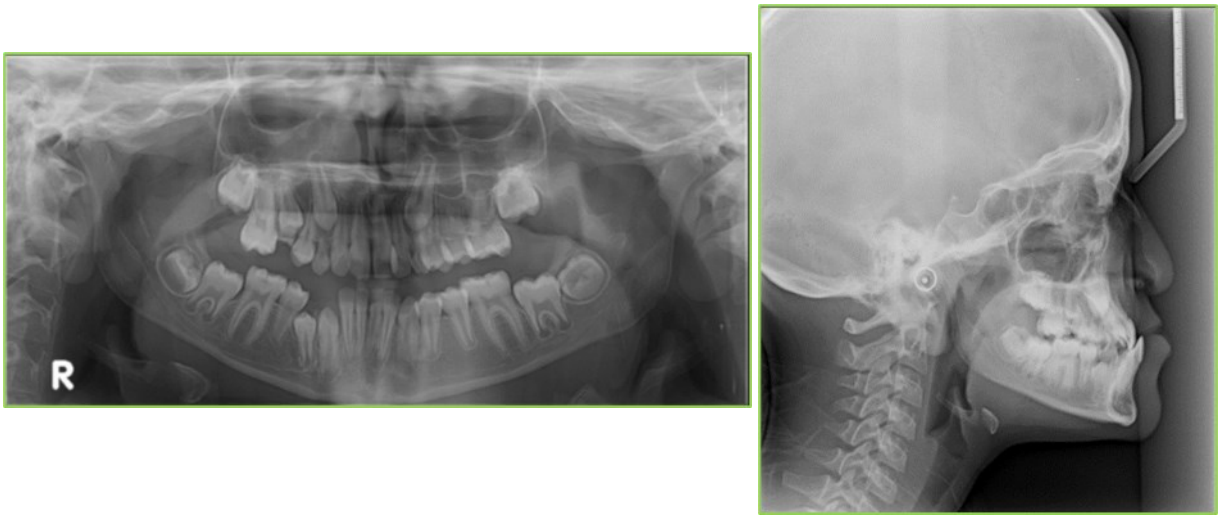
Pre-Treatment Photographs: Extra-Oral

Pre-Treatment Photographs: Intra-Oral

Pre-Treatment Study Models



Pre-Treatment Radiographs



Pre-treatment cephalometric analysis :

Table 1

Variable	Norms	Egyptian Norms	T0
SNA	82° ± 3	83° ± 3	78
SNB	79° ± 3	80° ± 3	83
ANB	3° ± 1	2° ± 2	-5
MMPA	27° ± 5	25° ± 3	23.5
Face height ratio	55% ± 2%	No reference	54.9
SN to maxillary plane	8° ± 3	9.8° ± 3	13
Upper incisor to maxillary plane	108° ± 5	112°± 5	115
Lower incisor to mandibular plane	92° ± 5	98° ± 6	96
Interincisal angle	133° ± 10	128° ± 5	125
Wits appraisal	0 mm	-0.3 ± 2.6 mm	-1.6
Lower incisor to APo line	0-2 mm	1 ± 3 mm	1.8

Source of normal values:

-Soliman SA. ''development of a Method for Analysis of Lateral Skull Cephalostat Radiograph'' PHD thesis /Cairo University, 1988.

Diagnostic summary

A pre-adolescent male presented with a Class III incisor relationship on a Class 3 skeletal base (maxillary deficiency) with average vertical proportions, complicated by– 3 mm reverse overjet and 70% reserve overbite with masticatory difficulties, average inclination of U & L incisors, 4 mm lower crowding & 5 mm upper crowding. The buccal occlusion showed full unit class III right and left molar relationship, and unclassified canine relationships. His profile was concave, acute nasolabial angle. He had decreased incisor show on smiling, and lower centreline was shifted 2 mm to the right in relation to the upper centreline.

Treatment Planning

The patient presented with multiple dental and skeletal discrepancies requiring orthodontic intervention.

These included:

- **Dental caries:** Cavities were identified in the upper primary teeth (U4s), all permanent molars (6s), and the remaining root of an upper tooth (ULE).
- **Reverse overjet and overbite:** The lower teeth overlapped the upper teeth to a significant degree (-3mm overjet and 70% reverse overbite), causing difficulty with chewing (chief complaint).
- **Crowding:** There was moderate crowding in both the lower arch (4mm) and upper arch (5mm).
- **Skeletal disharmony (Class III):** The upper jaw (maxilla) was underdeveloped compared to the lower jaw (mandible), contributing to the reversed bite. This skeletal discrepancy is classified as a Class III malocclusion.
- **Molar and canine relationships:** The molars and canines on the right side exhibited a Class III relationship, where the lower teeth were positioned forward relative to the upper teeth.
- **Midline discrepancies:** The lower midline (center point of the lower teeth) was shifted 2mm to the right compared to the upper midline. Additionally, the lower canine showed increased overjet (COS) of 2.5mm, likely due to the skeletal discrepancy.
- **Facial profile:** The patient exhibited a concave facial profile, which can be associated with a recessed upper jaw.
- **Reduced incisal show:** The upper front teeth were not visible to a desired extent when smiling.

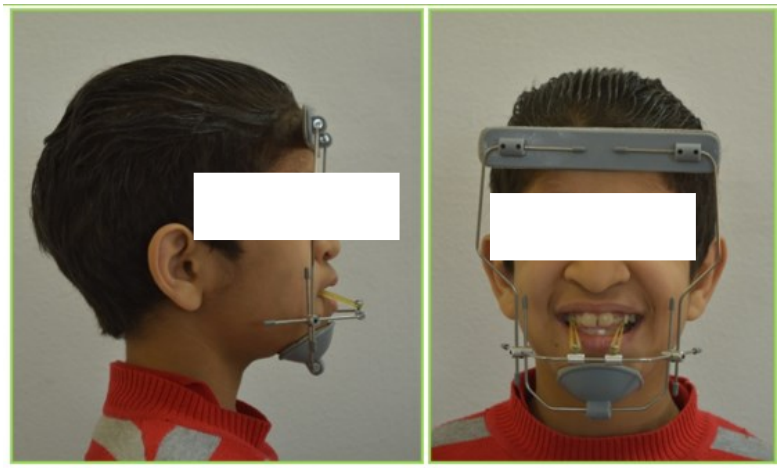
To address these issues, a two-phase orthodontic treatment plan was proposed, with an estimated total active treatment time of 33 months. The plan included:

- **Phase I - Expansion and correction of jaw discrepancy:**
    - **Appliance:** Delaire-type facemask and banded hyrax expander with posterior acrylic bite blocks.
    - **Goal:** To create space in the upper arch by promoting maxillary growth and widen the upper jaw to improve the bite relationship.
- **Phase II - Alignment and bite correction:**
    - **Appliance:** Fixed pre-adjusted edgewise appliance (0.022”x0.028” slot) with MBT prescription.
    - **Extractions:** Removal of the remaining upper tooth root (ULE).
    - **Special Anchorage:**
        * Phase I: Extraoral anchorage provided by the facemask.
        * Phase II: Class III intermaxillary elastics used to directly move the upper and lower teeth into proper occlusion.
    - **Additional dental treatment: Fillings for the cavities in the U4s and all 6s before initiating orthodontic tooth movement.**
- **Retention:** Bonded permanent retainers (upper and lower 3-3) and upper and lower vacuum-formed retainers to maintain the achieved tooth positions after treatment.

Images of key stages / mechanics in treatment

Phase 1: Facemask (Delaire type), banded hyrax associated with hooks mesial to U canines + posterior acrylic bite blocks.

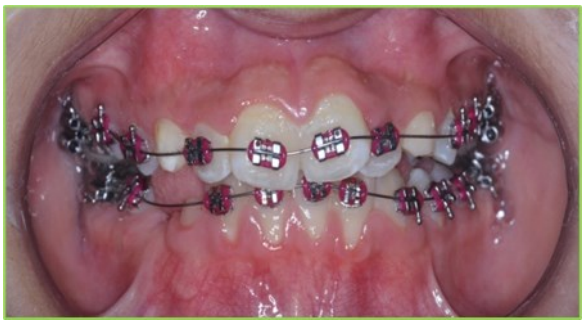
Extraoral elastics were used (3/8″ – 8 oz) for 2 weeks then (1/2″- 14 oz), 14 hours per day and hyrax turns (1 turn per day for 10 days).



After 4 months, positive overjet achieved, patient continues to use facemask 4 months later for overcorrection and retention.

Phase I completed, patient achieved positive overjet and overbite, over-correction of buccal segment.

Phase 2: Fixed pre-adjusted edgewise appliance (0.022"x0.028" slot) MBT prescription, U & L 14 Ni.Ti. Wire



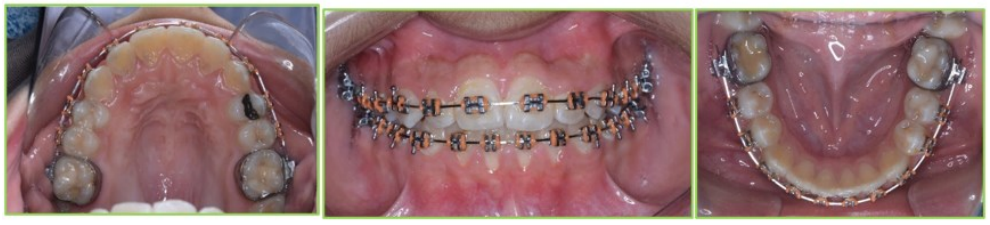
U: 18 x 25 St.St. wire & L: 18 NiTi wire

Open coil spring was placed for UL3 eruption and orthodontic sleeve was placed for reserving LR4 space.

U & L: 18 x 25 St. St., piggyback technique using 14 NiTi wire with main arch wire to align UL3 and LR4.

U: Finishing 17 x 25 TMA wire used (step down bend distal to UL2 and mesial to UR4).

L: 19 x 25 St.St. wire for improving torque expression.



Mid-treatment ceph analysis:

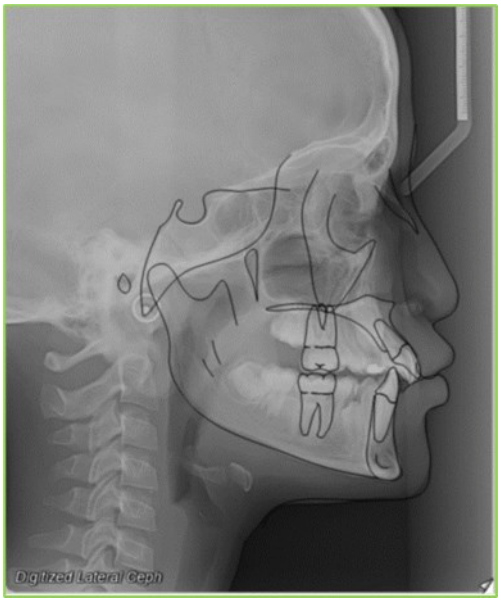


Table 2

Variable	T0	T1
SNA	78	80
SNB	83	79
ANB	-5	1
MMPA	23.5	24.5
Face height ratio	54.9	55.1
SN to maxillary plane	13	12.5
Upper incisor to maxillary plane	115	117
Lower incisor to mandibular plane	96	86
Interincisal angle	125	128
Wits appraisal	-1.6	-0.6
Lower incisor to APo line	1.8	-0.2

Near-end/end of treatment radiograph:

-Near-end /end of treatment analysis:

Table 3

Variable	T0	T1	T2
SNA	78	80	80
SNB	83	79	80.5
ANB	-5	1	0.5-
MMPA	23.5	24.5	26
Face height ratio	54.9	55.1	56.2
SN to maxillary plane	13	12.5	12
Upper incisor to maxillary plane	115	117	120
Lower incisor to mandibular plane	96	86	92
Interincisal angle	125	128	123
Wits appraisal	-1.6	-0.6	-1.1
Lower incisor to APo line	1.8	-0.2	1.2

Source of normal values:

-Soliman SA. ''development of a Method for Analysis of Lateral Skull Cephalostat Radiograph'' PHD thesis /Cairo University, 1988.

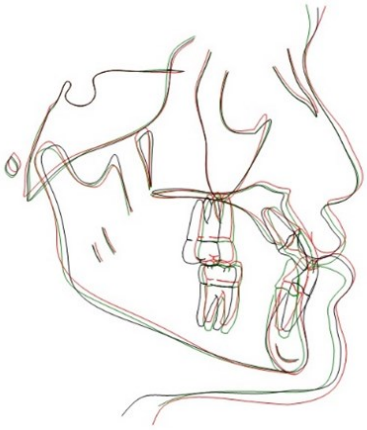
Cephalometric Superimposition

Pre-treatment: Black

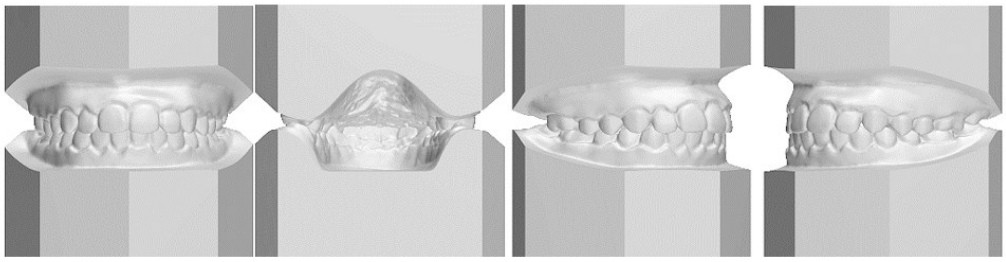
Post-functional(T1): Blue

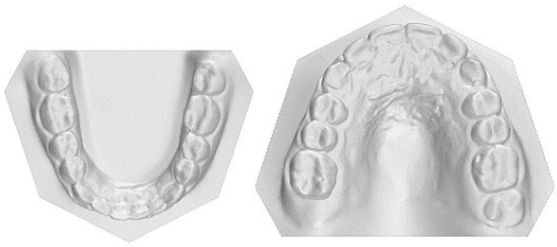
End of Treatment(T2):Red

Overall superimposition, registered on Bjork's stable structures



END OF TREATMENT STUDY MODELS





Post - treatment photographs:

(Retainers)

Conclusion and Final Result

Treatment successfully addressed the patient's chief complaint of chewing difficulties, leaving them extremely pleased with the outcome. Masticatory comfort improved significantly. Facial aesthetics were enhanced, with a transformation from a concave to a straight profile, increased lower face height (LFH), and a more protrusive maxilla. Smile aesthetics saw a dramatic improvement, with increased incisal show, a positive anterior overbite, and a better smile line. A referral to a periodontist was made for gingival margin adjustments on the upper front teeth. Skeletal improvements were observed, with the anteroposterior jaw relationship normalized. The SNA angle increased, indicating a more forward maxilla, while the SNB angle decreased due to a backward mandibular rotation. This resulted in a corrected ANB angle. Dentally, ideal Class I incisor, canine, and molar relationships were achieved, along with normal overjet and overbite. Both arches showed good alignment and resolved crowding. The upper incisors were proclined slightly to maintain overjet, and the upper right wisdom tooth (UR8) began development. While spotted white lesions were noted on the lower left 6th tooth (LL6) and lower left 4th tooth (LL4), the patient was advised to improve oral hygiene and wait for potential spontaneous correction before reassessment. Bonded and removable retainers were placed on both upper and lower arches, and the importance of continued monitoring until growth completion was emphasized.

Conflict of Interest

The author confirm there is no conflict of interest to disclose.

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