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Non surgical correction of skeletal class II open bite malocclusion with extraction of first molars in an adult patient:A case report.

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Abstract:
Anterior open bite treatment presents significant difficulty to orthodontists due to high chance of relapse. An adult patient presented with severe open bite treated with camouflage by extraction of four first molars and use of inter-maxillary elastics. The treatment outcomes demonstrated closure of anterior open bite, autorotation of the mandible, and improvement in facial appearance.

Keywords: Open bite, camouflage treatment, vertical discrepancy

Introduction

Anterior open bite malocclusion (AOB) is defined as a vertical space between the occlusal or incisal surface of maxillary and mandibular teeth when in occlusion from the labial aspect (1). AOB is characterised by open basal configuration and increased skeletal vertical dimension (2). Treatment is complicated in adults due to difficulty in anterior open bite correction as well as a tendency for post-treatment relapse (3). Surgical treatment may be indicated in these patients to improve underlying skeletal discrepancies. Other treatment modalities include camouflage, such as molar intrusion using temporary anchorage devices (TADs), and/or the extraction of permanent teeth for additional vertical control (4); it is recommended to extract as posteriorly as possible, ideally the second premolars or the first permanent molars, as this will aid in bite closure (5). Nevertheless, significant intrusion of the posterior teeth is difficult to address in adults (6).

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This case presents successful non-surgical treatment of a patient with skeletal Class II open-bite malocclusion. Treatment results were confirmed using two-dimensional radiographic superimposition and long-term stability.

Case Description

A 20-year-old male presented to the dental department of our institution with a severe anterior open bite, crowding, and a Class II molar relationship. His medical history was insignificant.

Clinical examination revealed a convex profile, vertical growth pattern, asymmetrical face with the chin deviated to the right, and competent lip with chin strain at rest. The patient had Class II canine relationship, 5-mm anterior and 2-mm unilateral posterior right open bite, bilateral posterior cross-bite, and asymmetric mouth closure. His maxillary dental midline coincided with the facial midline, while the mandibular dental midline deviated 3 mm to the right (Image 1).

Image-1

Panoramic radiography showed third molars, multiple restored teeth, an endodontically treated upper right first molar, and a deep carious lesion in the upper left first molar and lower left second molar.

Cephalometric analysis revealed a skeletal Class II relationship due to the retrognathic mandible, increased lower facial height, and a steep mandibular plane. Dento-alveolar analysis showed normally inclined maxillary and mandibular incisors. Soft tissue analysis showed a normally positioned upper lip and a protruded lower lip.

The patient was diagnosed with a Class II skeletal open bite malocclusion, increased lower facial height, a steep mandibular plane, bilateral posterior cross-bite with a competent lip, and chin strain at rest.

Treatment Objective

The treatment objectives were to correct the AOB, correct the posterior cross bite and lower dental midline shift, achieve Class I canine relationship, normalize overbite and overjet, improve facial aesthetics, and obtain passive lip competence.

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Treatment Options

(1) Orthognathic surgery was suggested as the first treatment option because of the severity of skeletal Class II malocclusion and vertical abnormalities.

(2) TAD-assisted posterior tooth intrusion and elastic-assisted anterior tooth extrusion in the maxillary and mandibular regions.

(3) Multiloop Edgewise Archwire (MEAW) mechanics and elastics that provide vertical control and uprighting of the posterior teeth.

Treatment Progress

Prior to treatment initiation, the maxillary first permanent molars were extracted due to poor prognosis and enhanced mandibular counter clockwise rotation. Treatment was initiated with a 0.022 × 0.028-inch slot standard edge-wise appliance.

The orthodontic mechanics involved levelling and alignment of upper and lower teeth using 0.014, 0.016, and 0.016 × 0.022-inch nickel titanium (NiTi) arch wires. 0.016 × 0.022-inch stainless steel arch wires were introduced in both arches, and the anterior teeth were slightly retracted to improve overjet. The remaining spaces were closed reciprocally with a power chain to move the second molars mesially.

Orthodontic vertical elastics were used to improve intercuspation in all segments. After debonding, a modified Hawley retainer and a lingual fixed retainer were placed in the upper and lower arches, respectively. The patient underwent treatment for 34 months.

Treatment Results

Significant improvement of facial appearance was noticed on extraoral photographs (Image 2). A well-balanced profile with lip competence at rest and an aesthetic smile with adequate maxillary incisor were apparent on smiling. Intraoral photographs and dental casts showed satisfactory overbite, adequate overjet, Class I canine relationship, correction of dental midline deviation, and correction of cross-bite. Periodontal health was satisfactory.

Image-2

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An increase in mandibular projection, decrease in facial convexity and sagittal and vertical discrepancies were among the skeletal changes observed at the end of treatment. Dento-alveolar chnages included a greater degree of lingual retroclination and minor extrusion of the maxillary and mandibular incisors, as well as protraction and intrusion of the second and third molars. In terms of soft tissue changes, there was a decrease in facial convexity and an improvement in the position of the upper and lower lips.

The following were noticed on superimposition of the lateral cephalometric radiographs (Image 3):

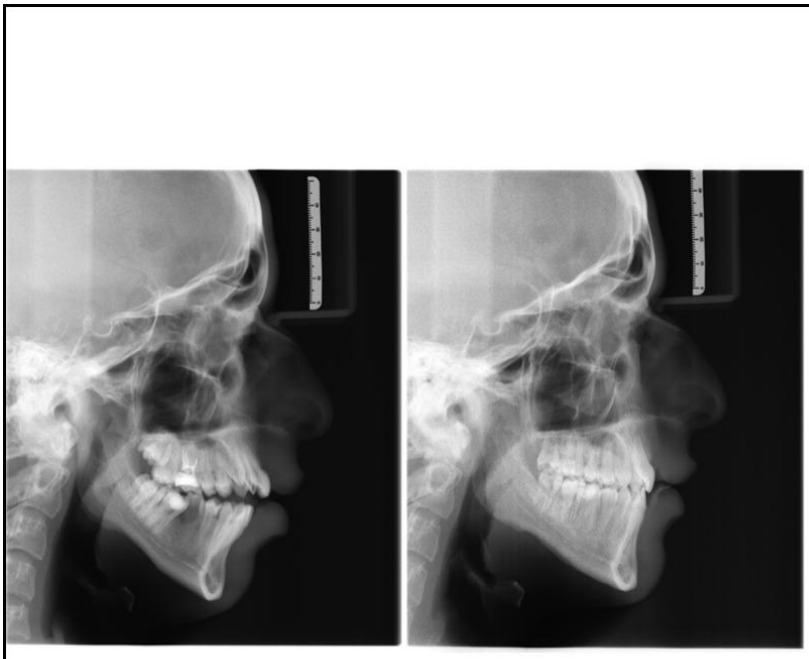
-Superimposition at the cranial base registration revealed a counter-clockwise pitch rotation and residual growth of the mandible.

-Maxillary regional superimposition confirmed cephalometric changes, including small maxillary changes as well as posterior teeth intrusion.

-Mandibular regional superimposition corroborated with the results, and residual mandibular growth was observed.

-No evidence of condylar remodelling.

Based on cephalometric radiograph superimposition, posterior teeth intrusion contributed to counter-clockwise mandibular rotation.



Variables	Norms	Pre-treatment	Post-treatment
SNA (°)	81°±2°	82°	82°
SNB (°)	78°±2°	76.5°	79°
ANB (°)	2°±2°	5.5°	3 °
SNPog (°)	81°±2°	76°	80°
Wits (mm)	–1±2°	4 mm	-2 mm
Man.SN (°)	32°±4°	41°	38°
Max.SN (°)	8°±2°	7°	7°
Max.-Man. (°)	27°±4°	38°	34°
Me-tgo-Ar (°)	126° ± 5°	138°	135°
UI-LI (°)	131° ± 10°	121°	140°
UI-Max. (°)	110±6°	115°	99°
UI-NA (mm)	4 ± 2.7	4.5 mm	-2 mm
LI-Man. (°)	93°±6°	89°	84°
NB – LI (mm)	4±2	6 mm	1.5 mm
UL-EL (mm)	– 2 ±2	-1 mm	-3 mm
LL –EL (mm)	– 0 ±2	2.5 mm	-1 mm
NLA (°)	90° – 110°	105.5°	107°

Image-3

The 3-year post-treatment follow-up visits showed stability of open-bite correction and maintenance of the Class I canine relationship.

Discussion

Both sagittal and vertical problems must be considered in camouflaging skeletal Class II open-bite malocclusions. Some dental restrictions, such as missing first molars as in this case,

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in combination with skeletal problems, make treatment more complex (7). A simple biomechanical principle and selective tooth extraction were used to overcome these limitations. The posterior teeth underwent protraction and intrusion, while the anterior teeth underwent retraction with slight extrusion.

Dental midline shift was corrected by closing the space following first molar extraction and using diagonal anterior elastics from the upper right lateral to the lower left lateral incisor. Inter-maxillary elastics were used to correct the sagittal relationship. After correcting the dental midline shift, reciprocal space closure was necessary to obtain adequate overjet.

Considering the advancements in orthodontic mechanics and fixed appliances, Mill's statement about a permanent molar extraction doubling treatment time and halving prognosis might no longer be applicable (8). Despite limitations of orthodontic protraction of the second molar, it was well tolerated owing to the good bone thickness in the edentulous area (9).

Since the first molars had poor prognoses in both arches, they were extracted before orthodontic treatment. This eliminated occlusal interferences and encouraged spontaneous counter-clockwise mandibular rotation (10). Occlusal contact was only present between maxillary and mandibular molars prior to therapy; their intrusion led to excellent results.

Andrade recommended removal of the first permanent molars to eliminate contacts in cases with significant skeletal discrepancy. It enhances the mesial movement of the second molars, which in turn alters the fulcrum of contacts and reduces hyperdivergency of the mandibular plane (11). Furthermore, extraction of the first permanent molars increased the chance of eruption of the third molars by 90%, in comparison to 55% when premolars were extracted (12). For treatment of AOB, studies concluded that a more conservative approach would be to remove the four first molars, which causes a loss of 12.5% only, compared to the loss of 25% of dental structure caused by removal of the four first premolars followed by the four third molars (13).

With the approach followed in this case, the stability is reportedly 94.4% in growing and 90% in non-growing patients (4). The relapse rate for posterior teeth intrusion ranges from 20% to 30%, with the greatest percentage in the first year after treatment (14). Therefore, 3-year post-treatment follow-up records are necessary (15).

Based on the excellent facial aesthetics and occlusal stability, and on the superimposition of the initial and final cephalometric tracings, an appropriate treatment plan was performed for the patient in this case.

Conclusion

This case report showed that molar extraction is favourable for correcting the vertical discrepancy in patients with increased lower anterior face height and an anterior open bite. Specialists should consider the mechanics of closing spaces, allowing for functional harmony, occlusal stability, and desirable aesthetics.

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