

Case Report

## CAMOUFLAGE THERAPY OF HYPOPLASIA OF THE MAXILLA. CASE REPORT

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**Abstract.** Maxillary hypoplasia is one of the forms of class III malocclusion. On average, 60% class III malocclusions are characterized by maxillary underdevelopment in all three directions. Anomalies in position, size and the shape of facial bones, maxilla in particular, usually appear in childhood, become more pronounced in adolescence until the end of the growth period. The aim of the paper is to show the camouflage treatment of the patient in adolescence with maxillary hypoplasia. Using the RME method in the upper jaw, extraction in the lower jaw and fixed orthodontic devices in both jaws, a satisfactory result was achieved.

**Key words:** Maxillary hypoplasia, Camouflage therapy, Rapid Maxillary Expansion (RME).

### Introduction

According to Angle, Class III malocclusion represents a relationship in which the lower first molar is more anteriorly placed related to the upper first molar [1]. It is a symptomatic or phenotypic description of occlusion which uses the relationship of first molars as a criterion and it does not clarify mutual relationship of the maxillary and mandibular skeletal base, as well as their relationship towards the skull base. Regardless of this, this is the most commonly used classification of malocclusion, due to its simplicity. However, many authors criticized its flaws, such as the lack of definition of transversal and vertical dimension [2]. The research carried out to identify anatomic specificities of class III malocclusion showed that deformity is not only limited to occlusion and overdevelopment of the lower jaw (as it was considered until 1970), but it includes the entire craniofacial complex. Most of the individuals with class III malocclusions have a combination of skeletal and dentoalveolar components, such as insufficient length of the frontal skull base, reduced angle of the cranial base, short and retrognathic maxilla, protruded maxillary incisors, retruded mandibular incisors, excessive lower anterior face height and obtuse gonial angle [3].

The etiology of class III malocclusion is multifactorial, with hereditary, ethnical, ecological and habitual components. Factors that contribute to anomaly are complex [4]. It is considered to be very difficult for therapy [5,6].

Different ethnic groups show various rates of prevalence of class III. It ranges from around 0.8–4% in Caucasians and around 13–14% among the Chinese and Japanese. In Asian population, majority of patients show deficit of the middle third of a face. According to literature, more than 60% of the cases of class III malocclusion occurred due to maxillary skeletal deficit [3,7,8].

A non-esthetic, concave face profile and functional disorders are the most common cause of seeking therapy. However, a concave profile with an altered nasolabial angle is often camouflaged by a natural dentoalveolar compensation. (e.g. with extremely pronounced protruded upper incisors).

This malocclusion can be classified into three types according to anatomic heterogeneity, more precisely, according to mutual relationship of the maxilla and mandible towards the base of the skull [1,3,4,9–12]. Type A has a normal maxilla and overdeveloped mandible. Its name is regular mandibular prognathism, since anterior crossbite or class III malocclusion resulted from the overdeveloped mandible. Type B has an overdeveloped maxilla and mandible, but the mandible has grown more than the maxilla, which results in a reduced nasolabial angle and anteriorly positioned point A. This type is more often found in Asians [2].

A typical characteristic of type C malocclusion is hypoplasia of the maxilla. On average, 60% in class III malocclusion are characterized by maxillary underdevelopment in all three directions [8]. Anomalies in position, size [13] and the shape of facial bones, maxilla in particular, usually appear in childhood, become more pronounced in adolescence until the end of the growth period [14].

In some cases of class III malocclusion, type C, with dentoskeletal mismatch, there are three possible therapeutic possibilities in general: modification of growth;

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camouflage through dental compensation; surgical repositioning of jaw bases [4,10,15]. For surgical correction, anterior positioning of the maxilla with maxillary osteotomy is necessary for obtaining a normal position of the upper lip and adequate nasolabial angle, and Le Fort I osteotomy are most commonly used [2,16].

As for the modification of growth, it is evident that the basic parameters that need to be considered are age, sex, type of malocclusion and the engagement of the skeleton in existing malocclusion. Age and sex impose precise time limits of each orthopedic treatment, in particular in the treatment of growth modification [17]. Growth modification with a facemask (Delaire) can be used for the correction of this malocclusion during the growth, and the options for treatment are limited to those with mild sagittal discrepancies [18,19].

Currently, there is a rational consensus on two basic questions. First, growth can be positively modified only in certain types of patients, which significantly limits this approach: maxilla and mandible could be stimulated to grow for a few additional millimeters. Therefore, it is not possible to obtain significant transformations. Second, during each orthodontic treatment teeth inevitably move in the direction of the correct occlusal relationship. These movements of teeth, which could be called 'dental compensation of skeletal discrepancy', make the complete orthopedic and skeletal correction difficult and introduce some elements of dental camouflage [20]. Orthodontic camouflage is a therapeutic process which largely uses extractions and orthodontic masking of skeletal discrepancy, instead of correcting them. Consequently, dentoalveolar compensation is performed without the correction of basal discrepancy [21].

The camouflage treatment with selective extractions is usually applied in borderline cases. However, sometimes we use it to treat patients with difficult

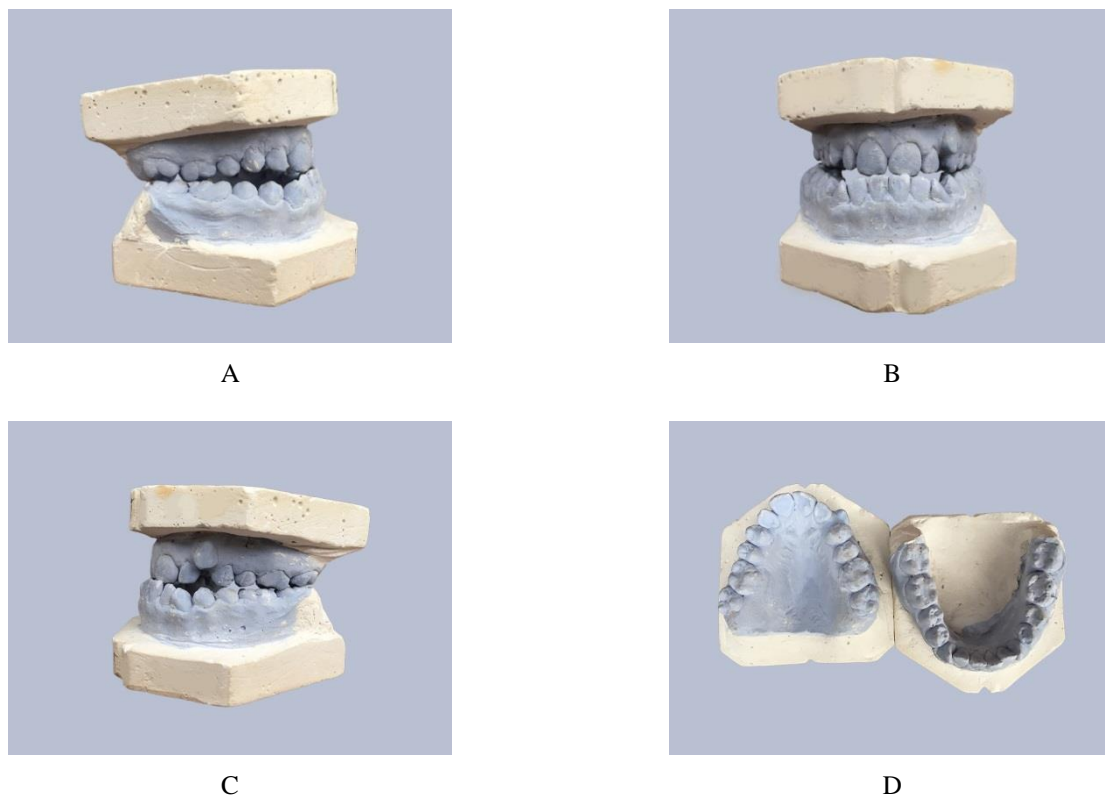
problems who do not want surgery as a part of treatment. The camouflage treatment should be prescribed for young adults only if there are cephalometric indications before the beginning of the treatment that residual growth will not cause the deterioration of deformity after the therapy. The camouflage therapy also implies that the treatment will have a favorable effect or at least it will be less harmful for face esthetics [21].

## Case Report

A male patient, aged 15, came with the complaint of esthetic (crooked teeth which are exposed during smiling and speech) and functional problems (chewing and difficulty breathing through the nose). It was found out from the anamnesis that he has a twin sister who does not have similar problems, that he had frequent respiratory infections in early childhood and the adenoid removed at the age of 3, three years of unsuccessful orthodontic treatment with a removable appliance for the widening of the upper jaw. The extraoral finding points to the presence of a leptoprosopic, adenoid face with paranasal depressions, wide buccal corridors which are exposed during smiling and speech and mostly oral respiration. The concavity of the profile is to a great extent camouflaged with the anteriorly inclined profile and full lips (Fig. 1 A, B, C). Intraorally: the movement of the middle of the upper dental arch to the right side; the lack of the upper right canine in the dental arch with completely closed space for this tooth, narrow and high position of the upper left canine, bilateral crossbite with the lack of occlusal contact on the right side; cutting relationship of central incisors with the antagonists; crowding and retrusion of lower frontal teeth. The analysis of study models showed ½ class III of malocclusion according to the reconstruction followed by big-



Fig. 1 A B C Pretreatment extraoral photographs (frontal, lateral view and smile)

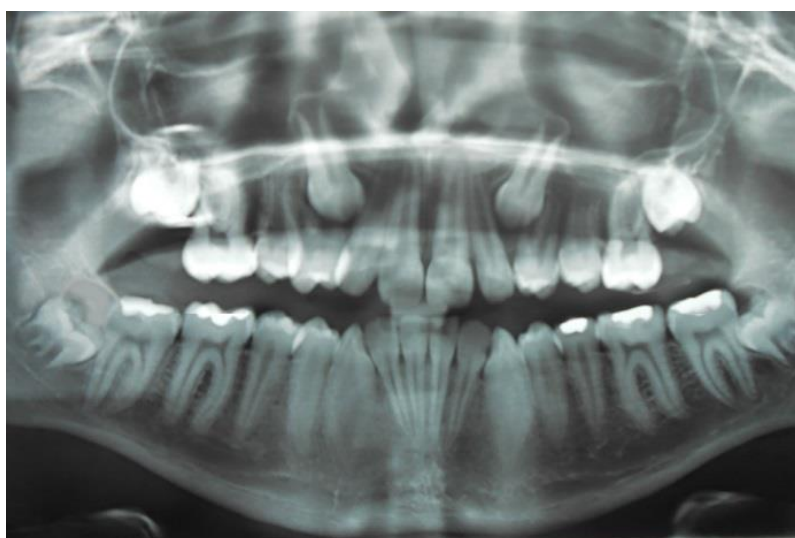


**Fig. 2 A B C D** Pretreatment models (frontal, left, right and occlusal view)

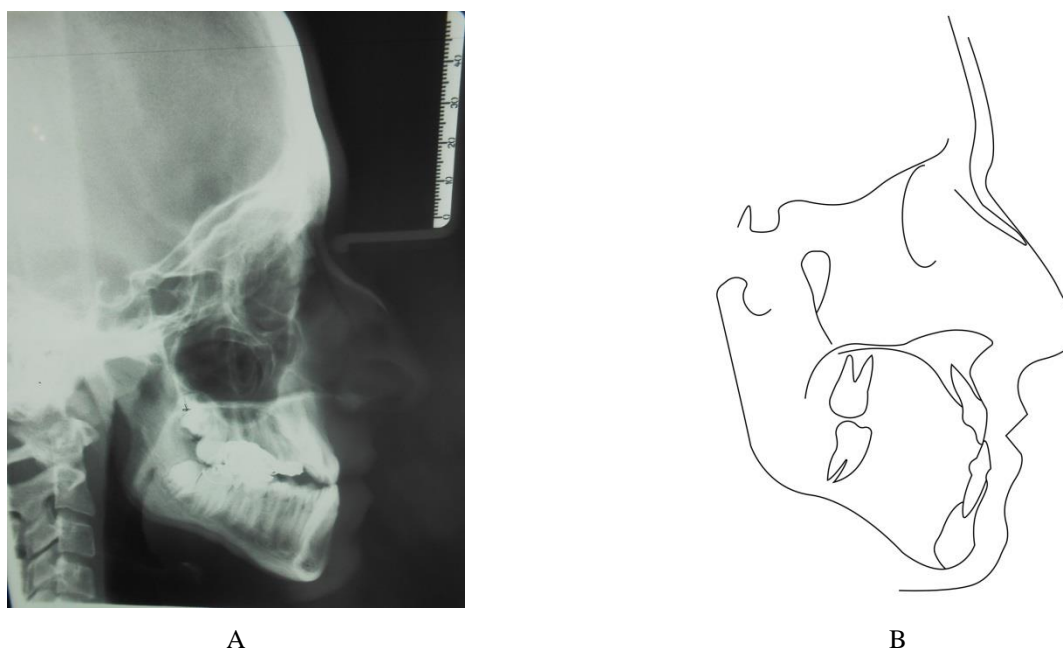
ger transversal disharmony between the upper and lower dental arch (-6 mm in bimolar distance). The asymmetrical upper dental arch with the complete loss of space for the upper right canine and partly for the left. There is a collapse of upper frontal teeth and the crowding of the lower ones, anterior crossbite on the lateral incisors; an incisal contact only in the area of central incisors in the

cutting relationship; the crossbite on the right side and difficult degree non-occlusion - only first molars are in contact. On the left side, the degree of crossing is milder and there is a contact of antagonists (figures of models) (Fig. 2 A, B, C, D).

The analysis of orthopan: Impaction of the upper right canine, the presence of all third molars (Fig. 3).



**Fig. 3** Panoramic radiograph before therapy



**Fig. 4 A B** Pretreatment lateral cephalometric radiograph and cephalometric tracings

Profile cephalogram analysis: There was bimaxillary retrognathism whereby retrognathism of the maxilla dominates, as well as mesial gnathic and dentoalveolar relationship. Then, the increased basal angle, sharp incline of the occlusal and mandibular plane, the retrusion of lower incisors, hyperdivergent type of growth (Fig. 4 A, B).

### The plan of the treatment

Two options were suggested to the patient:

1. Presurgical orthodontic treatment of rapid palatal expansion, followed by the use of fixed appliance with surgical intervention of releasing the impacted upper canine and the leveling of the upper and lower dental string. In the second phase, the anterior positioning of the maxilla with the maxillary osteotomy was predicted (Le Fort I osteotomy) which would enable optimal reponing and harmonization of sagittal relationship of jaw bases.
2. The other option was camouflage therapy in the second phase, with which the existing disharmony would be regulated on a dental level, by extracting the lower first premolars.

Since the patient rejected the option of surgical treatment of the reposition of the maxilla at first arrival, the other option was then accessed.

### The Objectives of the Treatment

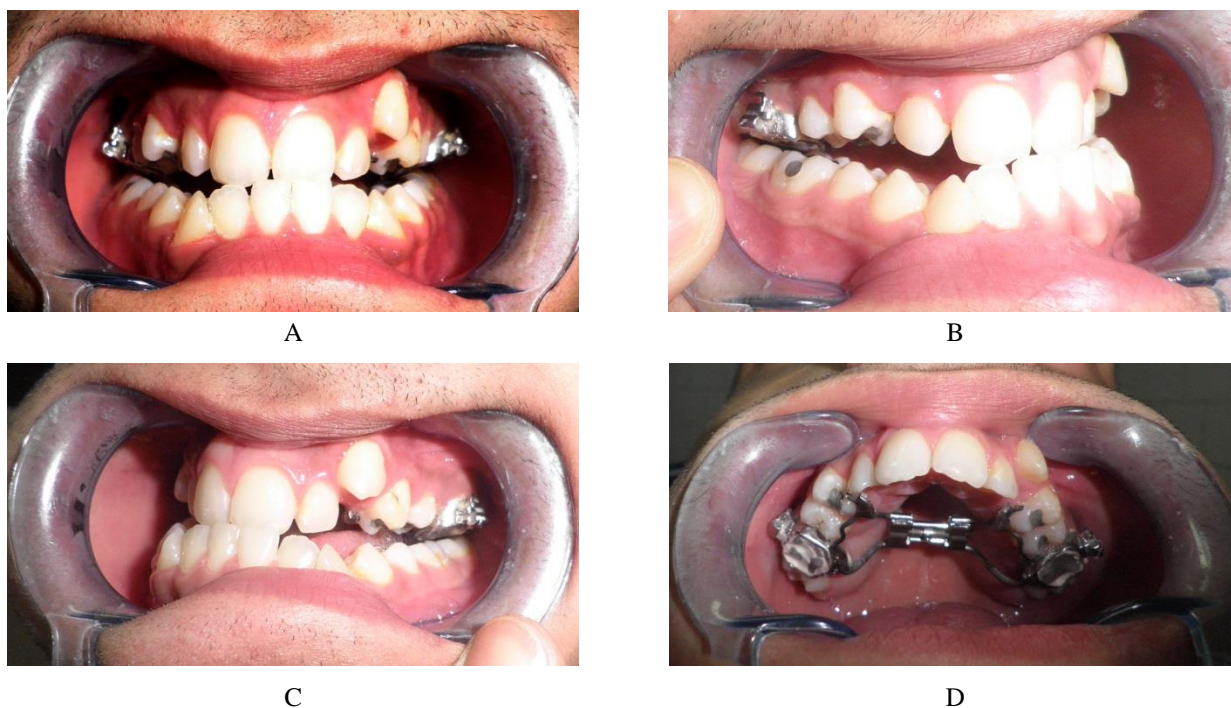
- To transversally develop the maxilla by using the appliance for rapid palatal expansion, with which transversal skeletal discrepancy between the lower and upper jaw and crossbite would be removed, dissipate the existing crowding and create space for canines;

- To extract lower first premolars, and to dissipate the crowding of lower frontal teeth at the expense of postextracted space, as well as to achieve retrusion that would enable improved contact of frontal antagonists.

These therapeutic procedures were expected to enable the improvement of the function of breathing as well as the correction of facial esthetics and the appearance of a smile.

### The progress of treatment

In the first phase the appliance for rapid maxillary expansion with the base on the first molars was constructed. Hyrax screw was used in the basis of the construction (manufacturer Leone, stock No A0620-13). The activation of the screw took place once a day. The expansion of the maxilla was achieved in less than a month (Fig. 5 A, B, C, D). Afterwards, both first premolars were extracted. Two months after placing the appliance for rapid palatal expansion, an upper and lower fixed appliance was placed (full arch, prescribed by Roth, slot 0,022") for the leveling in both dental arches. The treatment began with an 0.012" niti archwire on the upper and lower arch and Phase I finished with an upper and lower 0.019" × 0.025" SS archwire (American Orthodontics). It was scheduled to surgically release the impacted upper right canine which had a favorable position for placing in the dental arch and its linking to the system which would enable correct positioning. The lower spaces were closed with a 0.017" × 0.025" SS lower archwire and a short elastomeric chain (American Orthodontics). The therapy lasted 2 years altogether. The appliances were removed, and upper and lower circumferential retainers were placed as retention. The patient was instructed to wear it at night.



**Fig. 5 A B C D** A view shows an adequate space created with the help of the RME appliance

**Results**

The results were obtained by comparing the initial and final cephalometric values, extraoral and facial photographs and study models.

**Extraoral analysis**

Post treatment en face photography portrays a harmonious face with balanced facial contours; on the

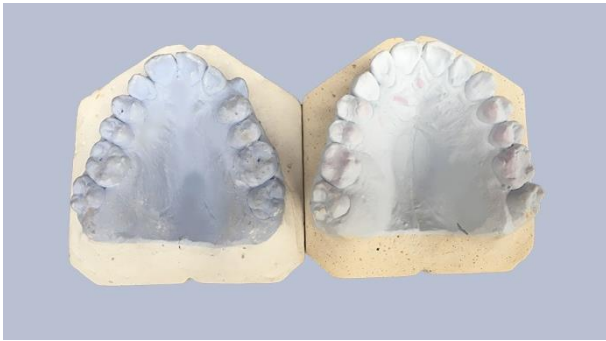
lateral photography an anteriorly slanted profile was noticed, facial harmonious relationship in the lower third, as well as mild increase of the nasolabial angle. In the smile photography a smile with the increased expression of teeth was noticed, by overlapping of middle lines of dental arches and complete elimination of crowding (Fig. 6 A, B, C).



**Fig. 6 A B C** Post-treatment extraoral photographs (two years after therapy) (frontal, lateral view and smile).

### The analysis of study models

When comparing the initial and final study models the leveling of the upper and lower dental arch is evident; class I in the area of canine teeth and class III in the area of molars, acceptable occlusal intercuspation in the front segment as well as in lateral parts (Fig. 7); reduced overbite and overjet are noticed, symmetrical and oval upper and lower dental arch (Fig. 8 A, B, C, D).



**Fig. 7** Pretreatment upper model and upper model after therapy

The analysis of a profile radiography shows the following enhancements: the angle of maxillary prognathism (SNA), the angle of maxillomandibular discrepancy (ANB), the decrease of the basal angle (B), the decreased inclination of occlusal plane (Occl/SN), the improvement in the relationship of the frontal and back height of the face (SGo/NMe), decreased distance

of the upper and lower lip from the esthetic line (Table 1, 2). The deterioration of parameters occurred on the dentoalveolar level is the increase in the degree of protrusion of upper incisors and retrusion of lower incisors and the decrease of the interincisor angle (Fig. 9 A, B).

**Table 1** Cephalometric evaluation of the patient before and two years after treatment

Measurement	Before treatment	After treatment
SNA (82)	72	75
SNB (80)	75	76
ANB (2-4)	-3	-1
SND (76-77)	70	72
N S Ar (123°)	132	128
S Ar Go (143°)	138	141
Gonial angle (130)	133	132
Y axis (59+4)	62	59
SN/Occ. plane (14°)	25°	20
SN/Go-Gn (32°)	40	39
N-Me (mm)	116	116
S-Go (mm)	71	72
1/1 (130-150)	139	131
1-NA (4 mm)	4 mm	6 mm
1/NA (22)	19	31
1-NB (4 mm)	3 mm	2 mm
1/NB (25)	26	18
Wits (-1mm)	10 mm	-7 mm
E line-upper lip (3mm)	8	6
E line-lower lip (2mm)	5	4
G1-Sn-Pg (169±3)	168	168
B (20°)	33	28
AB/SpP (99°)	89	91
PgA/SpP (99°)	89	92



A



B



C

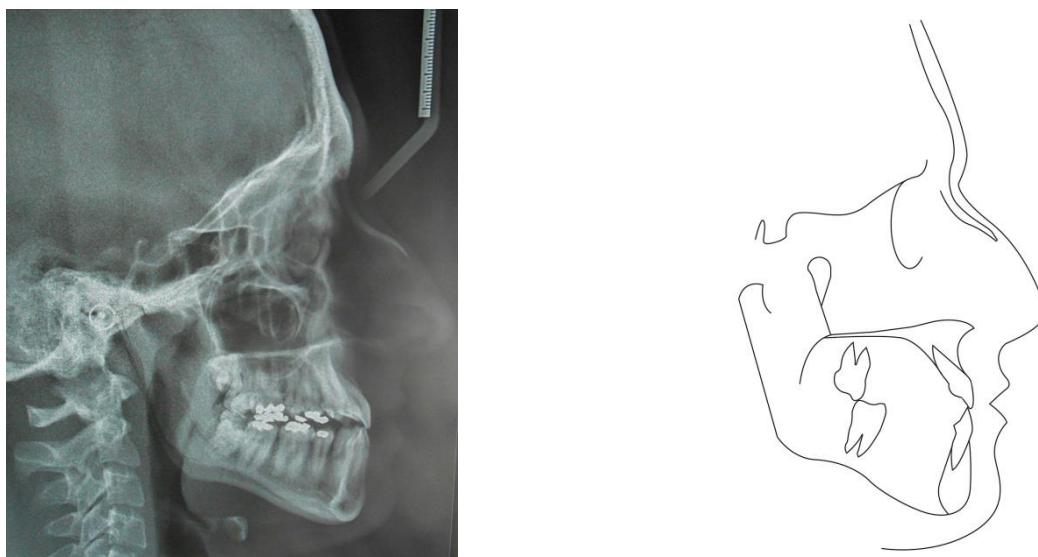


D

**Fig. 8** Post-treatment models (frontal, left, right and occlusal view).

**Table 2** Occlusal evaluation of the dentoalveolar parameters before and two years after treatment

Features	Pre-treatment	Post-treatment
Incisor relationship	reverse overjet	normal overjet
Overjet (mm)	-1	2
Overbite (mm)	0	2
Midlines	shifted	co-incident
Molar relationship (left/right)	½ class III / ½ class III	class III / class III
Canine relationship (left/right)	½ class III / ½ class III	class I / class I



**Fig. 9** Post-treatment lateral cephalometric radiograph and cephalometric tracings (two years after therapy).



**Fig. 10** Panoramic radiograph two years after therapy.

In the panoramic radiography, it can be noticed that all teeth have an adequate parallelism of the root, without the loss of bones or present pathological processes (Fig. 10).

**Discussion**

The strategy for the treatment of borderline cases with maxillary hypoplasia by camouflage therapy is based on creating dentoalveolar changes that will compensate the disbalance of the skeletal base. The decision on which type of treatment is appropriate is usually based on the degree of

anteroposterior and vertical discrepancy of the skeleton, inclination and the position of the incisors and dentofacial appearance [21].

Orthodontic camouflage is a sustainable alternative for treating mild to moderate maxillary hypoplasia with the view to correcting occlusal relationships in patients who reject surgical treatment due to various reasons. The ideal candidate for camouflage treatment should have small residual potential of growth and mild to moderate crowding, so that postextracted space could be used, whereby orthodontic camouflage effect and visual enhancement of dentoskeletal relationships are enabled [19,21].

Type of growth in this kind of malocclusions with camouflage therapy also has great significance. Some retrospective studies have shown that subjects with maxillary retrognathism most commonly have vertical pattern of face growth, which seems to be another mechanism for compensation [22]. The presented patient had precisely that kind of growth pattern. A vertical growth model is an important factor for the successful treatment of maxillary hypoplasia. The reduced lower height of anterior face, increased overbite and passive closing of lips related to Class III malocclusion have a better prognosis, since the rotation of the mandible opposite of clockwise caused by treatment, helps camouflage sagittal discrepancy. When the increased lower height of anterior face is related to this malocclusion, surgical intervention is usually the treatment of choice, since every therapeutic induction of clockwise rotation leads to the increase in vertical dimensions of a face and consequently causes the incompetence of lips [1].

The usual orthodontic camouflage is performed by protrusion of upper and retroclination of lower incisors, which, as mentioned before, results in mandibular rotation downwards and back. Often, extraction is a necessary component of the camouflage method. The most commonly used pattern of extraction is the removal of lower first premolars [9,15,19].

Some authors suggest the extraction of one lower incisor as an alternative to extraction of lower first premolars within camouflage therapy. That kind of extraction is occasionally recommended to patients with frontal crossbite or cutting relationship of the incisors. The decision is determined by factors such as pronounced anterior crowding in the mandibular arch, discrepancy of Bolton's index and the degree of negative overjet and overbite [9]. Other authors think that the extraction of incisors can favorably affect the maintenance of a face profile and the correction of crowding of the lower string of teeth [21,23]. According to the reports of studies which compared the stability of postretention in patients treated with the extraction of lower premolars and those treated with the extraction of one mandibular incisor, these authors found that the more acceptable solution is to level the mandibular arch with the extraction of one incisor [21,24,25].

Sometimes, when the circumstances in the mouth are favorable, the extraction of first lower molars is recommended. These are compromising extractions, which are applied when first molars have extreme cavity, hypoplastic lesions, apical pathologies or great restorations. Other situations in which first molars can be removed are significant crowding in the distal part of the mandibular arch, large angle of the mandibular plane and anterior open bite. The imperfection of first lower molars extraction is a difficulty in closing of the space, due to the fact that lower second molars inclined mesially and lingually, leaving interproximal spaces [15].

Where is the boundary between orthodontic camouflage and orthognathic surgical therapy? Proffit and Ackermanin's concept "3 envelopes of discrepancy" suggested the degree of protrusion of the upper incisors in relation to the retrusion of lower incisors as a critical

limitation [26]. Kerr et al. attempted to establish cephalometric criteria to objectivize these boundaries. The most important factors which differentiated operative and camouflage patients in their study were the size of anteroposterior deviation, the incline of mandibular incisors and the appearance of a soft tissue profile [9,21,27]. The presented patient had favorable inclination of upper and lower frontal teeth, whereby these natural compensatory resources were not used, so the biggest part of orthodontic camouflage happened at their expense. Regardless of clear criteria of decision in favor of one or other type of therapy, the choice between camouflage treatment and orthodontic surgery remains the challenge of specialty [9].

In the presented case, the extraction of lower first premolars resulted in the decrease of the angle of maxillomandibular prognathism, basal angle, inclination of occlusal and mandibular plane, as well as the reduce in concavity and obtaining an esthetic profile. What it needs to be taken care of during the retrusion of lower incisors is the fact that these patients have concave profiles, with a thin basal bone over the symphysis. The significant lingual incline or distal movement of incisors after the extraction of mandibular premolars can negatively affect a concave profile in comparison to non-extraction cases and it can even cause unwanted complications such as the expression of the root and the resorption of incisors [21].

The success of sagittal correction of relationship between maxilla and mandible for class III malocclusion depends on coordination of transversal and vertical relationships in combination with the growth potential of every patient [28]. When we talk about transversal underdevelopment of the maxilla, the circumference of required width which is necessary to establish with the expansion, is based on the basic concept that it is necessary to achieve close to 20% of overcorrection of the transversal deficiency [20]. This should be taken into consideration due to the choice of the appliance for transversal expansion since the presented patient had the lack of space of 6mm, the required 7.2mm (with overcorrection) could be obtained only by using the methods of rapid expansion of the maxilla (splitting of the palatal suture). The age of the patient enabled us to apply this method. By choosing this kind of appliance, the space for placing the impacted canine was obtained. What is the durability of the results achieved with this kind of therapy? The presented patient did not show the tendency for relapse for two years after the completion of the therapy, and the literature data point that relapse of class III primarily stems from mandibular growth, and not due to relapses in the maxilla [7].

## Conclusion

This case report shows that camouflage orthodontic therapy of skeletal Class III malocclusion with maxillary deficiency in a growing male individual can be successfully managed using the RME procedure followed by extraction therapy with fixed orthodontic treatment. The adequate diagnostic and orthodontic treatment, patient cooperation, and long-term stabilization ensure a treatment result that is successful, stable, and esthetic.



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