

## CONSERVATIVE TREATMENT OF CLASS II TREATMENT WITH EXTRAALVEOLAR TADs

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### ABSTRACT

Skeletal anchorage extends the range of orthodontic anchorage possibilities with Temporary Anchorage Devices (TADs), that can provide absolute anchorage for a short period of time. In this context, this paper argues the importance and efficiency of the extraalveolar TADs in skeletal class III anomalies orthodontic treatment. The article presents the results of using extraalveolar palatal, IZC and BSS screws for the non-surgical treatment of two class III patients, which declined any orthognatic surgery; in the first case palatal and Buccal Shelf Screws (BSS) were used and in the second one - InfraZygomatic Crest (IZC) and BSS screws were used. The study of these conservative treatments based on extraalveolar TADs showed that they are extremelly helpful in treating some class III skeletal anomalies when the patients decline the orthognatic surgery; the success of treatment with TADs strongly depends on the patient's desires and their compliance to our indications.

### INTRODUCTION

Skeletal anchorage extends the range of orthodontic anchorage possibilities with the endosseous implants, surgical miniplates and miniscrew implants (Temporary Anchorage Devices – TADs) anchored to the jaws, so that forces might be applied to produce tooth movement in any direction without detrimental reciprocal forces [1].

The temporary anchorage devices (TADs) can provide absolute anchorage for a short duration; they are commercially available in the screw diameter range of 1.2 – 2.7 mm and in length varying from 4 to 12 mm [2-4].

The most common site for their placement is the interradicular bone between the teeth and now, as newer advances, extraradicular placements in palatal bone, infrazygomatic crest (IZC) and the mandibular buccal shelf (BSS) are also used because of less risk of damaging rooth, do not interfere with mesiodistal movement of

teeth or groups of teeth and low failure percentage, if compared to the conventional miniimplants [5, 6-8].

In this context, the cases presented in this paper argue the importance and efficiency of the extraalveolar TADs in conservative, non-surgical, skeletal class III anomalies treatment.

### MATERIAL AND METHODS

The aim of the article is to present the results of using extraalveolar TADs (palatal, IZC, BSS) for the conservative, non-surgical treatment of two class III cases.

First patient was a 37 years old male, brachyfacial, class III, with no ortho treatment before but all the other opinions recommended orthognatic surgery. The extraoral exam showed a concave profile, obtuse nasolabial angle, reverse lip step, prominent chin. In the intraoral exam a full dental class III, full crossbite (frontal and lateral), deep frontal crossbite, deep curve of

Spee and no midline deviation were observed (Figure 1). The patient has not TMJ problems.

The main chief complain was improving the bite, smile and esthetics without orthognatic surgery.

The radiological exam included the



Figure 1. The extra- intraoral

orthopantomography (OPG) and the lateral cephalogram (Figure 2).

The OPG showed: 38/48 extracted (years before), 17/27 extracted (in the early childhood), 18/28 are extruded (pushing the mandible forward), 12-root canal treatment/ceramic crown.

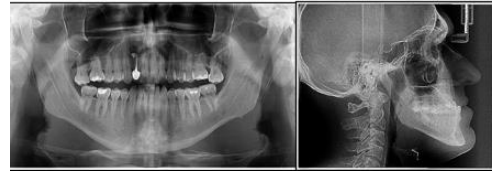


Figure 2. The radiological exam

The lateral cephalogram showed:

- Skeletal: ANB = - 2 (class III); WITS analysis = -14.5 (class III); PFH (posterior face height) – increased; AFH (anterior face height) – increased; PFH/AFH = 69.5 (brachyfacial).
- Dental: N - A to UI = 2.5 – **UI retrusion** (has to be increased), N – B to LI = 6.3 – LI protrusion (has to be decreased), UI (upper incisor) to PP (palatal plane) – 115 (proclined), LI (lower incisor) to MdP (mandibular plane)/IMPA = 82 (retroclined), OccPA (occlusal plane angle) = 2 (has to increase and rotate CW).
- Soft tissues: UL (upper lip) retrusion and LL (lower lip) protrusion, Z Angle – UL – has to be decreased.

The list of the patient’s problems includes: class III dental & skeletal, full crossbite, steep occlusal plane, concave profile, obtuse naso-labial angle and prominent chin.

The treatment plan objectives are: maxillary advancement and expansion, mandibular distalization, occlusion correction and improvement of the esthetics.

In order to expand the maxilla, the midpalatal suture maturation stage of the patient was classified according to Angellieri et al [9, 10] in stage C, on the CBCT base (Figure 3): two radiopaque, winding and parallel lines between themselves separated by areas of low radiographic density.

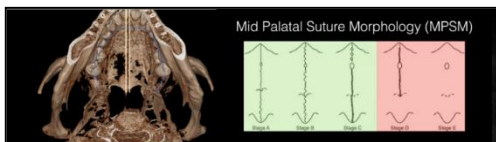


Figure 3. The midpalatal suture

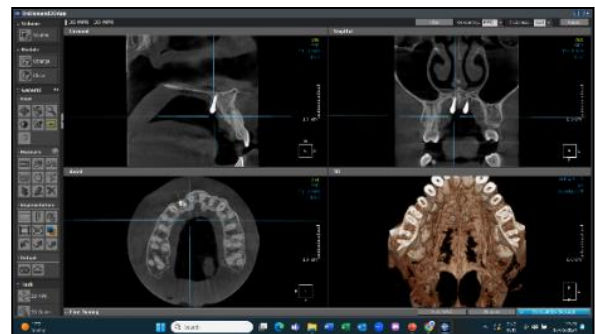


Figure 4. CBCT based palatal implant

Expansion; CBCT based palatal implant positioning (fig.4); TADs FIRST – BONE FIRST HYBRID HYRAX expander (0.2 mm opening/activation) (fig.5).

According to the objectives, the orthodontic treatment started with: MARPE – Miniscrew-Assisted Rapid Palatal



Figure 5. The HYBRID HYRAX in place

The indication for MARPE treatment were 2 times/day activation till diastema. Occlusal stops were made on 18 & 28, for their intrusion and raising the bite.

Unfortunately, the patient left the country for 4 months and turned back with expanded HYRAX but mobile TAD in the 1<sup>st</sup> quadrant and no diastema, but sustaining he had diastema for 1 month, starting with the third week of the treatment. The occlusion was corrected in

transversal with no buccal inclination of the lateral teeth, so the anterior arms of the HYRAX were cutted, the screw was again activated for overcorrection (1/day for 1 week) and the TAD from the 2<sup>nd</sup> quadrant was used for maxillary advancement of the maxilla with weekly changed elastic chain.

The fixed appliance orthodontic treatment started with the lower jaw and two extraalveolar Buccal Shelf Screws (BSS) were inserted for mandibular distalization and counterclockwise (CCW) rotation (fig.6); 3/16 class III elastics was used 23 hours/day, 7 days/week.



Figure 6. The BSS screws



Figure 7. F&M acting on arches &



Figure 8. The final OPG



Figure 9. The final lateral cephalogram

## RESULTS

The final OPG (Figure 8) showed the rooth parallelism, levelling of the occlusal plane, intrusion of the upper and lower molars.

On the final lateral cephalogram (Figure 9):

Skeletal: ANB=-1; WITS=- 4.5; SNA and SNB decreased (1 and 2 degrees); AFH and PFH decreased; PFH/AFH increased;

occlusal plane angle increased and rotated CW.

Dental: N-A to UI increased; N-B to LI increased; UI to PP increased; IMPA decreased.

Soft tissues: UL still retruded but came forward (from -14.4 to -6.8); UI to PP increased (4 degree); Z Angle decreased 10 degrees.



Figure 10. The final smile



Figure 11. The extraoral photos



Figure 12. The intraoral photos

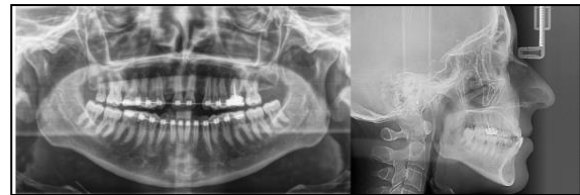


Figure 13. The radiological exam

The smile and esthetics were improved, the occlusion is class I (Figure 10).

The class III was conservative treated without orthognatic surgery.

The second case was a 36 years old female with upper lateral incisors agenesis, dolicofacial, hyperdivergent, after 3 years in orthodontic treatment (other doctor) and with no treatment documents.

The extraoral exam (Figure 11) showed an increased lower face hight, straight profile, obtuse naso-labial angle.

The intraoral exam (Figure12) revealed The radiological exam (Figure13)

the congenitally missing lateral incisors with no enough space for replacement, frontal crossbite with reverse overjet of 2 mm, frontal openbite of 2 mm, dental class III, maxillary constriction with edge to edge relationship at 1st molar and good occlusion in 2nd molars, mandibular laterodeviation to the left (2 mm).

Chief complain was to open the spaces for 12 and 22 implants and crowns, closing the bite, bringing back the mandible and improving the esthetics without orthognatic surger

comprised OPG that showed the absence of

12 and 22, 2 mm apical resorption of 11 and 21, 18, 38 and 48 in place and the cephalogram showing a hyperdivergent class III skeletal patient with steep occlusal plane, proclined lower incisors and retroclined upper incisors, increased Z Angle.

The list of the patient's problems included congenitally missing 12 and 22 with no enough space for replacement, class III hyperdivergent patient, frontal crossbite, openbite and reverse overjet, mandible shifted to the left, class III esthetics and long time before with braces.

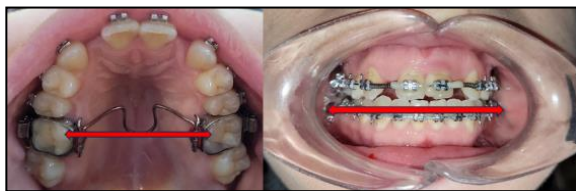


Figure 14. TPA& fixed appliances

- Placing two BSS screws for distalization and CCW rotation of the mandible, after checking on CBCT the reliable sites and the thickness of the cortical bone (Figure 15).

- Placing the two IZC (Infra Zygomatic Crest) screws for distalization of the upper lateral segments, after checking on CBCT the reliable sites, the cortical bone and the sinus (Figure 16). The biomechanics of the treatment is presented in figure 17.

Results:

- obtaining the space for inserting the implants for 12 and 22 (Figure18);

- distalization and CCW rotation of the mandible, CCW rotation of the occlusal plane, obtaining the occlusion (class I occlusion, retrusion of the lower incisors, protrusion of the upper central incisors) (Figure19) and esthetics (Figure 20) the patient needed after placing the implants with CBCT based guide and making the crowns.

The treatment objectives were: opening space for 12 and 22 replacement, enlargement of the dental arches, distalization and counter clock wise (CCW) rotation of the mandible with BSS, improving esthetics and going fast.

According to the objectives, the orthodontic treatment consisted in:

- fixed appliances with transpalatal arch (TPA) & lingual lower arch (LLA) activated for expansion, open coils for opening the empty spaces (Figure14);



Figure 15. The IZC screws



Figure 16.

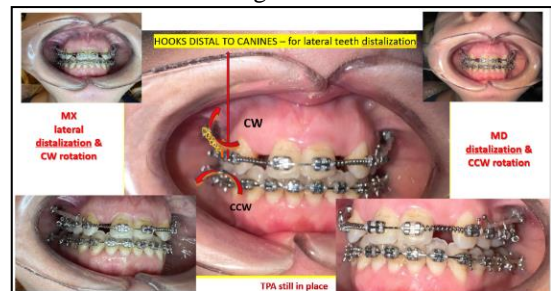


Figure 17. The biomechanics of the treatment



Figure 18. The final OPG



Figure 19. The final occlusion



Figure 20. The final smile

## DISCUSSIONS

During orthodontic treatment the teeth are exposed to forces and moments, these acting forces always generating reciprocal forces of the same magnitude but opposite in direction, as to every action there is an equal and opposite reaction according to the Newton's third law of motion [11-19]. To avoid unwanted tooth movements and maintain treatment objectives, these reaction forces must be diverted.

Anchorage in orthodontics may be defined as the resistance to the unwanted teeth movements, or to overcome the reaction of an applied force [20].

Orthodontic anchorage, as the ability to resist these unwanted reactive tooth movements, can be provided by other teeth, by the palate, head, or neck, or implants in bone (skeletal anchorage) [11-20]. With Temporary Anchorage Devices the orthodontic forces might be applied directly to the jaws; intra-oral skeletal anchor units are predictably stable, relatively non-interfering, biocompatible and comfortable and could make appliance design simplified and more efficient [1] and can treat conservative some skeletal anomalies.

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## CONCLUSIONS

1. Miniscrews are efficient tools to improve the clinical results in many types of malocclusions, in many cases making our cases somehow easy to manage,

2. Buccal Shelf Screws (BSS) and Infra Zygomatic Crest (IZC) screws are extremely helpful in treating conservatory some skeletal anomalies when the patients decline the orthognatic surgery.

3. Knowledge of their specific biomechanics is essential to get all the beneficials from using the temporary anchorage devices.

4. Choosing the eligible patient (no chronic diseases, no periodontal problems, healthy bones, good oral hygiene and appropriate age) is a very important part of the treatment.

5. The success of treatment with TADs (as of all the orthodontic treatments) depends on the patient's desires and their compliance to our indications.

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