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Case Report

Bimaxillary Surgery with Maxillary Segmentation and Lingual Orthodontics

De la Iglesia F[2]*, Pinós H[1], Arcas A[1], Wallter A[2], Clusellas N[2], De la Iglesia G[1], Quevedo O[2] and Puigdollers A[3]

[1]*Orthodontic Department, Univeristat Internacional de Catalunya, Barcelona, Spain*

[2]*Professor, Orthodontic Department, Univeristat Internacional de Catalunya, Barcelona, Spain*

[3]*Chairman, Orthodontic Department, Univeristat Internacional de Catalunya, Barcelona, Spain*

***Corresponding Author**: De la Iglesia F, Professor, Orthodontic Department, Univeristat Internacional de Catalunya, Barcelona, Spain.

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Abstract

Nowadays, many orthodontic treatments are treated with aesthetic braces such as lingual orthodontics. In some cases, surgery is needed to accomplish all the objectives that the patient proposed. However, few reports have been published regarding lingual orthodontics combined with a segmented Le Fort I osteotomy. The aim of this article is to report a clinical case and seeks to show a new action protocol in lingual orthodontic cases combined with bimaxillary orthognathic surgery and maxillary segmentation.

A case of a patient with skeletal class III and mandibular deviation to the right is treated with lingual orthodontics and bimaxillary surgery and microscrews in 14 months achieving very acceptable results.

Keywords: *Bimaxillary Surgery; Maxillary Segmentation; Lingual Orthodontics*

Introduction

The lingual appliance system was simultaneously created by Kinya Fujita and Craven Kurz in the 1970's. Dr Kurz, Dr Gorman and Dr Smith continued with the technique after a decline on its use, as well as Dr Altounian, Dr Decker and Dr Fillion, who set up the first university program based in lingual orthodontics in Paris [1]. The lingual technique has evolved, turning into a suitable option for the patients who demand aesthetic above all because of the groundbreaking minds and the technology [2,3].

Since 1960's, Professor Hugo Obwegeser showed American surgeons how to correct facial skeletal deformities through intraoral incisions, the combined efforts of orthodontists and surgeons have led to steady progress in efficient and predictable treatment outcomes [4].

The objectives of orthognathic surgery and orthodontics are to provide the best solution to the patient's requests, focusing on the functionality, stability and good aesthetic results [5,6]. To reach this, a comprehensive diagnosis of the case and plan ahead must be made in order to obtain the best plan of treatment and to achieve the desired results [7,8].

There are reports of patients treated with lingual orthodontics in combination with orthognathic surgery such as the one of Hong et al. in which they treated a skeletal Class III patient with a mandibular prognathism and an anterior crossbite. They decided to extract the maxillary first premolars because of the incisors protrusion and crowding in the maxillary arch and to perform a bilateral sagittal split ramus osteotomy, moving the mandible posteriorly [9]. Similarly, Fukui., *et al.* satisfactory treated a skeletal Class III malocclusion with an anterior crossbite, an open bite, mandibular protrusion and facial asymmetry with a bilateral sagittal split ramus osteotomy of the mandible to set it back, finishing their case in a Class I relationship and pleasant facial changes [10].

Whereas, Pauls describes a case in which a sagittal mandibular split osteotomy was performed in order to advance the mandible of their severe Class II, division 2 patient to obtain an occlusal function and facial harmony [11].

However, few reports have been published regarding lingual orthodontics combined with a segmented Le Fort I osteotomy. One such example is the one of Kairalla., *et al.* were they treated a skeletal Class III patient with an asymmetry, anterior and posterior crossbite, crowding in the maxilla and mandible with a segmented Le Fort I osteotomy, obtaining a Class I relationship and correct overbite and overjet [12]. Therefore, Kairalla., *et al.* treated a skeletal II pattern whose complaint was frequent and severe pain in the temporomandibular joint of both sides. The patient presented a Class II malocclusion, crowding in the maxilla and mandible and proclination of lower incisors. They extracted the first lower premolars to improve the inclination of the proinclinated lower incisors and achieve an ideal overjet, in order to allow the required surgical advancement of the mandible, with a bilateral sagittal split osteotomy. They also performed a surgery of both joints, a segmented Lefort type I maxillary osteotomy and a chin surgery to achieve a final harmony of the face and a suitable occlusion [13].

This study aims to report a clinical case and seeks to show a new action protocol in lingual orthodontic cases combined with bimaxillary orthognathic surgery and maxillary segmentation.

Diagnosis and Etiology

The patient was a 25-year-old man with a chief complaint of facial asymmetry. At the age of 19 he started to notice he didn't closed properly and that his mandible was deviated to the right. He was in good health with no significant systemic medical history. He had a mixed breathing pattern and no temporomandibular joint (TMJ) symptoms were noted.

The pretreatment facial frontal photographs showed a well-balanced face with a mandibular asymmetry and the chin deviated to the right (Figure 1). His maxillary midline was coincident with the facial midline and had an adequate lip seal. He had a Class III profile, straight, with competent lips, a proper nasolabial angle and a not marked sublabial angle.

Figure 1: *Pretreatment facial and intraoral photographs.*

The intraoral examination of the canine and the molar relationships showed a Class I on the right side and a Class III on the left side. The mandibular midline was deviated 4 mm toward the right. Mild crowding in both arches and an anterior and unilateral crossbite from the upper right central incisor to the upper right first molar with an anterior overjet of 0 mm were evident. Both arch forms were U-shaped. The oral mucosa was normal and the tongue and frenulum without alterations. His periodontal biotype was thin and had a reduced keratinized tissue.

In the panoramic radiograph the four third molars were present. It showed no bone defects and symmetric and well pneumatized maxillary sinuses (Figure 2).

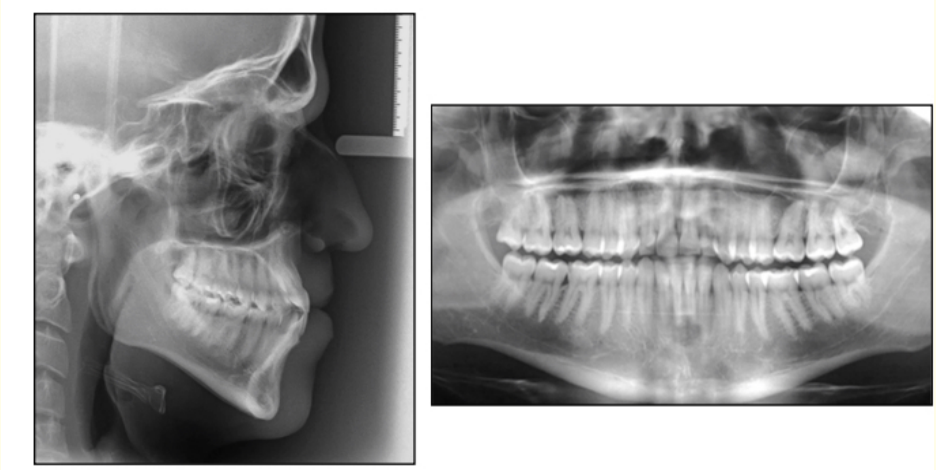

Figure 2: *Pretreatment cephalometric and panoramic radiographs.*

Measurement	Norm	Pretreatment	Presurgical	Posttreatment
SNA (°)	82 ± 2	83	82	86
SNB (°)	80 ± 2	84	84	84
ANB (°)	2 ± 2	-1	-2	2
SND (°)	76 ± 2	81	81	82
OP-SN (°)	14 ± 4	11	9	9
GoGn-SN (°)	32 ± 4	30	31	28
U1-NA (mm)	4,0 ± 1,0	9,7	11,5	6,8
L1-NB (mm)	4,0 ± 1,0	7,1	7,5	7,6
Pg-NB (mm)	4,0 ± 1,0	-0,4	0,0	1,0
Interincisor angle (°)	131 ± 6	121	116	125
U1-NA (°)	22 ± 2	31	38	28
L1-NA (°)	25 ± 2	29	28	26
E-plane-Upper lip (mm)	0,0 ± 0,0	-3,5	-3,0	-3,6
E-plane-Lower lip (mm)	0,0 ± 0,0	-0,4	1,1	-0,8

Table 1: *Cephalometric anal sis at pretreatment, presurgical and posttreatment.*

Treatment Objectives

The objectives for this patient were to (1) improve the Class III profile; (2) obtain a properly centered mandible and improve the mandibular midline shift, considering his main complaint; (3) level and align both the maxillary and mandibular dentitions; (4) establish a Class I molar and canine relationship; (5) achieve an ideal overbite and overjet; and (6) create a stable functional occlusion.

Treatment Alternatives

According to the treatment objectives, the treatment plan proposed to the patient was the following: combination of surgical and lingual orthodontic treatment. The surgical procedure consisting in a segmented maxillary advancement (3 parts maxillary Le Fort I osteotomy) and impaction and a bilateral sagittal split ramus osteotomy in order to centre the mandible. Furthermore, a septoplasty was recommended to reduce the projection of the nose. Placement of miniscrews were also planned with the purpose of fix the surgical splints and achieve an occlusal stability with the use of intermaxillary elastics during the post-surgical orthodontics.

Treatment Progress

The patient chose orthodontic treatment with individual lingual brackets for aesthetic reasons. Lingual brackets Hiro (0.018-inch slot) were bonded on the lingual surfaces of all upper and lower teeth with the Hiro system. This lingual system allows to observe thanks to a setup, the final position of teeth. The instructions given to the laboratory technician was to align teeth in perfect position with the correct torque in the upper and lower arches in molar and canine class I but with a bodily expansion that will simulate the segmentary maxilla.

The objectives of the presurgical orthodontics is to decompensate the dental position of the malocclusion in all three planes of space so that teeth are placed in there correct position in the alveolar bone without compensations before surgery. In this case we decompensate leveling and aligning all teeth and specially correcting the molar torque and obtaining a correct incisor proinclination previous to the surgical procedure. The presurgical orthodontic preparation in the maxilla was carried on with segmented wires between the lateral upper incisors and the upper canines, whereas in the lower maxilla, a continuous wire was selected. The orthodontic treatment started with a 0.014 NiTi-wire. After 3 months of leveling and alignment, a 0.016" stainless steel wire was inserted, and then replaced 3 months after with a 175 x 175 TMA wire. The last wire placed before the surgery was a 0.016 x 0.022 stainless steel (Figure 3).

Our protocol in surgical cases with lingual orthodontics is:

- Setup with the final occlusion we want to achieve. We use the Hiro system to make the individualized lingual brackets [14].
- Use of segmented arches from the beginning to keep the anterior and posterior planes and avoid extrusion or intrusion before surgery.
- Bonding of aesthetic buccal buttons or braces in upper lateral incisors and canines in order to facilitate the union of the medial and distal segments of the maxilla with metal ligatures after surgery some days before the surgical procedure.
- Placement of microimplants between premolars and also between central incisors in the mandible and maxilla during the surgery so that the surgeon can fix perfectly the surgery splints. Also, the patient will use this microscrews with intermaxillary elastics to maintain and stabilize occlusion.
- Keep the final surgical splint during 3 - 4 weeks until the patient can open the mouth properly to place an upper continuous arch. If needed as in transversal expansion more than 6 mm, a palatal bar is advisable.

Achievement of the pre-surgical treatment objectives was confirmed by a progress lateral cephalogram (Figure 4 and 5).

Figure 4: *Presurgical cephalometric radiograph.*

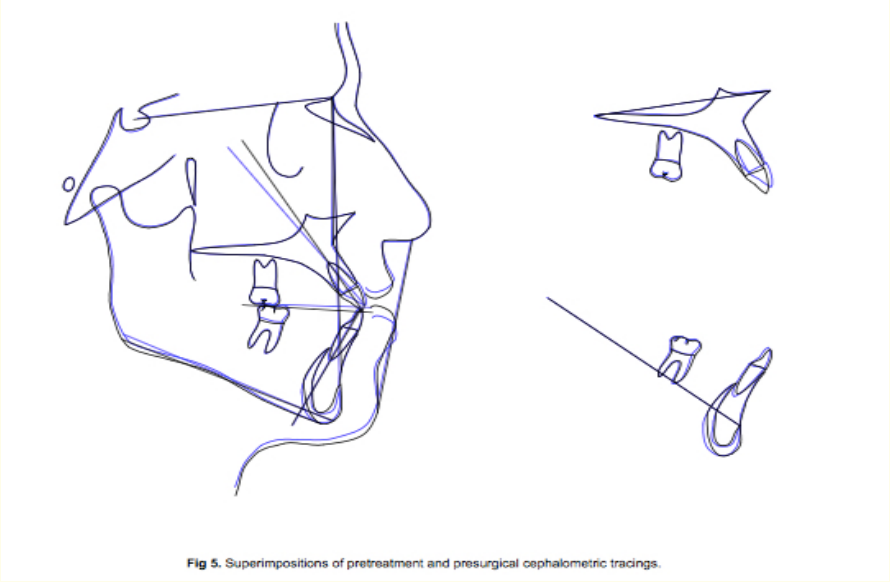

Figure 5: *Superimpositions of pre and presurgical cephalometric tracings.*

Orthognathic surgery was carried out via a segmented maxillary advancement (3 parts maxillary Le Fort I osteotomy) and impaction. A bilateral sagittal split ramus osteotomy was carried on in order to centre the mandible. A septoplasty was also performed to reduce the projection of the nose. At the end of the surgery, the surgeon placed six miniscrews, one between the canine and first premolar of every quadrant and one between the upper and lower central incisors.

After the operation, a methallic ligature was used in the upper arch to tie the segmented wire from the left upper lateral incisor to left canine and from the right upper lateral incisor to the right canine to ease the stability after the segmentation. In addition, shortly after the surgery, the six miniscrews placed were used for intermaxillary elastics in order to obtain a good occlusal stability. After 1 month of the orthognathic surgery, a continuous wire was placed in the upper maxilla.

Appliances and miniscrews were removed after the postsurgical treatment concluded and a maxillary Hawley retainer and a fixed canine to canine mandibular retainer were placed.

The total active treatment took 14 months.

Treatment Results

At the end of treatment, esthetic and functional results were achieved. The occlusion was finished with Class I canine and molar relationships. Correct posterior torques and axial inclinations were obtained. Overbite and overjet were ideal, the anterior crossbite was corrected and the patient's chief complaints of facial asymmetry were rectified. The mandibular dental line was deviated 1 mm to the right. In the surgical approach, during the placement of the miniscrews between the two lower incisors, the root of the lower left central incisor was damaged, suffering a necrosis of the dental pulp which was successfully treated with a root canal treatment and an internal bleaching. It would have been advisable to use a palatal bar during the post-surgery orthodontics to over correct and avoid a minor transversal relapse which is observed in posttreatment results.

At the end of the treatment, a dental bleaching was performed in the upper and lower arch of the patient. In addition, because of the upper central incisors had become eroded due to the initial malocclusion, a composite reconstruction was done to provide them an adequate shape.

The patient's facial appearance was improved significantly with a straight profile, a reduced lower facial height, a symmetrical mandible, a maxillary dental midline coincident with the facial midline, a correct lip seal and a consonant and wide smile (Figure 6). The patient didn`t wanted a great facial change and that is why the maxilla advancement was mild with a minor anterior maxillomandibular rotation.

Figure 6: *Aesthetic buttons after segmentary maxilla surgery.*

The posttreatment panoramic radiograph showed no marked root resorption in the upper and lower incisors, an achievement of the root parallelism, a root canal treatment in the lower left central incisor and the absence of the four third molars which were extracted during the surgery. Also, some months after the surgery it was decided to remove the lower miniplates because they had repeated infections (Figure 7).

Figure 7: *Posttreatment facial and intraoral photographs.*

The posttreatment cephalometric analysis and the superimposition showed a reduced lower facial height, a correct lower and upper incisors inclination and position maintenance, a nasal projection reduction and a significant decrease in the nasolabial angle (Table 1). The maxilla varied 3 mm upward and forward its position after the orthognathic surgery. The mandible showed a counterclockwise rotation due to the mandible centered and the maxilla impaction and the position of the lower incisors and molars didn't changed significantly from the pretreatment records (Figure 8 and 9).

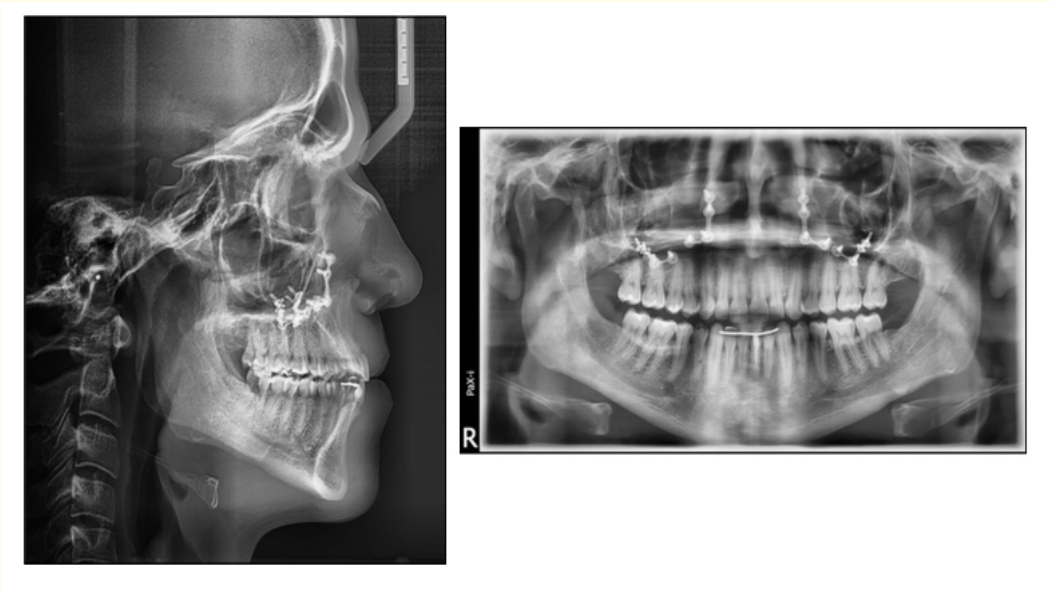

Figure 8: *Posttreatment cephalometric and panoramic radiographs.*

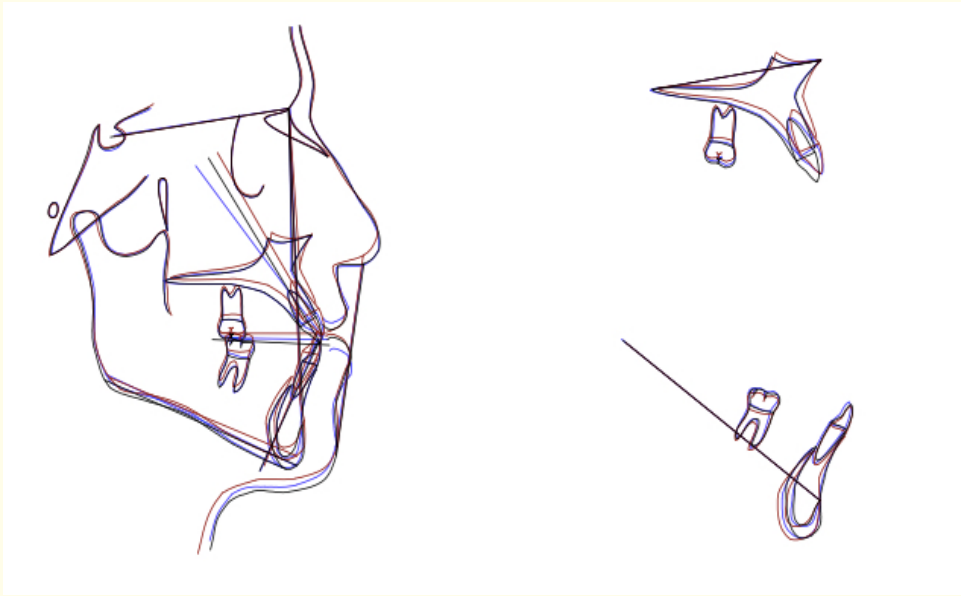

Figure 9: *Superimposition of cephalometric tracings before and after treatment.*

There were no clinical symptoms or radiologic changes in the temporomandibular joint after treatment.

Discussion

The patient presented initially an anterior crossbite and a mandibular deviation. The treatment alternative of carrying out extractions as an orthodontic camouflage was rejected because of his chief complaint of mandibular deviation and aesthetics, and the best option considered, proposed and accepted was a combination of surgical and lingual orthodontic treatment. Lingual orthodontics is an excellent option for patients who seek aesthetics and need a surgical jaw treatment.

A setup with the ideal occlusion was done before starting the treatment which begun with segmented wires from the first moment. The use of segmented arches from the beginning of the orthodontic treatment makes teeth decompensation from the buccolingual point of view, but maintaining the vertical position which will be corrected during surgery.

After surgery, the patient cannot open properly until after 3 weeks. As the upper lingual arch cannot be changed, we keep the splint to maintain the transversal changes until a continuous arch can be placed. This is an important difference with buccal brackets, as the buccal segmented arches can be changed for a continuous one the first week after surgery.

Another important difference with surgical cases with buccal brackets is that after a segmented maxillary surgery is performed, the surgeon or the orthodontist places some metal ligatures between upper lateral incisors and canines in order to join the medial and distal segments with a metallic ligature to promote their stability after their segmentation. As we don't have the possibility to join the medial and distal segments of the maxilla properly with lingual orthodontics, we bond either aesthetic buttons or brackets and use then a metallic ligature to join the segments. We take off these buccal brackets when we place a continuous lingual arch after 3 weeks after surgery.

Furthermore, at the end of the surgery, the surgeon placed six miniscrews, one between the canine and first premolar of every quadrant and one between the upper and lower central incisors. The aim of the miniscrews was not only for the fixation of the surgical splints but also for the use of the intermaxillary elastics and also to correct the possible post-surgery problems like the canting of the occlusal plane [15].

Nowadays, we don't use anymore the microscrews between upper and lower incisors [16]. This microscrews are useful during surgery to fix the surgical splint but at the end of the surgery we take them off. We must avoid placing miniscrews between the incisors because they are rarely used with the intermaxillary elastics due to the aesthetical discomfort and unpleasantness in the gum caused by the elastics force vectors. We only use the intermaxillary elastics between the microscrews placed between premolars. They are easy and comfortable to use and besides, they are enough efficient to maintain and stabilize the occlusion.

Conclusion

Surgical cases can be performed with lingual orthodontics and obtain good results. The use of a protocol can minimize errors and improvisation during the orthodontic treatment.

Bibliography

1. Paul H Ling. "Lingual Orthodontics: History, misconceptions and clarification". *Journal of the Canadian Dental Association* 71.2 (2005): 99-102.

2. Husain N., *et al*. "Lingual appliance system: A literature review of its Evolution and Development". *Indian Journal of Stomatology* 4.2 (2013): 91-94.

3. Echarri P. "Lingual Orthodontics: Patient selection and diagnostic considerations". *Seminars in Orthodontics* 12.3 (2006): 160-166.

4. Proffit WR and White RP Jr. "Combined surgical-orthodontic treatment: how did it evolve and what are the best practices now?" *American Journal of Orthodontics and Dentofacial Orthopedics* 147.5 (2015): S205-S215.

5. Roy Sabri. "Orthodontic objectives in orthognathic surgery: State of the art today". *World Journal of Orthodontics* 7.2 (2006): 177-191.

6. Furquim B., *et al*. "Class III Malocclusion surgical-orthodontic treatment". *Case Reports in Dentistry* (2014).

7. Ravi MS., *et al*. "Orthodontics-surgical combination therapy for Class III skeletal malocclusion". *Contemporary Clinical Dentistry* 3.1 (2012): 78-82.

8. Wermker K., *et al*. "Soft tissue response and facial symmetry after orthognathic surgery". *Journal of Cranio-Maxillo-Facial Surgery* 42.6 (2014): 339-345.

9. Hong R., *et al*. "Lingual orthodontics combined with orthognathic surgery in a skeletal class III patient". *Journal of Clinical Orthodontics* 34.7 (2000): 403-408.

10. Fukui T., *et al*. "Multilingual bracket treatment combined with orthognathic surgery in a skeletal Class III patient with facial asymmetry". *American Journal of Orthodontics and Dentofacial Orthopedics* 115.6 (1999): 654-659.

11. Pauls H-J. "Lingual Orthodontics with Orthognathic Surgery in a Severe Class II, Division 2 Case". *Journal of Orofacial Orthopedics* 69.2 (2008): 135-145.

12. Kairalla SA., *et al*. "Cirurgia ortognática com aparelho ortodôntico lingual 2D". *Revista Clínica de Ortodontia Dental Press* 12.1 (2013): 88-93.

13. Kairalla SA., *et al*. "Lingual orthodontics as an aesthetic resource in the preparation of orthodontic/surgical treatment". *International Journal of Orthodontics* 25.2 (2014): 39-43.

14. Hiro T., *et al*. "Indirect bonding technique in lingual orthodontics: the HIRO system". *Progress in Orthodontics* 9.2 (2008): 34-55.

15. Takano-Yamamoto T and Kuroda S. "Titanium screw anchorage for correction of canted occlusal plane in patients with facial asymmetry". *American Journal of Orthodontics and Dentofacial Orthopedics* 132.2 (2007): 237-242.

16. Kravitz N and Kusnoto B. "Risks and complications of orthodontic miniscrews". *American Journal of Orthodontics and Dentofacial Orthopedics* 131.4 (2007): S43-S51.

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