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#### Mots clés

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### Summary

Facial asymmetry is a common complaint in patients with facial concerns. Some patients have mandibular asymmetries that have light maxillary cant compensation due to a reduced gingival exposure. A common treatment in facial asymmetries is bimaxillary surgery treatment. However, there are no cases of non-severe occlusal plane canting (OPC) with mandibular asymmetry treated with mandibular surgery and miniscrews for the extrusion of the maxillary molars. The aim of this article is to show how to correct mandibular asymmetries combined with OPC by making a single mandibular "early surgery" combined with the extrusion of the maxilla with miniscrews to correct the occlusal plane in order to avoid a Le Fort I surgery. This type of treatment provides lower medical costs, shorter surgeries, and less postoperative discomfort and invasion for patients.

#### Résumé

L'asymétrie du visage est un motif de consultation fréquent chez les patients ayant des préoccupations faciales. Certains patients présentent des asymétries mandibulaires avec une bascule maxillaire de compensation peu visible en raison d'une faible exposition gingivale. Le traitement courant des asymétries faciales est la chirurgie bi-maxillaire. Il est peu fait état des cas d'asymétrie mandibulaire avec faible bascule du plan d'occlusion (OPC) traités par chirurgie mandibulaire isolée et adjonction de mini-vis pour l'extrusion des molaires maxillaires. Le but de cet article est de montrer comment corriger les asymétries mandibulaires associées à l'OPC en ne réalisant qu'une seule « chirurgie précoce » mandibulaire, c.-à-d. au début de l'orthodontie, combinée à l'extrusion du maxillaire avec des mini-vis pour corriger le plan d'occlusion et éviter ainsi l'ostéotomie de Le Fort I. Ce type de traitement permet de réduire les coûts médicaux, de raccourcir les chirurgies, de diminuer l'inconfort postopératoire et il représente une chirurgie moins invasive pour les patients.

## Introduction

Facial asymmetry is a common complaint among orthodontic patients [1–3]. Adult patients with severe mandibular asymmetry have often been treated with a combination of surgery and orthodontic therapy to improve facial aesthetics and occlusion. In these cases, maxillary osteotomy is required if the patient has horizontal, sagittal, or vertical problems in the maxilla, such as canted occlusal plane, a gummy smile, or maxillary hypoplasia [3]. Although these procedures are useful for improving morphologic and functional problems, 2-jaw surgery involves greater medical costs, longer surgeries, and severe postoperative discomfort and invasion for patients [1,4].

There are some facial asymmetries with a light occlusal plane canting where no Le Fort I bimaxillary surgery is required. Several cases of a non-severe occlusal plane canting (OPC) with mandibular asymmetry treated by mandibular surgery alone, to correct the asymmetry associated with miniscrews to intrude the maxillary molars, are found in literature [5–7]. However, there are no cases of non-severe OPC with mandibular asymmetry treated with mandibular asymmetry treated with mandibular surgery and miniscrews for the extrusion of the maxillary molars.

The aim of this article is to show how to correct mandibular asymmetries combined with OPC by making a single mandibular "early surgery" combined with the extrusion of the maxilla with miniscrews to correct the occlusal plane in order to avoid a Le Fort I surgery.

## **Case presentations**

#### Patient 1

#### Diagnosis and aetiology

A 23-year-old Spanish man's complaint was "an asymmetric smile". He had a facial asymmetry with the chin deviated to the left side and a skeletal class I pattern. His mandible was shifted to the left according to the cant of the maxillary occlusal plane due to the unilateral extrusion of the maxillary left molars and premolars. The upper and the lower midlines were coincident with the midsagittal plane. No tooth size-arch length discrepancy was present in either arch. Both left and right first molars showed a class I relationship. The patient underwent an orthodontic treatment 10 years ago with the extraction of 4 premolars due to severe crowding (*figures 1 and 2*).



#### FIGURE 1

Pretreatment facial and intraoral photographs





FIGURE 2 Pretreatment radiographs

### Treatment options

- The two treatment options proposed in this case were:
- bimaxillary surgery;
- correction of the mandible asymmetry centering the mandible with surgery and extrusion of the left maxillary molars and premolars with miniscrews with an early surgery technique.

#### Treatment plan

After review of treatment options, the patient accepted the following treatment plan:

- presurgical orthodontic treatment to decompensate both, mandibular and maxillary occlusal plane;
- correction of the mandible asymmetry with the surgical treatment. After surgery, a lateral open bite was created on the left side of the patient in order to correct the maxillary occlusal plane;
- extrusion of the maxillary left molars and premolars to correct the open bite created after the surgery with the use of microscrews located in the left side of the mandible between premolars

This treatment plan was chosen because the surgical treatment was less aggressive and faster.

#### Treatment progress

After the treatment plan was decided, the orthodontic treatment began by bonding both arches with  $0.022 \times 0.028$ -in MBT aesthetic brackets. Initial levelling was accomplished in 2 months with 0.014 "round nickel titanium wires followed by  $0.017 \times 0.025$ " rectangular nickel titanium wire. Then, a " $0.019 \times 0.025$ " stainless steel rectangular wire was used. Once the mandibular and the maxillary occlusal plane were decompensated the patient was prepared for the surgical procedure in 4 months, and the presurgical records were taken (*figures 3 and 4*). In this surgical procedure, the mandible was centred and fixed with titanium mini-plates (*figure 5*). One week later, a microscrew (Microdent 1.6 mm  $\times$  9 mm), was placed in the buccal alveolar bone between the mandibular

left first molar and the second premolar. The microscrew was placed under local anaesthesia. Vertical elastics were used to extrude the maxillary left teeth and changed every day by the patient. The elastic was used from the upper left canine, premolar and first molar to the microscrew (*figure 6*). The extrusion of the left maxillary teeth took approximately 3 months. Postoperative orthodontic treatment took 9 months to finalize the patient's occlusion. The microscrew was removed before the orthodontic treatment was completed. The treatment was finished in 13 months and the retention included fixed canine-tocanine lingual retainer in the lower arch and a maxillary Hawley retainer in the upper arch for nighttime wear.

# **Results**

The mandible was centred surgically correcting the mandibular occlusal plane and a 3 mm posterior open bite was achieved on the left side after surgery with the purpose of extruding the maxillary plane to correct it (*figure 7*). The maxillary left molars were extruded 3 mm to close this posterior open bite. Correction of the patient's facial asymmetry and canted occlusal plane were achieved with the combination of the mandible surgery and the use of a microscrew located on the right side of the mandible to create the extrusion of the left maxillary molars with no effect on the left mandibular molars.

## Patient 2

#### Diagnosis and aetiology

A 54-year-old woman's chief complaint was correcting her deviated mandible. The mandible was deviated to the left side of the facial midline. A canted occlusal plane was observed with elongation of the maxillary right molars. The patient was diagnosed as having class III malocclusion with mandibular excess, deviation, canted occlusal plane and posterior crossbite on the left side, and a mild skeletal class III jaw-base relationship (*figures 8–10*).

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FIGURE 3 Presurgical facial and intraoral photographs





FIGURE 4 Presurgical radiographs

#### Treatment options

In this case, two treatment options were proposed to the patient:

- bimaxillary surgery;
- correction of the mandible asymmetry with surgery and extrusion of the left maxillary molars with microscrews.

## Treatment plan

After review of treatment options, the patient accepted the following treatment plan:

• early surgery as the occlusion was very stable and only a mild interference with the left upper lateral incisor was observed, a 2-month orthodontic treatment prior to the mandibular







FIGURE 6 Postsurgical orthopantomogram



#### Figure 7

Postsurgical intraoral photographs showing the lateral open bite on the left side and the setting of the vertical elastic on the miniscrew to correct it



#### Figure 8

Lateral open bite closing due to the extrusion of the upper left molars

surgery was planned. When the interference was corrected, the lower brackets were bonded, and the patient was ready for surgery;

- correction of the mandible asymmetry with the surgical treatment created a lateral open bite on the left side of the patient as we had corrected the mandibular occlusal plane but not the maxilla. In addition, corticotomies were proposed in the maxilla to correct a light transversal problem shown on the study models;
- extrusion of the maxillary left molars and premolars to correct the open bite that appears after the surgery with the use of microscrews located in the left side of the mandible.

This treatment plan was chosen because the surgical treatment was less aggressive and faster.

#### Treatment progress

The patient accepted this treatment plan and the orthodontic treatment began by bonding the upper arch with  $0.022 \times 0.028''$  MBT aesthetic brackets before orthognathic surgery. Once the occlusion was stable, the surgery was planned. Twenty-four hours after bonding the lower braces, mandibular surgery was performed using a bilateral sagittal branch osteotomy and fixation according to surgical splint with 2.0 titanium mini-plates. For the intermaxillary block, BIM screws were



FIGURE 9 Posttreatment facial and intraoral photographs



FIGURE 10 Pre- and posttreatment smiles

placed in the upper midline, between 3.2–3.3 and 4.2–4.3 and between the first and second premolar of each quadrant. Corticotomies were performed in the upper arch through small incisions of 1 cm in the interadicular spaces in order to trigger the regional acceleratory phenomenon (RAP) and thus, allow a more ambitious maxillary expansion in quantity and fast in time (*figure 11*).

During the first 7 postoperative days the patient remained with an intermaxillary block with elastics 24 hours. From the 8th day, nocturnal elastics were placed between the locking screws of both arches. On the 14th day, work began on both arches in order to achieve the orthodontic goals and the arches were changed every 20 days (*figure 12*).

On day 21 and after confirming the correct consolidation of the osteotomies, the locking screws were removed on an outpatient basis and the following phases of the treatment were continued.

During orthodontic treatment, the objective was to align and coordinate the dental arches to obtain bilateral class I occlusion and correct overbite. Since the arches used after surgery were flexible, occlusal stability was obtained thanks to the use of intermaxillary elastics between the microscrews. In this way, Correction of mandibular deviation and maxillary occlusal canting with mandibular "early" surgery and microscrews: Two case reports



FIGURE 11 Pretreatment facial and intraoral photographs

orthodontic treatment was continued until the establishment of torque with rectangular stainless steel arches. At that moment, the correction of occlusal canting was initiated thanks to the extrusion of the second quadrant with the use of intermaxillary elastics from the microscrews of the third quadrant to the premolars and canine of the second quadrant. Once the occlusal canting was corrected, the orthodontic appliance was removed and a new fixed prosthesis of the second quadrant was performed.



FIGURE 12 Pretreatment radiographs



FIGURE 13 Postsurgical intraoral

photographs showing the setting of the miniscrews

The treatment was finished in 14 months. Retention included fixed canine-to-canine lingual retainer in the lower arch and a maxillary Hawley retainer in the upper arch for nighttime wear.

### Results

Posttreatment photographs show that facial symmetry was achieved, and an ideal occlusion with class I molar and canine relationships was established (*figures 13 and 14*). The mandibular midline coincided with the maxillary midline. The posterior crossbite on the left side was improved, and molar inclinations were acceptable. With the mandibular surgery, mandibular symmetry was achieved, and the mandibular midline coincided with the facial midline. The midline and facial asymmetries in this patient improved significantly.

# Discussion

Treatment of facial asymmetry in adults mainly consists of a surgical orthodontic approach [1–3]. In patients with facial asymmetry and maxillary cant, Le Fort I osteotomy in combination with mandibular surgery is the most usual treatment plan. Two-jaw surgery has acceptable results and long-term stability [1,8]. However, this procedure has high medical costs, requires long surgery, and causes severe postoperative discomfort and invasion for patients [4].

To avoid maxillary surgery and solve the case only with mandibular surgery, molar intrusion or extrusion is required to improve the maxillary cant, but it is difficult to establish absolute anchorage with traditional orthodontic mechanics, such as multi-brackets combined with intraoral or extraoral anchorage [6]. For this purpose, dental implants [9], titanium screws [10-13], and mini-plates [14,15] have been used for absolute and non-compliance orthodontic anchorage. In the literature we found some articles describing treatment plans consisting of a mandibular surgery to correct the facial asymmetry and the use of microscrews located on the maxilla, to intrude molars and solve the maxillary cant [6,7]. Takano-Yamamoto and Kuroda [6], showed two patients with a chief complaint of facial asymmetry who presented canted occlusal plane with elongation of the maxillary right molars. In both cases, the treatment plan was to intrude the maxillary molars using titanium screw anchorage to improve the canted occlusal plane and intraoral vertical osteotomy (IVRO) to set back the mandible. Before implantation, a palatal arch appliance was placed to compensate for the crown buccal torque that would be caused by the intrusion force. Then, a titanium screw was placed in the maxilla and after 5-6 months they get 3.0 mm of intrusion of the maxillary molars. After intrusion, IVRO was performed to correct the mandibular deviation. On the other hand, Jeon et al. [7] also presented a patient with complaints about facial asymmetry and mandibular prognathism. The patient's mandible was shifted to the right according to the cant of the maxillary occlusal plane due to the unilateral extrusion of the maxillary left premolars and molars. The mandibular occlusal plane was also canted slightly by unilateral extrusion of the left mandibular molars. In this case, the treatment plan was first, to correct extruded teeth, implant microscrews in the maxillary left molar area, the mandibular left molar area, and the right mandibular canine area. And then, perform surgery, including bilateral sagittal split ramus osteotomy (BSSRO), with asymmetric setback and reduction genioplasty. This patient also used a palatal arch appliance to compensate for the crown buccal torque that would be caused by the intrusion force. In these two cases, the maxillary cant was solved before the surgery and with intrusion of the maxillary plane.

The cases shown in this article were complaining of facial asymmetry and both presented a mild vertical maxillary problem. Contrary to the articles of Takano-Yamamoto and Kuroda [6], and



#### FIGURE 14 Posttreatment facial and intraoral photographs

Jeon et al. [7], the patients described in our article were treated with "surgery early", and the microscrews were located in the mandible to correct the maxillary cant with extrusion of the maxillary molars and premolars after surgery, and not before as described in the articles. The advantage of correcting the maxillary cant after surgery is that the dental movements will be faster thanks to the regional acceleratory phenomenon (RAP) [16] and the occlusal gap created with the surgery that will make extrusion easier. Liou et al. concluded that orthognathic surgery triggers a 3 to 4-month period of higher osteoclastic activities and metabolic changes in the dentoalveolar postoperatively, which possibly accelerates postoperative orthodontic tooth movement [17]. RAP is a complex physiologic process with dominating features involving accelerated bone turnover and decreases in regional bone density. RAP increases tissue reorganization and healing by way of a transient burst of localized severe bone resorption and then remodelling [18,19]. The patient can also benefit from better aesthetics of early surgery at almost the beginning of the treatment, which will help with their cooperation due to their increased motivation.

To summarize we can affirm that a patient with mandibular asymmetry and mild maxillary cant, may benefit from only one

mandibular surgery and the extrusion/intrusion of the maxillary cant with microscrews. The main advantages of a single surgery versus a bimaxillary surgery are lower medical costs, shorter surgeries, less postoperative discomfort and invasion for patients, and that the success of microscrews to treat and solve occlusal problems with skeletal anchorage has been demonstrated. These are the reasons why we recommend this treatment plan in similar cases.

## Conclusions

The correction of mandibular asymmetries combined with OPC can be corrected by making a single "early"-mandibular surgery combined with the extrusion of the maxilla with microscrews to correct the occlusal plane in order to avoid a Le Fort I surgery. With this method the medical costs, surgical risks, surgical duration, and patients' physiological stress and discomfort after surgery can be reduced. As the orthodontic tooth movements after the orthognathic surgery are faster, we can significantly reduce the treatment duration. It is also important to note the increased motivation due to the earlier aesthetic change thanks to the "early"-surgery.

**Disclosure of interest**: the authors declare that they have no competing interest.

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