

Corticotomy-Assisted Uprighting of a Lower Third Molar Using an Original “2 Miniscrew” Biomechanics

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Abstract

The aim of the study is to illustrate how the use of alveolar sectorial corticotomy and skeletal anchorage devices have allowed the correction of a complex dental malocclusion in an adult, already subjected to an Orthodontic extraction treatment as a teenager. The treatment plan predicted the alignment of both the arches without extractions, the uprighting and the mesial movement of the lower left 3rd molar in place of the second missing molar. To facilitate the orthodontic movement, a selective corticotomy was performed in the region 3.7. An original biomechanic was planned using two miniscrews that determined a couple of forces on the third molar 3.8, in order to move the crown distally and to upright the root. The treatment lasted 31 months. At the end of the treatment, both the dental arches were aligned and the edentulous space in the mandibular arch was completely closed by the uprighting and mesialization of the left 3rd molar. Fixed retainers were placed in both the arches. According to Literature, corticotomy is considered a useful aid to increase the bony turnover and to facilitate orthodontic tooth movement. In the case reported, the combined use of miniscrews and corticotomy could prevent implant insertion by protracting third molars and closing edentulous spaces.

Keywords: Corticotomy; Miniscrew; Molar Uprighting

Introduction

Orthodontic treatment in adult age is very common in everyday clinical practice, thanks to the introduction and development of effective orthodontic devices and as well as new ways of dental and skeletal anchorage [1-4]. The benefits of an orthodontic approach in adulthood are represented by being able to correct the occlusal defects by reducing the use of prosthetic rehabilitation, and, from a biological point of view, the use of a light and continuous orthodontic force constitutes a physiological stimulus for the alveolar bone trophism and of the periodontal tissues. Previous report [5-10] showed that orthodontic treatment can be an alternative to the implant treatment in cases of loss or malposition of permanent lower molars, the condition most commonly found in an adult patient [11]. When possible, orthodontic treatment easily overcomes the difficulties of an implant prosthetic rehabilitation, which may have to be preceded by bone regeneration interventions, resulting in a lengthening of treatment times and greater discomfort for the patient. In addition, the improvement and preservation of a natural and correct dental occlusion may also represent the best aesthetic solution for the patient, minimizing the need of corrections at the end of the orthodontic treatment. The aim of the case report was to show the combined use off corticotomy and skeletal anchorage to upright a third lower molar by using two miniscrews.

Materials and Methods

F.F, male, 36 ys old was visited on May 2012. The patient referred a previous orthodontic treatment during childhood, to correct the dental crowding and Cl.III malocclusion. The space for the alignment was created by the extraction of both upper and lower left first

premolars and a fixed appliance was used at the upper and the lower arches in order to close the extraction spaces. In 2009 the patient was visited to plan the surgical extraction of an impacted lower second molar (Figure 1). The extraction was performed without clinical consequences. On examination the patient had a deep bite, not coincident dental midline, right class 3 and left class 1 canine relationship and right class 1 and left class 3 molar relationship, cross bite 1.3/4.3, Brodie 2.7/3.8, inferior crowding and good condition of periodontal tissue except the 3.7 region that presented a moderate inflammation. The profile was slightly biretrusive with minimal exposure of the upper incisor (Figure 2). The dental crowding and mesial tip of the lower left III molar was visible on the Rx orthopantomography. The crown was in contact with the first molar and the position seemed changed after the surgical extraction. The first lower molar was distally tipped. An area of bony atrophy was present in the surgical site as consequence of the extraction of the impacted second molar (Figure 3). Lateral x-ray and cephalometric examination showed Cl. III skeletal relation, deep bite, biretrusion of the labial profile (Figure 4).



Figure 1: Impacted 3.7.



Figure 2: Pretreatments photographs.

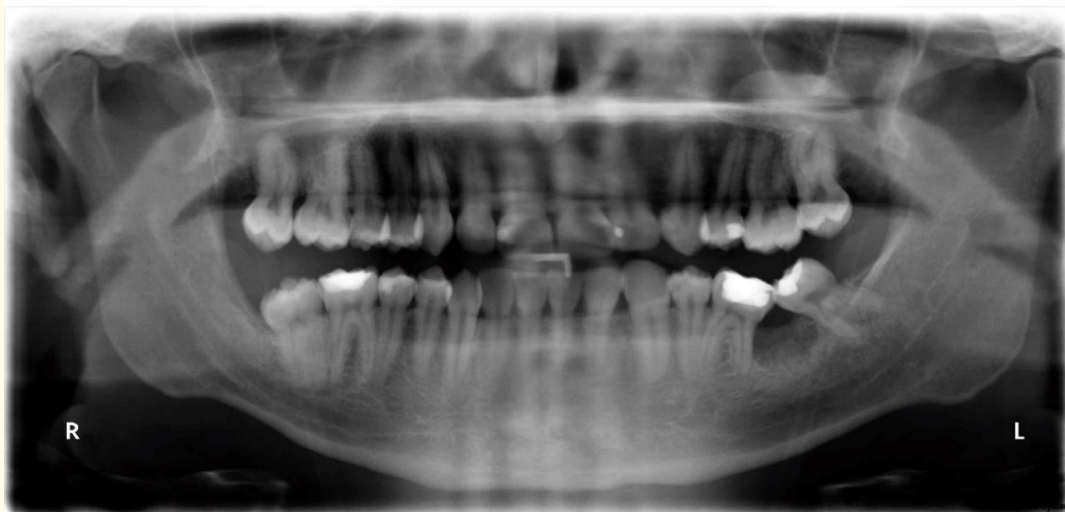


Figure 3: Post extraction 3.7.

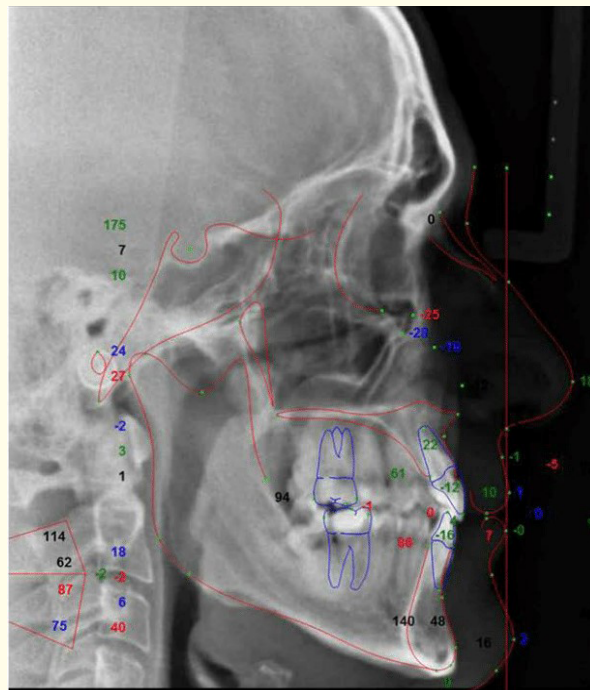


Figure 4: Pretreatment lateral cephalometric radiograph.

Firstly, the upper arch was banded with self-ligating bracket for the alignment and the distalization of 2.7. Eight weeks after the beginning of the treatment the lower arch surgery was made, with a full-thickness flap in the region of 3.7, under local anesthesia. The exposed site showed atrophic and poor vascularization. After removing the residues of granulation tissue, perforations of the vestibular cortical and a vertical corticotomy mesial to the root of 3.8 were performed, in order to increase the local bleeding. A graft of heterologous bone was then placed. The flap was repositioned with a suture with separate stitches. In the meantime, a miniscrew self-ligating was inserted in the interradicular space between 3.3 and 3.4. The miniscrew was positioned so that the slot 0.22 x0.28 was parallel to the occlusal surface. The position of the implant has been decided according to the available interradicular space. The miniscrews was charged immediately by applying a tma lever with loop and an open spring inserted in the molar tube bonded on 3.8, in order to determine an initial uprighting and distalization. The suture was removed seven days after surgery. After eight weeks a second miniscrews was positioned in the retromolar area to allow the application of an elastic chain on a button positioned at the mesial-palatal surface of 3.8 and passing on the occlusal surface of the dental element. This was done in order to determine the distalization of the crown and to keep under control the extrusion of the lower molar, an unwanted side effect of the uprighting movement (Figure 5).

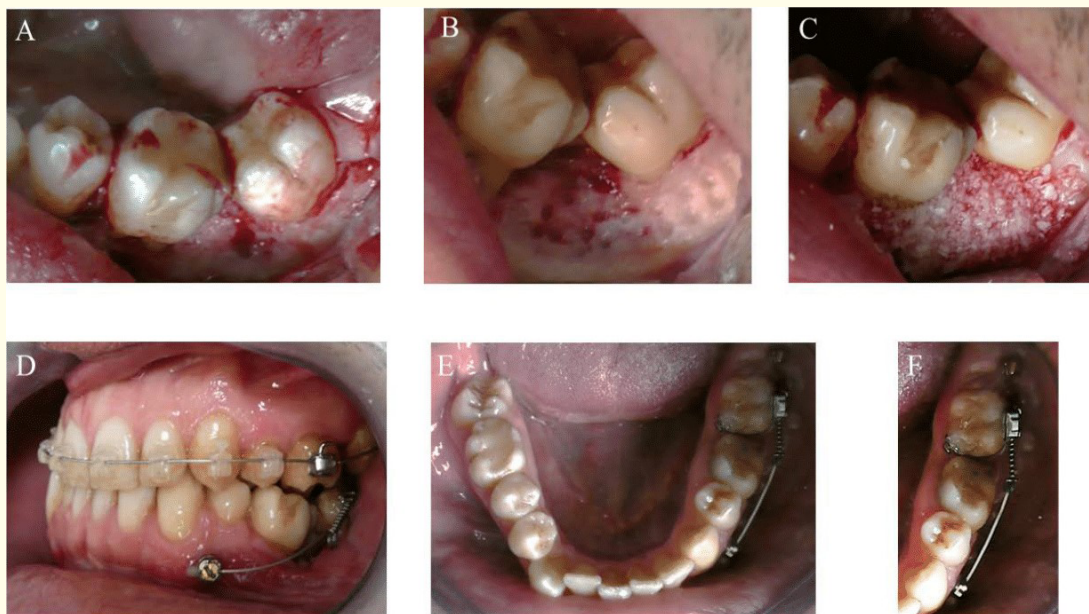


Figure 5: a) Regional Corticotomy b) Graft of heterologous bone c, d) Tma lever e) Second miniscrew positioned in the retromolar area.

Results and Discussion

The treatment plan objectives were achieved in 31 months of treatment. The uprighting and the protraction of 3.8 were obtained and a contact point was re-established with 3.6. The patient’s overjet, overbite, deep bite, brodie 2.7 and 3.7 and cross-bite 1.5 and 4.3 were corrected. A 1 class molar and canine class relationship with proper alignment of the dental arch were achieved. The post-treatment Rx panoramic showed an improvement of bone trophism in the area 3.7 (Figure 6-8).



Figure 6: Posttreatment photographs.

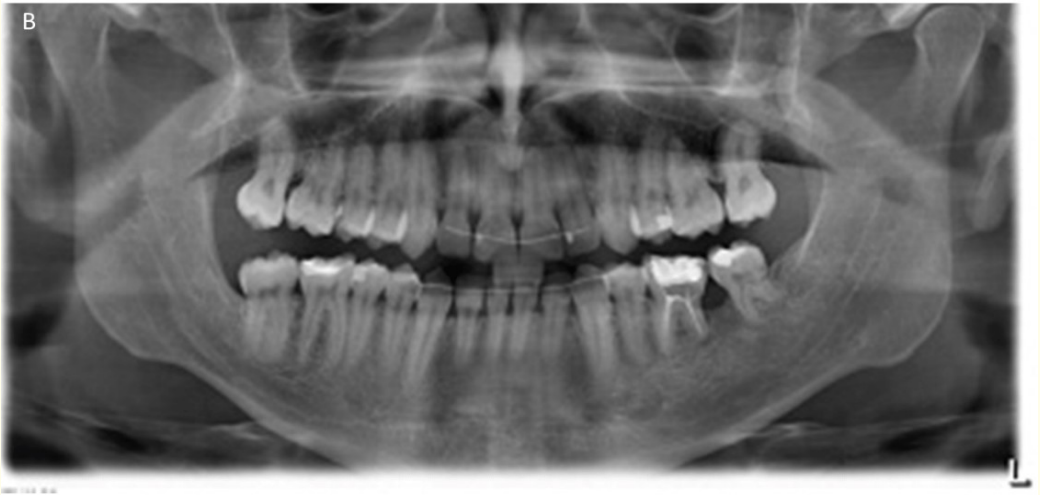


Figure 7: Posttreatment panoramic radiograph.

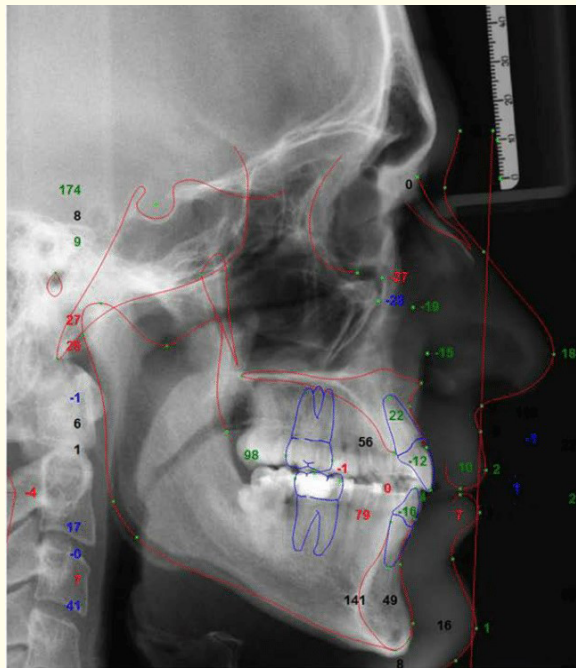


Figure 8: Posttreatment lateral cephalometric radiograph.

The loss of the mandibular molars is a frequent occurrence in adults [11], resulting in alterations in the occlusal distal sector, such as migration and extrusion of the proximal teeth, that may cause premature contacts during mandibular movements, as well as remodeling and atrophy of the alveolar processes. The ability to close the post-extraction space through appropriate orthodontic biomechanics represents, first of all, a biological advantage since the occlusion may be rehabilitated without using prosthetic-implant solutions. The implant-prosthetic solution would have expected the element extraction 3.8, determining a further bone resorption. The bone resorption that occurs following a dental extraction restricts the effectiveness of the implant positioning [12]. The area 3.7 presented an atrophic mandibular ridge due to previous extraction of the included element, so the further extraction of 3.8 would have required interventions aimed at increasing the crest both vertically (vertical sandwich osteotomies) and horizontally (on-lay bone block augmentations, gbr procedures). These clinical procedures have a high number of complications [12,15-17]. Previous studies reported in the literature [13,14], refer that the movement of the uprighting and closure of extraction space may lead to increased hole-lingual thickness and a non-significant root resorption. In this case-report the closure of the orthodontic space was carried out by associating the advantages of orthodontic treatment with skeletal anchorage to the biological effects of corticotomy, which is a minimally invasive surgical technique capable of increasing the bone turn-over, following induction of the cortical wound(RAP) [18-20]. As previously demonstrated, the local osteopenia induced by the corticotomy reactivates the vascularization process in the extraction socket, facilitating and speeding up the alveolar remodeling process [21]. The resulting clinical effects are the facilitation of complex orthodontic movement, reducing the risk of root resorption of 3.8 and the improvement of the conditions of the deep and superficial periodontal tissues. The orthodontic treatment was performed using an original biomechanics by applying two miniscrews, in order to obtain the uprighting of 3.8, reducing the possible undesirable side effects related to orthodontic movement. In literature, several positioning modalities of miniscrews necessary to determine the lower molar uprighting are reported. In particular, the mechanical Derton-Perini [22] did not appear suitable for the impossibility of positioning the second miniscrew SL in interradicular site 3.5 - 3.6. The option to apply a single miniscrews in the distal

3.8 would have led to the retraction of the crown with extrusion control, but also to an increasing in the interdental space that would have to be closed in the second phase of the treatment. The Biomechanics used involved the application of a single miniscrews SL 0.022 x 0.028 slot in the interradicular space 3.3 - 3.4 and the use of a tma lever with loop and an open spring inserted in the molar tube bonded on 3.8. This made it possible to begin the orthodontic treatment of the lower arch with a comfortable and hygienic sectional device for the patient. From a biomechanical point of view, the application of a sectional device with only one miniscrew determines a derotation effect that may restrict the miniscrew stability. To control this undesirable effect, after eight weeks a second miniscrews has been positioned in the retromolar region, to complete the retraction and prevent the extrusion of 3.8 of the crown, through the use of an elastic chain. The lower arch was completely bonded after x weeks and in the same session miniscrews SL were removed.

Conclusion

The uprighting and the protraction of the molar, in combination with the corticotomy, have proven to be a valuable treatment in case of an atrophic mandibular ridge, restoring an optimal occlusion and a good bone regeneration without recurrence (follow-up to 3 years).

Conflict of Interest

There is no conflict of interest of any of author with any material, product and methods used in this study.

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