

Up-to Date Review And Case Report

The use of mini-anchorage screws in the surgical orthodontic treatment of stage-III periodontitis: a clinical case

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Abstract – The use of miniscrews for orthodontic anchorage combined to periodontal treatment in aggressive periodontitis: case report and review of the literature. **Introduction:** Miniscrews (MSs) have gained rapid popularity among orthodontic specialists over the past decade. Subsequently, as general dental practitioners continue to provide general care for patients undergoing orthodontic treatment they are likely to encounter MSs. **Observation:** A 60-year-old woman concerned about generalized aggressive periodontitis (generalized periodontitis stage-III) with complaints of diastema and spacing in the upper arch, received for ten years nonsurgical therapy via scaling and root planning combined with systemic antibiotics. Maxillary periodontal flaps achieved this primary periodontal treatment. As she complained of protrusion of her maxillary incisors she was referred for orthodontic treatment with palatal MSs to retract and align the maxillary anterior segment. A 26 months follow-up showed esthetic and functional stability of the result. **Discussion:** This case report demonstrates efficacy of combined periodontal and orthodontic treatments using palatal MSs in order to successfully contribute to treatment of stage-III periodontitis.

Introduction

Bone anchorages have proven to play an essential role in the successful completion of certain orthodontic treatments, especially in adults [1,2]. Their use is also indispensable in the treatment of aggressive periodontitis. They support the posterior pillars, which in the event of anterior segment recoil, would be under invariable stress beyond their residual resistance. The episodic evolution of generalized alveolysis in aggressive periodontitis renders its treatment difficult and its results may be unreliable. Here report a case in which periodontal treatment for aggressive periodontitis (stage III) was combined with orthodontic treatment using palatal miniscrews.

Observation Clinical Case

A 60-year-old woman consulted with the aim of esthetically improving her smile. She complained of a “protrusion” of the

upper incisor–canine block and secondary diastemas. Apart from a functional mitral murmur, she did not have any other relevant medical or surgical history. The patient was under follow-up for aggressive periodontitis for 10 years. Upon radiological examination (Fig. 1a and b), she showed a vestibular migration of the upper incisor–canine block underpinned by severe horizontal alveolysis (30–70%) with displacements >1 mm (type-III mobility) and marked gingival inflammation (gingival index 3). The migrations explained the onset of the unsightly diastema (22/23 et 12/13). The presence of more than two interproximal sites with attachment loss of ≥6 mm, and more than one interproximal site with a pocket depth ≥5 mm confirmed the diagnosis of aggressive periodontitis [3]. Furthermore, the diagnosis of aggressive periodontitis was confirmed by the absence of concomitant systemic disease, attachment loss, rapid episodic bone destruction, and familial aggregation [4]. The following represents the classification criteria adopted by the 2017 International Workshop [5] for this generalized periodontitis stage-III: clinical attachment loss at the most affected interproximal site ≥5 mm, alveolysis of more than two-third of the radicular length, and ≤4 number of teeth lost.

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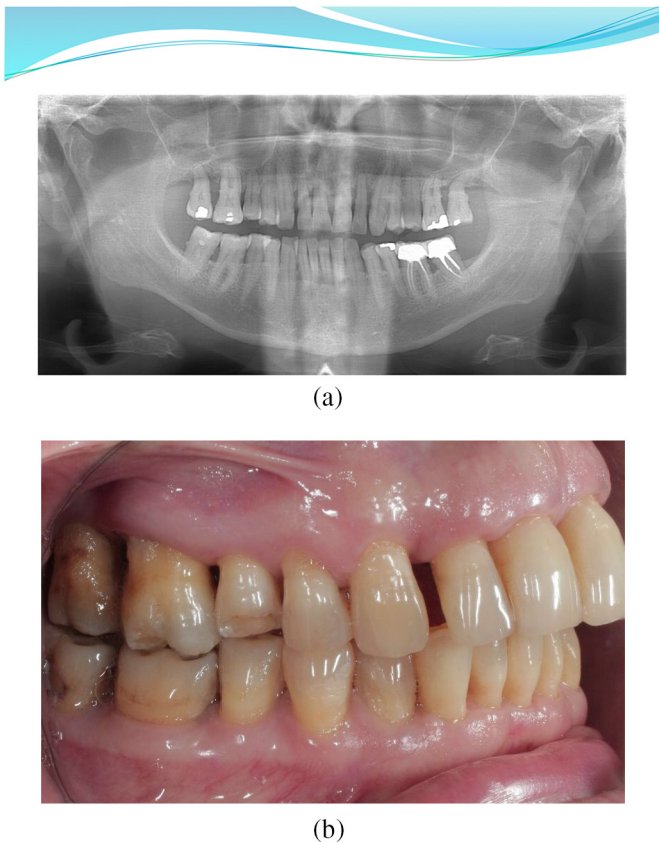


Fig. 1. (a) Panoramic view revealing horizontal (30–70%) and angular alveolysis of marginal bone at sites (#11, #12, #17, #27, #36). Moderate (4–6 mm) and severe (>6 mm) clinical attachment loss in sites (#16, #17, #22, #25, #26) and (# 11, # 27) respectively. (b) Preorthodontic initial view: interdental space between #12 and #13.

Treatment

After obtaining informed consent, a periodontal treatment phase was initiated. This treatment comprised oral hygiene instruction (brushing in rolling movements, interdental brushes), scaling, root planing and irrigation sessions (povidone iodine, 10%) a local antiseptic (0.5% chlorhexidine, gingival paste) and general antiseptic treatments (amoxicillin, $3 \times 1 \text{g d}^{-1}$ + clavulanic acid, $3 \times 125 \text{mg d}^{-1}$, for 15 days), during the active phases was continued for 12 months. In addition, two esthetic flaps were introduced for upper tooth cleansing with curettage and filling (β -tricalcium phosphate 500–1000 μm , Cerasorb®, Nederland) of the infraosseous pockets concluded this initial basic periodontal treatment. A re-evaluation of the initial treatment showed significant clinical attachment gain, disappearance of gingival inflammation, and decreased mobility and bleeding (assessed using the sulcus bleeding index by Mühlemann and Son) [6]; this indicated orthodontic intervention. The initial goal was to move the incisor–canine block back in place. Mobility control was immediately regained after the placement of an Edgewise® fixed lingual appliance (18 × 25 mm; Fig. 2) and the use of a

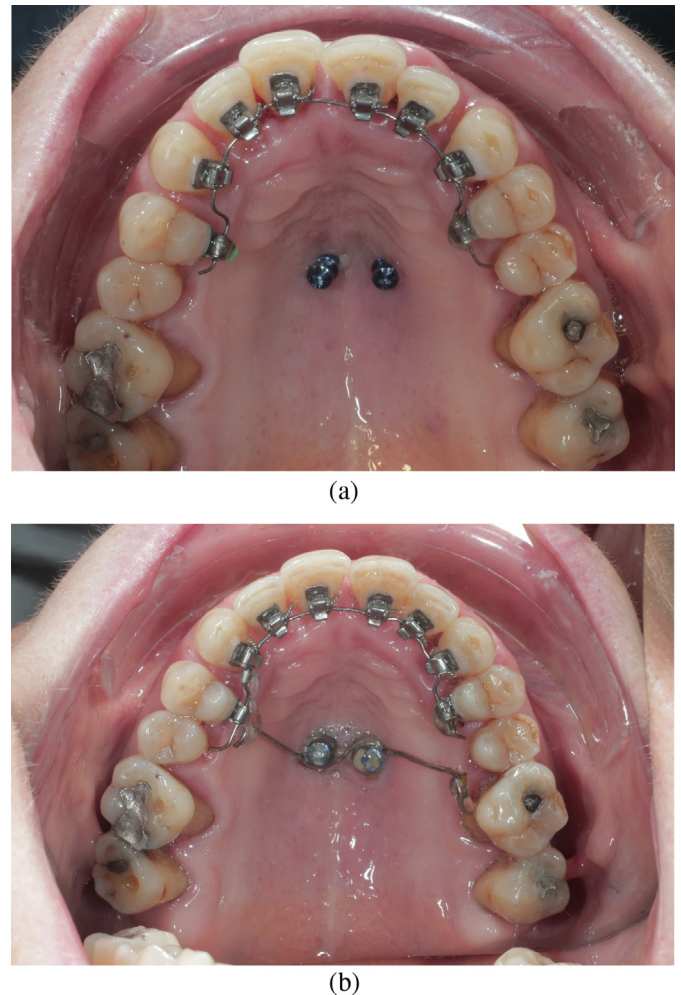


Fig. 2. (a) Miniscrews and Edgewise® system have been installed. (b) 8 months post-orthodontic view.

0.018-inch Niti® arch. The recoil was achieved with the aid of Deltex® mini-screw anchorages with double support ($2 \times 8 \text{ mm}$, thread: 4 mm) positioned under local anesthesia, on both sides of the median raphe at the level of teeth 14–16 and 24–26 (Fig. 2a). A surgical guide (Fig. 3) was designed using two telerradiographic positions: face and profile [7,8]. This guide made it possible to safely conduct the necessary predrilling because of the extreme density of the hard palate (1.3 mm in diameter and 6 mm in depth). The orthodontic treatment lasted 6 months and the miniscrews were removed without any difficulty; to ensure fixation, support was provided by a bonded and keyed bridge.

Maintenance

After this, quarterly maintenance sessions were implemented. The check at 26 months post-orthodontic treatment (Fig. 4) showed a reduction in the overbite and a significant decrease (0.9% vs. 9.8%) in the mild pocket rate (4–6 mm) when compared to initial values at the beginning of periodontal

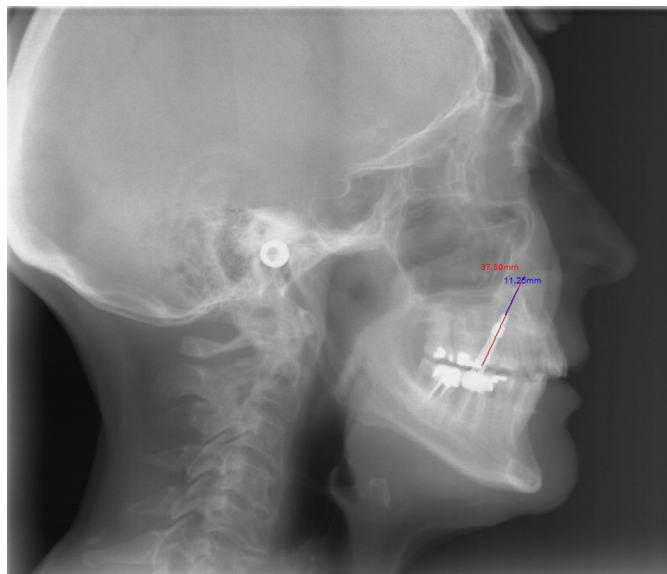


Fig. 3. Lateral telerradiography of profile, surgical guide in place.

treatment. For 7 years before orthodontic treatment; the deep pocket rate (0.9%; ≥ 7 mm) had remained unchanged. The stability of the functional and esthetic result was noted. The results of the bacterial analysis by DNA probe (IAI PadoTest 4.5[®], Switzerland) and by multi-site test (three sites taken: 16, 22, 26), revealed facultative anaerobic bacterial growth rate (Aa), which had subsided at the 10-month checkup (0.00% vs. 0.1%, respectively). However, despite these maintenance sessions, there were obvious increases in the obligate anaerobic bacterial growth rate (Bf, Pg, Td: 16.2% vs. 5.5%, 18.7% vs. 13.1%, and 8.9% vs. 4.5%, respectively). Sessions were therefore adapted to include antibiotic therapy (amoxicillin, $3 \times 1 \text{g d}^{-1}$ /metronidazole, $3 \times 125 \text{mg d}^{-1}$). After treatment, lifelong quarterly maintenance sessions were instituted along with annual bacterial analysis.

Discussion

This clinical case illustrates the usefulness of palatal mini-screw anchorages in the treatment of aggressive periodontitis for which dental anchorages increase the risk of weakening the posterior pillars. In cases of aggressive periodontitis, the orthodontic indication requires interdisciplinary consultation to assess the height of the attached gingiva, pocket depth, mobility, dental displacement, and residual bone height. Alternatives to orthoperiodontal treatment are one of the following two options: multiple endodontic treatments with extractions and a full-arch bridge or multiple extractions with guided bone regeneration and multiple bone grafts to facilitate prosthetic rehabilitation by using full-arch implant-supported bridges. This strategy, which causes significant tissue damage, has shown poor clinical results in patients [9,10] and is not in line with the principle of tissue economy. The prerequisite for



Fig. 4. 26 months post-orthodontic view. Unsightly diastemas have been closed and overbite reduction has been noticed.

any orthodontic treatment on a diminished periodontium is to attempt to stabilize the periodontal disease, which is sensitive to the deleterious effect of tooth displacements [11]. Orthodontic forces should therefore be light, as constant as possible, controlled, and accurate, especially during the initial phase. Skeletal anchorages make force action mechanisms simpler and more reliable. This reduction in treatment duration consequently explains why they are now more frequently used. The Deltex[®] bi-flanged miniscrews—one supra-osseous and the other supra-gingival separated by a smooth collar—are specially adapted to the thick palatal fibro-mucosa. They are mounted by a Goggle[®] arch (steel 19×26 tp) custom-bent in the shape of a goggle; the support is able to offset the point of application of the elastic forces applied from the anchorage to the system in the premolar zone. Anchoring is achieved by the synthesis of the two palatal (“pyramidal”) screws, which are confined in photopolymerizable resin. Their self-tapping structure and their self-compacting progressive screw pitch facilitated their insertion, subject to the use of a surgical guide, particularly to the palate (nasal cavity). The longer screw lengths (11 mm) are particularly useful for tuberosity-pterygoid anchorage [12]. The palatal anchoring of these screws also has the advantage of decreasing their proximity to the teeth especially in the context of primordial periodontal hygiene. This advantage can be weighed against possible masticatory and phonatory discomfort.

Ultimately, the treatment of aggressive periodontitis by the combination of coordinated double orthodontic and periodontal care permitted the reduction of the periodontal pocket rate as well as the alignment of the incisor-canine block. In our patient, quarterly periodontal maintenance (monthly during active periodontitis) was necessary [10]. This result is consistent with the study published by Khorsan *et al.* ($n=8$ aggressive periodontitis cases followed over 6 months) [11] and the clinical case (12-month follow-up) by Carnio *et al.* (2015) [9]. In conclusion, the suitability of the screw mechanism has provided a definitive advantage to the use

of the orthodontic mini-screw technique on a thinned periodontium such that the desired result has been achieved [13,14]. Other advantages include a reduction in the treatment duration [14] and an improved prognosis [7]. Nevertheless, this technique requires perfect coordination between the orthodontist and the oral surgeon as well as the therapeutic compliance from the patient. This collaboration made it possible to avoid the complications typically associated with this type of treatment: loss of screws, aggravation of periodontitis, and fracture or detachment of the contention system (which usually results in the patient becoming discouraged or abandoning treatment). The loss of miniscrews is generally attributed to selecting an inappropriate implantation site where there is an absence of attached gingiva, when the screw is too close to the periodontal bone, and when there is insufficient bone density. It can also be explained by the action of excessive tensile forces that cause tiny bone fractures [14]. Chillès *et al.* (2016) [15] proposed the use of buried miniscrews which have the advantage of cortical penetration (decreased anatomical risks) and of having a weaker lever arm, and with the thread being pressed directly against the bone, limiting the risk of screw loss. They have the disadvantage of requiring a surgical intervention with mucosal detachment.

Conclusion

The use of deep anchorage screws known as “pyramidal screws” inserted on either side of the median raphe facilitates the orthodontic treatment of severe periodontitis. Because of the minimal consequences associated with the installation of these miniscrews, patients are more willing to adhere to therapy. Nevertheless, their full cooperation vis-a-vis dental hygiene is the key to the success of this surgical orthodontic treatment.

Conflicts of interests: The authors declare that they have no conflicts of interests in relation to this article.

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