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Reduction of gingival recession following orthodontic intrusion in periodontally compromised patients

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Structured Abstract

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Objectives – To evaluate the role of orthodontic intrusion and alignment in the reduction of gingival recession (REC) around maxillary incisors of adult periodontal patients.

Design – Prospective clinical study.

Setting and Sample Population – Twenty-eight consecutively treated adult patients, suffering from severe chronic periodontitis and with one upper central incisor extruded and infrabony defect on its mesial site. All patients were seen in a private practice in Turin, Italy. At baseline, all patients presented with REC on the buccal and mesial aspects of the treated teeth.

Measurements and Results – For each patient probing pocket depth (PPD) and REC were assessed at baseline, at the end of treatment and 1-year after the end of treatment. REC was also evaluated independently in patients with narrow (NPB) or wide periodontal biotype (WPB). All parameters showed improvement between initial and final measurements statistically, and showed no changes between final and follow-up measurements. Mean mesial PPD decrease was 4.29 mm, with a residual PPD of 2.50 mm. Mean REC reduction was 0.96 mm on the buccal sites and 1.71 mm on the mesial. No statistical difference was recorded on REC values between groups NPB and WPB.

Conclusion – The presented clinical protocol resulted in improvement of all parameters examined. At the end of orthodontic treatment a predictable reduction of REC was reported, both in patients with thin or wide gingiva.

Key words: gingival recession; orthodontic intrusion; periodontal biotype

Introduction

Flaring and space opening in the anterior region is a common problem in patients suffering from advanced adult periodontitis. Presumably, as the periodontal support and forces acting on these teeth are no longer in a state of equilibrium, such positional changes may result (1, 2). Anterior teeth are susceptible to such changes, as they are not protected by anteroposterior or occlusal contacts to inhibit their migration. This kind of tooth migration usually is a combination of extrusion and proclination, with an increase in the clinical crown length and gingival recession (REC). The final result of all these is functional problems and unpleasant aesthetics. Orthodontic treatment of these pathologically migrated teeth could improve the long-term prognosis (3).

Often, elongation and spacing of incisors resulting from periodontal disease is associated with the presence of interproximal bone defects. Several authors have suggested forced eruption as a treatment alternative for osseous defects. This would eliminate infrabony pockets by leveling the bony margins (4). The need for endodontic therapy and prosthetic restoration due to excessive incisal reduction, however, can be the negative sequelae. Furthermore, intrusion and retraction of incisors seem to be the logical treatment plan for these patients from both aesthetic and functional points of view. In fact, in cases of pathologic extrusion, orthodontic intrusion has been recommended to realign the teeth and to have a beneficial effect on clinical crown lengths and marginal bone levels, so to avoid the need for further reconstruction (1, 5–7).

Experimental studies have shown that tooth movement into infrabony defects may enhance the rate of attachment loss when inflammation is present (8), but once the healthy periodontal status is provided, no additional breakdown occurs (9). Ideally, teeth with an interproximal osseous defect could be moved into the defect until there is no further clinical or radiologic evidence of the pocket (10).

It has long been suggested that the morphologic characteristic of the gingiva can be related to tooth anatomy. Teeth with short and wide crown forms are associated with a thick gingival biotype, while the long and narrow crown forms with a thin gingival biotype. The long and narrow teeth with a thin periodontium can be more susceptible to REC than short and wide teeth with a thick periodontium (11, 12).

The recession of gingival margin is a common outcome of periodontal disease. It is also a common side effect of surgical periodontal therapy because of apical repositioning of the gingival margin during the healing period. Long crowns especially when associated with pathological extrusion and malpositioned teeth could produce a particularly unaesthetic smile.

The first aim of this study was to evaluate the combined effect of periodontal surgery with orthodontic intrusion to reduce the REC around the maxillary central incisors and secondly to see if the thick or thin gingival biotypes have responded differently.

Materials and methods

Twenty-eight consecutively treated patients, aged 29–60, participated in this study. None of the patients reported any systemic diseases or routine medication. Initially, the affected sites were scaled and root planed until a Full Mouth Plaque Score ≤15% (13) was reported for each patient. In all the cases, migration and extrusion of one upper central incisor was present, with radiologic evidence of a mesial infrabony defect and a probing pocket depth (PPD) ≥6mm.

The periodontal treatment consisted of open flap surgery: after an intrasulcular incision, a full-thickness flap was elevated from the distal aspect of one lateral incisor to the distal aspect of the contralateral tooth. Vertical releasing incisions were made if necessary. No guided tissue regeneration techniques were utilized. Fixed appliances were placed the day sutures were removed, which was about 7–10 days after surgery, active orthodontic treatment started with the segmental arch technique (14, 15).

Intrusions were accomplished using a titanium-molybdenum alloy (TMA) wire with cantilevers on base arches (SDS Ormco, Glendora, CA, USA). The anchorage unit was augmented by splinting the posterior teeth with stainless steel segmental wires and transpalatal arches. The migrated teeth were intruded and realigned using light and continuous forces. All patients were enrolled in a hygiene maintenance program and were recalled every 3–4 months (16, 17). Overall, the average orthodontic treatment time was 6–18 months (mean 11.71 months). After debonding, patients received a resin-bonded Maryland splint from cuspid to cuspid not only to prevent relapse, but also to reduce tooth mobility (18).

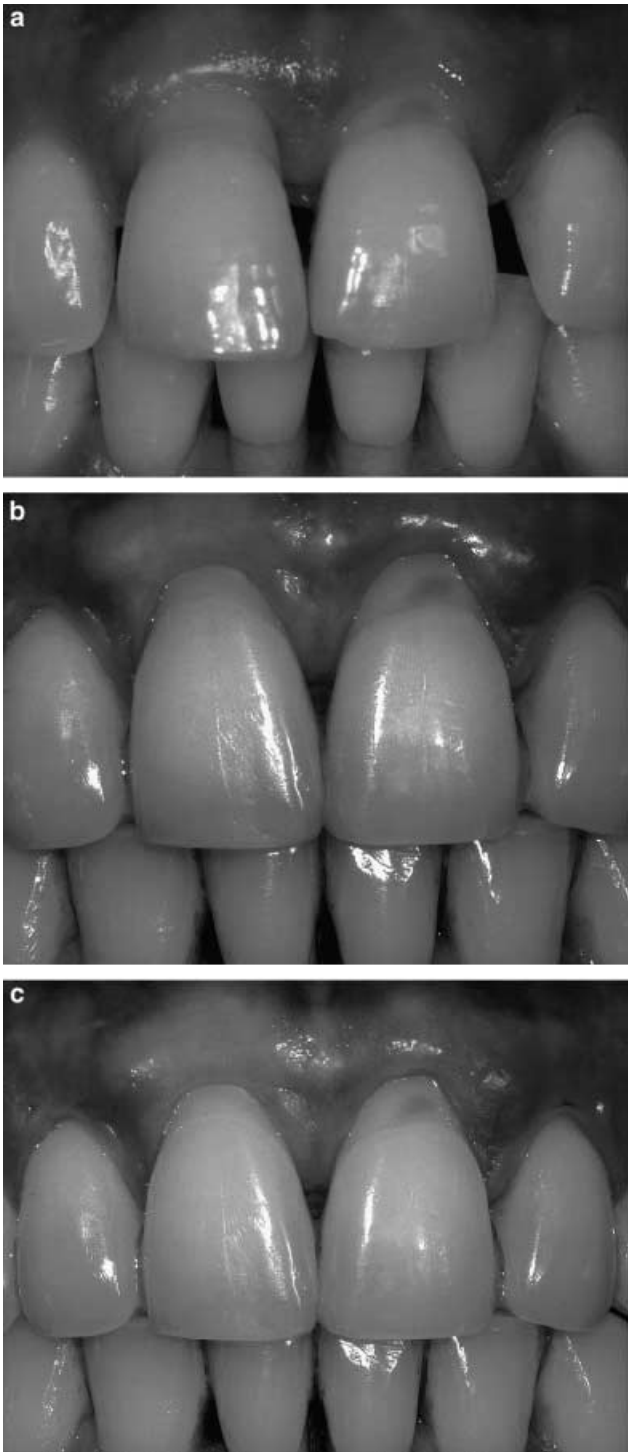

Fig. 1. Patient with extrusion of the right central incisor and gingival recession. Initial clinical situation (a); final clinical situation (b); one-year follow-up control (c).

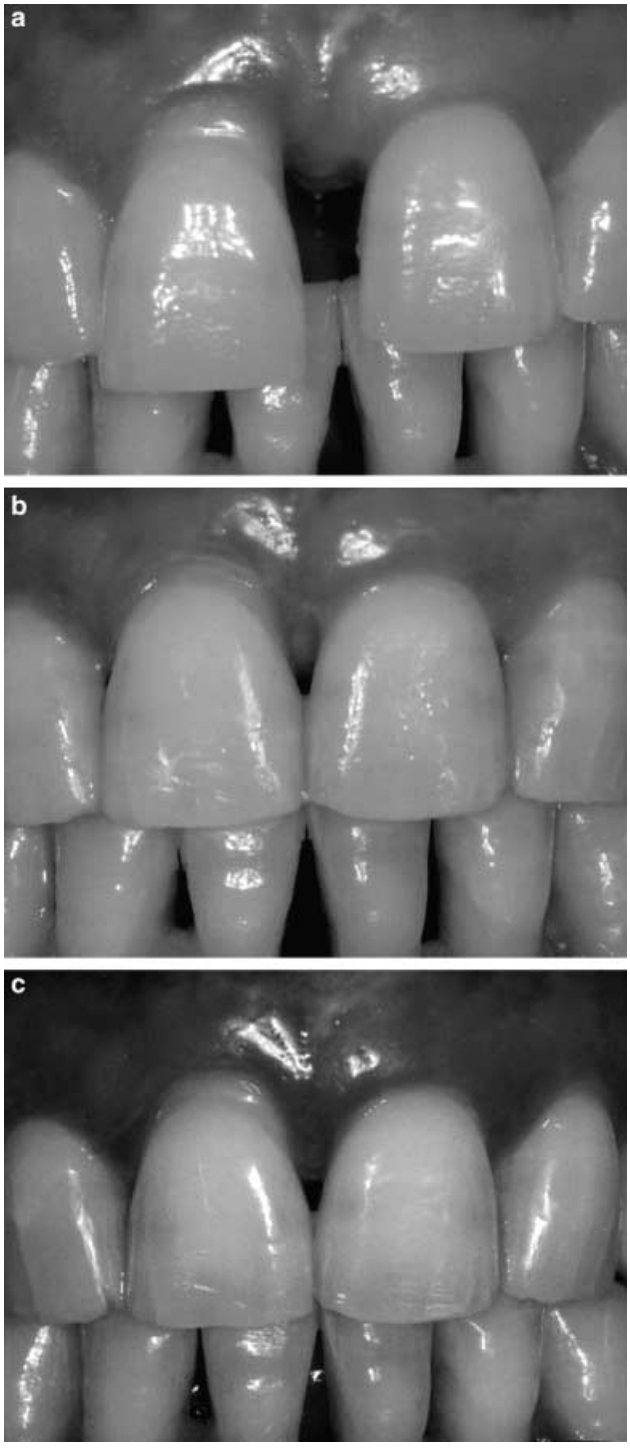

Fig. 2. Patient with extrusion of the right central incisor and gingival recession. Initial clinical situation (a); final clinical situation (b); one-year follow-up control (c).

At baseline (Figs. 1a, 2a), end of treatment (Figs. 1b, 2b) and 1 year post-treatment (Figs. 1c, 2c) PPD and REC were assessed for each patient on both the mesial and buccal aspects of the treated incisors. Clinical measurements were made using a calibrated periodontal probe (PC-15; Hu-Friedy, Chicago, IL, USA). On the basis of the ratio between the crown width (CW) and the crown length (CL) of the central incisors, the dental and periodontal biotype was assessed for each patient. Central incisors were divided as having a long narrow

form, corresponding to a narrow-thin periodontal biotype (NPB) if CW/CL ratio was >0.66, or a short wide form, corresponding to a wide-thick periodontal biotype (WPB) if CW/CL ratio was ≤0.66. Changes between the initial, final and follow-up values of PPD and REC were analyzed by means of *t*-test for coupled data. Modifications of REC were also evaluated in the two groups with different periodontal biotypes (NPB and WPB) by means of *t*-test for non-coupled data. Values with $p < 0.001$ were considered statistically significant.

Results

At the end of treatment a mean intrusion of 1.95 ± 0.48 mm was reported for the orthodontically moved incisors. The intrusion, measured at the incisal edge with respect to the contralateral incisor, varied from 1 to 3.5 mm. Initial, final and follow-up mean values, with differences, of mesial probing pocket depth (mPPD), buccal probing pocket depth (bPPD), mesial gingival recession (mREC) and buccal gingival recession (bREC) are reported in Table 1.

At baseline mean mPPD was almost 7 mm, and reduced to 2.5 mm at the end of treatment; it was statistically significant. This reduction remained nearly stable at the follow-up evaluation.

An initial mean value of bPPD was approximately 2.5 mm and remained statistically stable both at the final and 1 year follow-up evaluations. At baseline mean mREC was 2.5 mm and reduced to 0.79 mm at the final measurement, remaining stable after 1 year. Initial mean bREC was 1.75 mm, and almost 1 mm of reduction was reported at the final evaluation. No statistically significant changes were noted at follow-up.

According to the CW/CL ratio classification, 10 patients were classified as having an NPB and 18 patients were classified as having a WPB. No statistical difference was reported in man bREC modifications between NPB and WPB groups (Table 2).

Table 2. **Mean reduction of gingival recession (mm) at buccal sites (ΔbREC) in groups with narrow periodontal biotype (NPB) and wide periodontal biotype (WPB)**

	NPB	WPB	Difference
Initial bREC	1.30 ± 0.95	2.06 ± 0.94	0.76
Final bREC	0.60 ± 0.84	0.89 ± 0.90	0.29
ΔbREC	0.70 ± 0.67*	1.17 ± 0.62*	0.47

**t*-Test for non-coupled data ($p = 0.073$).

Discussion

We report the effects of a combined orthodontic–periodontic treatment on upper central incisors that were migrated following the onset of periodontal disease. The treated teeth had infrabony defects on the mesial aspect, REC with lengthening of the clinical crown height and all repositioning was indicated for all. Open flap surgery was performed to treat the bony defects and orthodontic intrusion followed. The results showed a resolution of the periodontal inflammation with a corresponding elimination of infrabony pockets. A mean mPPD decrease of 4.29 mm was noted at end of treatment, and the residual mean mPPD of 2.5 mm was conducive to good periodontal status. At the end of treatment a significant reduction of the REC, both on mesial and buccal sites, was present. The mean mREC decrease was 1.71 mm, while the mean bREC reduction was 0.96 mm.

It can be supposed that orthodontic movement, designed to intrude and align the incisors with

Table 1. **Mean initial, final and follow-up values, with differences, of probing pocket depth (mm) at mesial (mPPD) and buccal (bPPD) sites and gingival recession (mm) at mesial (mREC) and buccal (bREC) sites (*t*-test for coupled data)**

	Initial	Final	Difference	Follow-up	Difference
mPPD	6.79 ± 1.13	2.50 ± 0.51	4.29 ± 1.12 ($p = 0.000$)	2.64 ± 0.49	0.14 ± 0.36 ($p = 0.043$)
bPPD	2.43 ± 0.79	2.25 ± 0.52	0.18 ± 0.48 ($p = 0.057$)	2.32 ± 0.55	−0.07 ± 0.26 ($p = 0.161$)
mREC	2.50 ± 1.14	0.79 ± 1.07	1.71 ± 0.98 ($p = 0.000$)	0.89 ± 1.03	−0.11 ± 0.31 ($p = 0.083$)
bREC	1.75 ± 0.97	0.79 ± 0.88	0.96 ± 0.64 ($p = 0.000$)	0.86 ± 0.93	0.07 ± 0.26 ($p = 0.161$)

simultaneous closure of the diastema, was able to guide the soft tissues during the earl phases of the healing process. Interproximal soft tissues could refill the embrasures once a new contact point between the two incisors was obtained. It was noted that the mean reduction in buccal recession was almost half of the mean distance of intrusion. This finding is in agreement with other previously published papers. It appears that buccal gingiva is capable of following the vertical tooth displacement by 50% (1, 19). Gingiva can shorten coronal clinical crown length. Combined with realignment of teeth, this gingival shift greatly impacts the aesthetics of the smile.

Gingival recession was also evaluated independently in the two groups with different periodontal biotypes. This analysis was conducted because it can be supposed that patients with narrow dental biotype and thin gingiva are most susceptible to recession of the soft tissue margin than patients with wide dental biotype and thick gingiva. No significant differences were detected in the degree of decrease of REC between these two groups of periodontal biotype. It can be concluded that patients with thin gingival type respond favorably to this combined treatment.

Results presented in this clinical paper show a positive outcome of all parameters examined, and both PPD and REC reductions remained stable at the 1-year follow-up. From a clinical point of view, orthodontic treatment not only has no detrimental effects on the periodontium once inflammation is eliminated, but it also modifies both deep and superficial periodontal tissues. Proper management of soft tissues is critical. Patients expect significant aesthetic results. Thus, a multidisciplinary approach should be the first choice when periodontal disease is associated with tooth migration.

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