Non-carious Cervical Lesions Associated with Multiple Gingival Recessions in the Maxillary Arch. A Restorative-periodontal Effort for Esthetic Success. A 12-month Case Report

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Abstract

Restoration of non-carious cervical lesions (NCCL) represents a major challenge for resin materials due to the different adhesive properties of the tooth structure, the biomechanical aspects of the cervical area, and the difficulties in the access and isolation of the operative field. Furthermore, NCCLs should be approached with a complete understanding of the role played by the marginal periodontal tissue. Whenever a cervical lesion is associated with a gingival recession, the interplay between restorative dentistry and periodontology is decisive for a full esthetic and long-term success. A case report is presented dealing with the treatment of NCCLs associated with multiple gingival recessions using a combined restorative and periodontal treatment with a 12-month follow-up.
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Figs 1 to 3 Frontal and lateral views of the initial clinical situation with the two arches in maximal intercuspation. Multiple gingival recessions associated with non-carious cervical lesions are presented.

Introduction

The incidence of non carious cervical lesions (NCCL) has shown a continuous increase over the years.[1] The progressive nature of those lesions suggests an early correction in order to prevent biological and biomechanical complications.[2-5]

The conservative restoration of cervical lesions is a challenge for adhesive materials due to the type of substrate available for the adhesion,[6] the biomechanical aspects of the cervical area[7], and the isolation and access to the operative field.

Many papers have dealt with these topics in the literature, but only a few of them have pointed out that this area should be approached only with a complete understanding of the role played by the marginal periodontal tissue in the planning and selection of the correct treatment procedure. Given the anatomical context, in fact, careful evaluation of the periodontal apparatus is also part of the diagnostic process.[8]

The presence of a treatable gingival recession associated with NCCLs requires a combined restorative-periodontal effort to achieve all of the biological and esthetic goals, such as an ideal clinical crown proportion and a harmonious gingival architecture.[9]

A restorative treatment alone in such a situation would be associated with a high risk of traumatic injury to periodontal tissues and would not recreate ideal soft tissue-crown relationships. Also the long-

Figs 4 to 6 Frontal and lateral preoperative views of the maxillary arch. The loss of gingival architecture and the NCCLs are evident.

term retention of the restoration may be impaired due to the difficult isolation of the field, interfering with a safe adhesive technique. A combined approach has been recently proposed and investigated by several authors, showing promising short-term results.[9-13]

The present case report deals with the treatment of NCCLs associated with multiple gingival recessions using a combined restorative and periodontal treatment.

Case report

A 33-year-old male, in good general medical condition, complained of poor esthetics and increasing teeth sensitivity. Teeth 16 to 13, and 23 and 24 were affected by NCCLs and multiple gingival recessions were present in the maxillary arch with a rather asymmetric pattern of severity for any tooth. (Figs 1 to 6). The main contributing factors were traumatic use of a hard bristle tooth brush combined with a horizontal motion and moderate consumption of soft drinks.[14,15]

Full-mouth radiographs, periodontal charting, study casts and a careful medical and dental history were obtained. Also, a complete photographic documentation of the case was carried out.

Treatment goals were the following: *i)* restorative and surgical correction of the defects, *ii)* reduction of teeth hypersensitivity, *iii)* achievement of ideal clinical crown

proportion, and *iv)* harmonization of gingival architecture.[16,17] Furthermore, great care was taken to reduce the patient's morbidity and discomfort throughout the treatment while shortening total chair time.

Intraoral examination, as well as the photographs and stone casts, revealed that some of the cervical lesions were characterized by a severe horizontal component with a deep concavity and the loss of the anatomic cementoemamel junction (CEJ) (Figs 7 to 10).

Fig 7 Teeth affected by NCCLs show a severe horizontal component with deep concavity and loss of anatomical CEJ.

Figs 8 to 10 Frontal and lateral views of the initial study cast of the maxillary arch. Casts are essential for diagnostic evaluation as well as treatment planning.

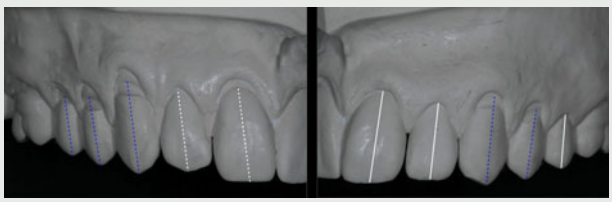

Fig 11 Anatomical crown height of teeth 11 and 12 was measured (white dotted line). This measure was used to estimate the clinical crown height for all other teeth where the anatomical CEJ was lost (blue dotted line). Teeth 11 and 12 were preferred over teeth 21 and 22 because the presence of gingival recessions allowed a clearer identification of the anatomical CEJ.

Fig 12 The identification of the anatomical CEJ creates two different areas of treatment: the restorative compartment located in the coronal portion (blue dotted lines), and the periodontal compartment located in the apical portion (red areas).

The ability to clearly identify the anatomic CEJ may be helpful in surgical planning as it is coincident with the line of root coverage at least in the absence of interproximal periodontal attachment loss or other anatomical limiting factors (tooth rotation, extrusion etc).[18] In this case to recover this landmark, teeth 12 and 11 were used as a reference as their anatomical CEJs were preserved (Fig 11). The height of the clinical crown of those teeth were compared with the average crown height reported on anatomic tables.

At this point, the clinical crown height of all other teeth was calculated with a simple mathematical proportion.

The clear identification of this landmark immediately creates two different areas of treatment: *i)* the restorative compartment, located in the coronal portion, and *ii)* the periodontal compartment, located in the apical portion (Fig 12).

This allows recreation of the lost anatomic CEJ through an adhesive restoration within the first compartment, leaving the apical portion of the lesion available for surgical coverage. A waxup was realized on a plaster model following the indications provided by these calculations, in order to have a tridimensional representation of our working project (Figs 13 to 15).

Figs 13 to 15 Frontal and lateral views of the waxup on the plaster cast according to the anatomical indications.

Teeth anatomy and crown emergence profiles were restored before the surgical correction of the gingival recessions was performed.

Before entering the treatment, the patient underwent professional prophylaxis with oral hygiene instructions and motivation to avoid any further trauma of the gingival tissues and to ensure optimal plaque control. All of the restorative and surgical procedures were performed by the same clinician (MAA).

Restorative procedures

The restorative procedures in the maxillary arch were carried out with a quadrant approach in two separate sessions. Under local anesthesia the cervical lesions were prepared with rotary instruments set at high speed under abundant cooling and also with hand chisels (Fig 16). Diamond round burs of various size and grit were used in order to preserve as much healthy mineralized tissue as possible.[19] The exposed dentin was treated so that any demineralized as well as permineralized tissue was removed, improving the quality of the substrate for adhesion.[6]

The margins of the cavity were leveled off so that a precise finishing line could be identified (Fig 17). This may be helpful in guiding the layering of the restorative material to avoid an excessive over-contour of the restoration. A light butt joint margin was also created at the cervical level. The finishing line was located about 1 mm apical to the line of root coverage irrespective of the actual extension of the cervical lesion.[9] This allows a smoother emergence profile and may prevent, after the healing of the surgical flap has taken place, the exposure of some isolated areas of dentin that may contribute to the persistence of hypersensitivity.

Ameloplasty of the coronal portion of the lesion was carried out due to the depth of the horizontal component of the cervical defect (Fig 16f). This, again, was intended to reduce any over-contouring of the restoration that may determine plaque entrapment, tissue inflammation, and ultimately result in tissue contraction during the early healing phase.

After cavity preparation was accomplished, adhesive procedures were performed. The field was carefully isolated using a rubber dam[20,21] positioned one quadrant at a time. This allowed for multiple treatments and comparison of the anatomic profiles of the adjacent teeth during the operative phases. Customized clasps were used to isolate those areas with a severe discrepancy between the buccal and palatal gingival margins.[22,23] After the rubber dam was placed, the cavities were sandblasted (Fig 18a). Great care was taken to avoid bicarbonate powder that may weaken the adhesion link, and only glycine-based powder was used.[24]

After an etch-and-rinse three-step adhesive system was used, according to the manufacturer's instructions (Figs 18b and c and 19a and b), a tiny layer of fluid composite was delivered into the cavity without incorporating air bubbles and short of the margins (Fig 19c). The use of this flow is intended to relieve biomechanical stress at the cervical area while improving the quality of the internal adaptation of the resin restoration to the cavity walls.[25-28]

A nano-filled composite resin was used to carry out the restorations. Only a dentin mass was utilized since its reduced translucency and high chroma make it an

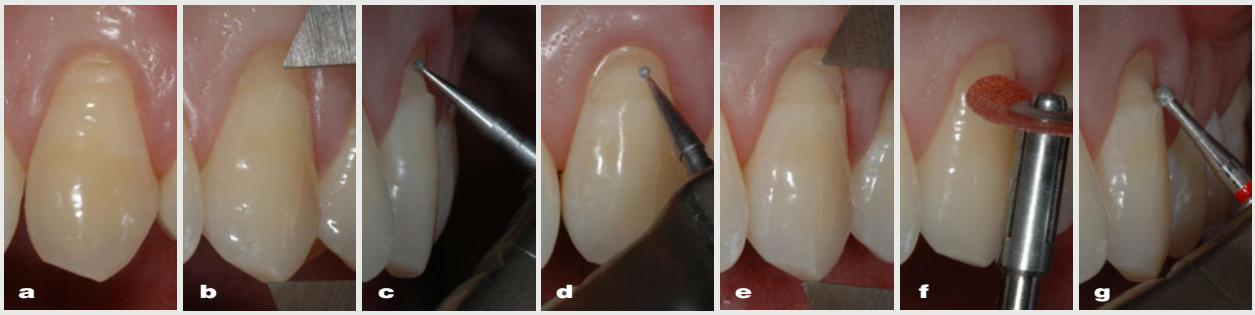

Fig 16 Step-by-step documentation of tooth 23 cavity preparation: **(a)** preoperative view of tooth 23, **(b)** ideal crown length as planned in the diagnostic phase, **(c and d)** identification of the cervical finishing line with a diamond round bur, **(e)** the correct position of cervical finishing line is double-checked, **(f)** ameloplasty of the coronal portion of the lesion to create a smoother emergence profile and reduce any over-contouring of the restoration that may lead to plaque entrapment and tissue inflammation, and **(g)** the coronal finishing line is further defined with a fine-grit diamond bur.

Fig 17 Outlined view of the cervical, proximal, and occlusal finishing lines of the prepared cavity.

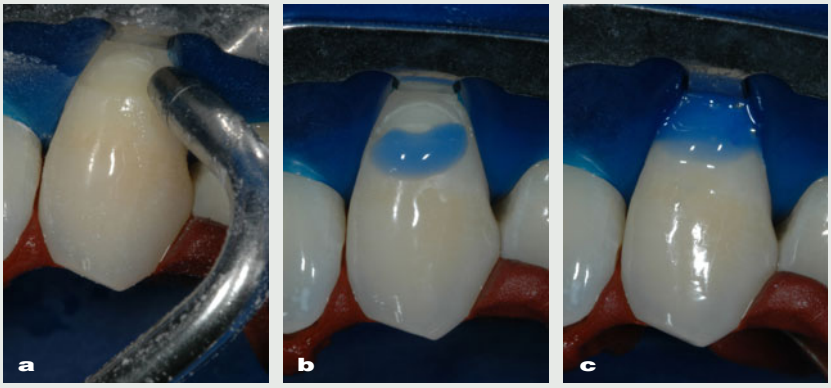

Fig 18 Step-by-step documentation of tooth 23 adhesive restoration: **(a)** sandblasting of the cavity with a glycine-based powder, **(b)** enamel etching, and **(c)** dentin etching.

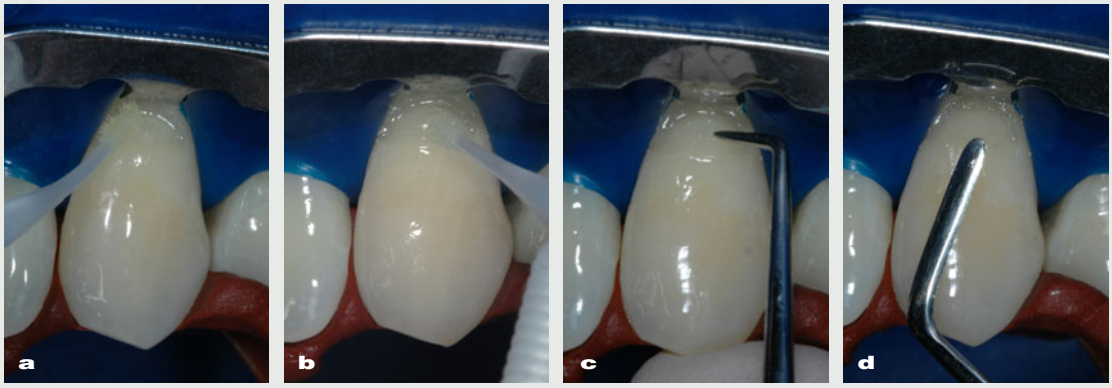

Fig 19 Step-by-step documentation of tooth 23 adhesive restoration: **(a)** primer application, **(b)** bonding application, **(c)** a tiny layer of flow is applied to the cavity, and **(d)** incremental stratification of nano-filled composite in a corono-apical direction.

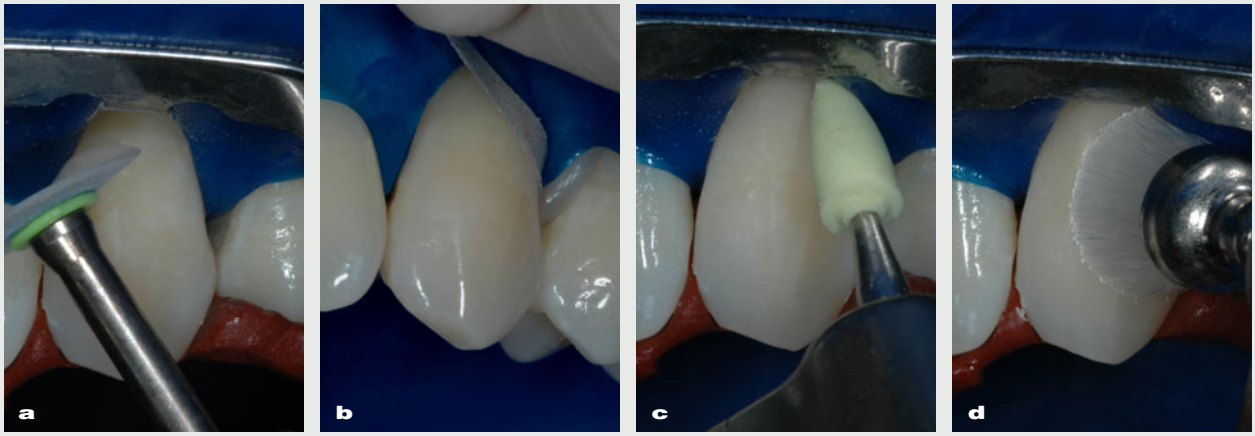

Fig 20 Step-by-step documentation of tooth 23 adhesive restoration: **(a and b)** finishing with alumina oxide disks and strips, **(c)** silicon rubber points were used to create a smooth surface, and **(d)** a brush was used to remove rubber residuals and to provide a polished surface.

Figs 21 to 23 Frontal and lateral views of the maxillary arch after the restorative treatment was completed (see Figs 13 to 15).

ideal material to achieve perfect integration in the cervical area.

The composite was progressively layered with straight and curved spatulas of reduced size moving in a corono-apical direction to achieve the maximum adaptation at the cervical margin while restoring, three-dimensionally, the anatomic profile[29] (Fig 19d). Small brushes were also used to increase the adaptation of the different composite increments.

The restorations were finished by removing all the over-contoured areas. Diamond fine and extra fine burs were used at low speed with abundant cooling and oscillating diamond devices to complete this step. Care was taken not to create any thermal or mechanical trauma to the tooth–restoration interfaces. Aluminum oxide paper disks and abrasive strips with decreasing abrasive ability, and soft silicon rubber burs were used in an alternating fashion (Fig 20). The polishing procedure was delayed for 24 hours to avoid additional stress on the restoration and to let the composite settle.[30,31] Brushes and cups with extra-fine diamond paste were used to improve the esthetic quality of the restoration and to achieve the highest level of smoothness possible. Finally, a surface sealant was employed.[32] A re-evaluation of the restorative outcome according to the wax-up indications was performed before the surgical steps took place (Figs 21 to 24).

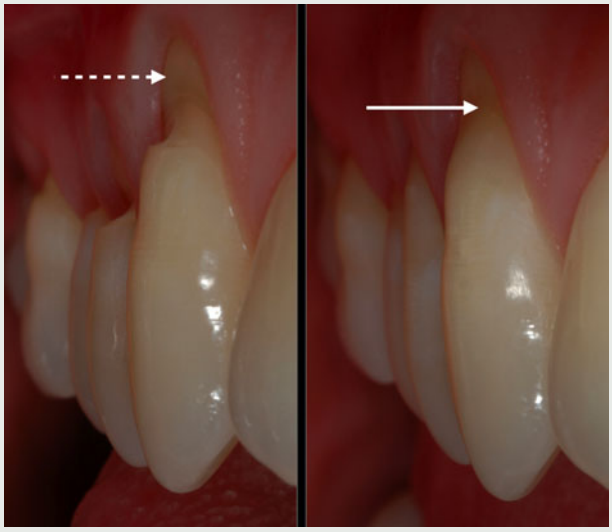

Fig 24 Tooth 13 before and after restorative treatment. The cervical finishing line of the adhesive restoration is placed 1 mm apical to the line of root coverage irrespective of the actual extension of the cervical lesion (dotted arrow).

Periodontal procedures

Periodontal surgical correction of the lesions was carried out in two separate appointments, one for each quadrant. The upper right quadrant was treated using a coronally advanced flap (Figs 25 to 30). This surgical technique allows simultaneous treatment of multiple adjacent recessions, thus reducing the number of surgeries and overall morbidity. The technique has been thoroughly described by Zucchelli and DeSanctis.[33] Briefly, under local anesthesia, supplemented with epinephrine 1:100,000, an intrasulcular incision was performed to ensure good hemostasis, extending from the second molar to the central incisor. Beveled oblique incisions in the interproximal areas were outlined connecting the intrasulcular ones. Those oblique incisions were oriented towards the center of rotation of the flap that corresponds to the deepest recession of the area. No vertical releasing incisions were used. A split-thickness flap was raised up to the base of the papillae followed by a full-thickness elevation. The mucoperiosteal flap was then raised to the mucogingival junction. From that point on, a split-thickness flap was designed so that the periosteum could be completely released and the masticatory muscles insertion detached. By doing so, complete flap freedom was established in a coronal

Figs 25 to 30 Maxillary right quadrant coronal flap surgical procedure.
Fig 25 Preoperative view.

Fig 26 Surgical incisions: interproximal beveled oblique incisions are outlined towards the flap center of rotation and then connected by intrasulcular ones.

Fig 27 Flap elevation is performed in a mixed thickness fashion (split, full, split).

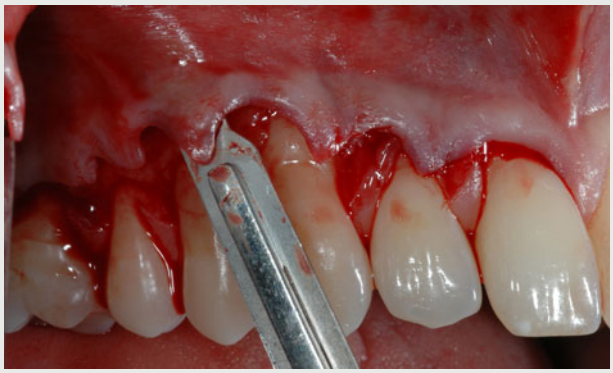

Fig 28 Release of the periosteum and separation of the masticatory muscles insertion at the base of the flap.

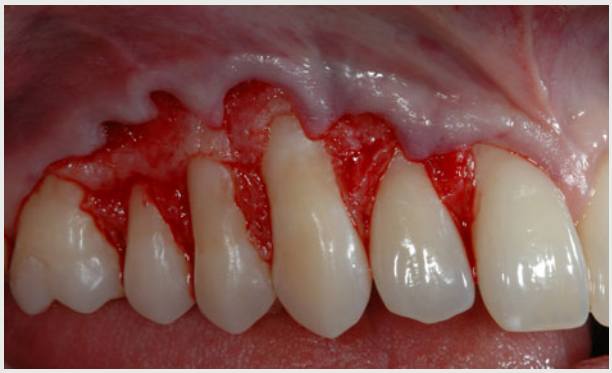

Fig 29 The papillae have been de-epithelized and the root surface has been prepared to receive the flap.

Fig 30 The flap is positioned coronally using passive sutures.

Figs 31 to 36 Surgical procedure in the maxillary left quadrant.
Fig 31 Preoperative view.

Fig 32 A coronally advanced flap was designed with a distal vertical releasing incision to increase flap mobility. Note the submarginal incision on tooth 22 to avoid excessive coronal displacement of the flap at the proximal teeth not affected by recessions.

Fig 33 Flap elevation.

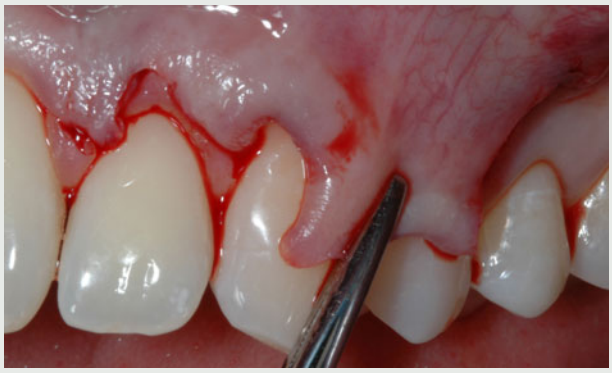

Fig 34 A great degree of coronal flap displacement was achieved after periosteum and muscle insertion separation.

Fig 35 The papillae were de-epithelized and the root surface was prepared to receive the flap.

Fig 36 Flap is sutured into position.

direction with virtually no or minimal tension. Root preparation was also performed using hand and sonic instrumentation. A light root preparation was used to achieve a biocompatible surface in order not to flatten out the root convexity. This approach seems to be supported by recent findings that questioned the utility of an aggressive root preparation modality.[34] The residual interproximal papillae were carefully de-epithelized to provide a good recipient bed for flap stability. At this point, the flap was moved into position and a tension-free stabilization was achieved using 5-0 resorbable sutures. To further reduce any flap micromovements, a horizontal mattress suture was performed buccally across the entire flap extension.

In the upper left quadrant, a modified surgical technique of the same coronally advanced flap was used (Figs 31 to 36). Due to the reduced flap extension compared to the upper right quadrant, a distal vertical releasing incision was carried out to increase flap mobility. Furthermore, a submarginal incision on tooth 22 was outlined to avoid excessive coronal displacement of the flap at the proximal teeth not affected by any recession defect but included in the surgical flap. This may prevent undesired flap tension and improves tissue adaptation. Postoperative management included an anti-inflammatory medication (ibuprofen 400 mg twice a day) and chlorhexidine 0.2% mouthwash twice a day until the sutures were removed and brushing could be resumed. The sutures were removed about 15 days later. The healing was uneventful (Figs 37 to 42). The patient was placed on a recall schedule every 4 months. Complete coverage of the recession defects was achieved, and no hypersensitivity was reported by the patient. The 12-month follow-up showed an excellent esthetic result with a physiological integration of the restorative material with the new gingival architecture (Figs 43 to 45). In this case and in accordance with other reports[35,] an increase in the band of keratinized gingiva seems to have taken place.

Discussion

NCCLs associated with gingival recessions may be considered one of the main esthetic concerns in modern dentistry. Recent epidemiological data showed that 65% of NCCLs are located in the maxillary arch. The teeth most frequently involved are the first premolar (26%), first molar (25%), second premolar (20%), and canine (20%).[5] Therefore, disruption of the gingival architecture combined with erosive/abrasive lesions may result in gingival asymmetry and alteration of the clinical crown height. Whenever these features are combined with a high smile line or a broad lateral fullness, a negative esthetic perception of the smile may result.

Recent clinical studies have reported the short-term results of a restorative-periodontal combined approach in the treatment of NCCLs associated with gingival recession.[10-13,36] Composite[10] or resin modified glass-ionomer restorations[11-13] were used to treat the cervical lesions. Thereafter, the residual recession defects were corrected either with a coronally advanced flap[10,11,] or with a connective tissue graft.[12,13,36]

The presence of a restoration not only did not have any negative effect on the degree of root coverage, but significantly improved the esthetic outcome of the therapy and reduced dental hypersensitivity.






Figs 37 to 39 Frontal and lateral views of the maxillary arch after the correction of the mucogingival defects was accomplished.

Figs 40 to 42 Frontal and lateral view of the maxillary arch 6 months after surgery.

Despite the limited histological evidence on this combined therapy[37,38], it has been shown that long junctional epithelium and connective tissue attachment formation are directly related to the degree of finishing and the compatibility of the restoration material. The absence of any significant alteration of periodontal clinical parameters (bleeding on probing, clinical attachment level, pocket depth) over time seems to be justified by the absence of any violation of the biological width.[13] It may be that this combined periodontal-restorative approach has several advantages. From a restorative standpoint, the reduced extension of the filling placed 1 mm apical to the

Figs 43 to 45 Frontal and lateral view of the maxillary arch 1 year after the treatment. Optimal esthetics were achieved through a complete integration of the cervical restorations with the new gingival architecture.

Fig 46 Side-by-side treatment sequence from left to right including preoperative view, restorative treatment, and plastic surgery outcome: **(a)** tooth 13, and **(b)** teeth 16 to 14.

line of root coverage, will significantly reduce the biomechanical stress placed on the restoration by functional or parafunctional movements. The bending movement between the clinical crown and the root at the cervical area has been shown to be a contributing factor to the initiation and progression of NCCLs.[7,25] At the same time, the same mechanism may be involved in the mechanical failure of the adhesive restoration. Furthermore, the supragingival location of the operative field allows a simplified isolation without interfering with the marginal periodontium. Also, finishing and polishing procedures of the restoration are enhanced, and a delayed approach as suggested by many authors is possible without any further trauma to marginal tissues. Delaying polishing for 24 hours has been claimed to improve gap formation and surface quality of composite cervical restorations.[30,31] From a periodontal standpoint, the restoration of a clinical CEJ and the creation of a physiological emergence profile provide guidelines for fine surgical planning while enhancing flap adaptation. The precise adaptation between the marginal keratinized tissue of the flap and the convexity of the restored clinical crowns favored by the sling sutures, minimize the exposure of the blood clot to the oral cavity and in turn increase the space between the soft tissues and the root. This space will be occupied by a stable coagulum that will mature to connective tissue. This might be responsible for the increase in buccal soft tissue thickness following coronally advanced flap procedures (Figs 46 and 47). Also, patient home care and maintenance may be improved by restoring physiological tooth proportion and gingival architecture.

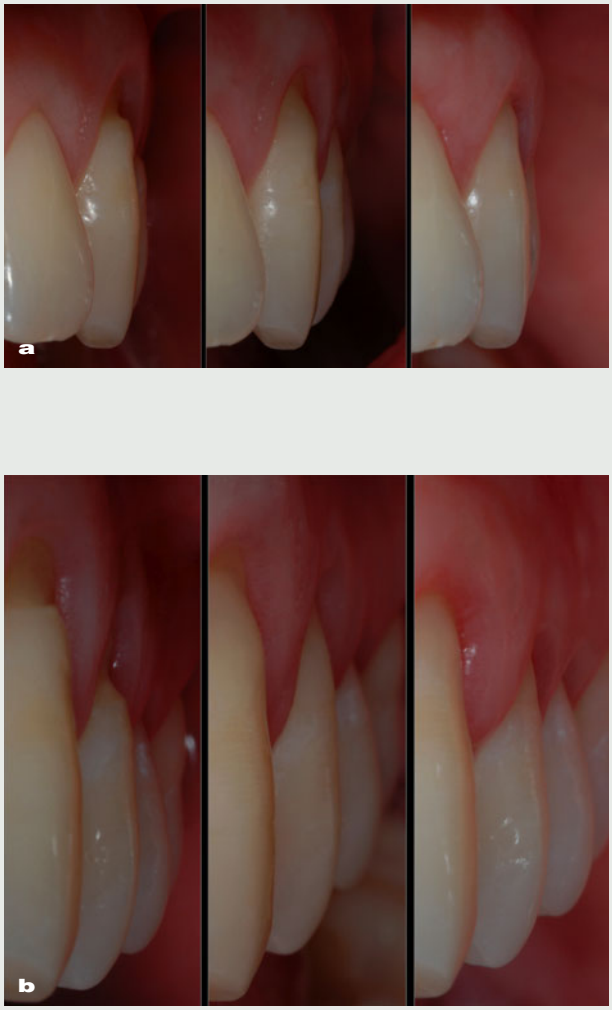

Fig 47 Side-by-side treatment sequence from left to right including preoperative view, restorative treatment, and plastic surgery outcome: **(a)** tooth 23, and **(b)** tooth 24.

Conclusion

In conclusion, NCCLs associated with gingival recessions require the combined periodontal and restorative efforts of the dental team. A careful diagnosis and timing of the treatment strategy are the key factors in achieving predictable results. Long-term data on a large population is warranted.

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