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Multiple root coverage with subepithelial connective tissue graft, 8-year follow-up: A case report.

Cobertura radicular múltiple con injerto de tejido conectivo subepitelial, seguimiento de 8 años: Caso clínico

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Abstract:

Some challenges of root coverage with connective tissue graft are donor site morbidity and patient cooperation for long-term treatment follow-up. **Objective:** to show a case of root coverage of multiple maxillary and mandibular recessions, with a graft of subepithelial connective tissue and its 8-year follow-up. **Materials and method:** multiple root coverage was performed using different surgical techniques. And coronally advanced flap technique with or without subepithelial connective tissue graft. **Results:** at 6 months, with the connective tissue graft technique with coronally advanced flap in upper and lower posterior teeth (CT + CAF), the percentage of root coverage was 95.51%, at 8 years 83.33%, in the upper posterior teeth on the left side, with the coronally advanced flap (CAF) technique an initial coverage of 93.3% was obtained, and there was no difference at 8 years, with the (CT + CAF) technique in upper anterior teeth it was 97.37% without a significant difference at 8 years, with the tunnel technique with connective tissue graft (CT + tunnel) in lower central and lateral incisors teeth had a percentage of coverage at 6 months of 73.10%, at 8 years it was 88%, percentage of bleeding less than 10%, significant aesthetic improvement. **Conclusions:** The coronally advanced flap technique with or without connective tissue allowed obtaining a partial percentage of root coverage and stability of the interproximal bone for eight years in Miller's Class III multiple recessions. In this clinical case, traumatic tooth brushing was modified and periodontal control was obtained.

Keywords:

Root coverage, coronally advanced flap, connective tissue, non-Carious root lesions, multiple root coverage

Resumen:

Algunos de los desafíos de una cobertura radicular con injerto de tejido conectivo son la morbilidad del sitio donante y la cooperación del paciente para el seguimiento a largo plazo del tratamiento. **Objetivo:** presentar un caso de cobertura radicular de recesiones múltiples maxilares y mandibulares, con injerto de tejido conectivo subepitelial y su seguimiento a 8 años. **Materiales y métodos:** se realizó cobertura radicular múltiple con combinación de técnicas quirúrgicas, técnica de colgajo desplazado coronal con o sin injerto de tejido conectivo subepitelial. **Resultados:** a los 6 meses, con la técnica de injerto de tejido conectivo con colgajo desplazado coronal en dientes posteriores superiores e inferiores (ITC más CDC), el porcentaje de cobertura radicular fue del 95.51 % a los 8 años 83.33 % , en los dientes posteriores superiores del lado izquierdo, con la técnica de colgajo desplazado coronal (CDC) se obtuvo una cobertura inicial del 93.3% no hubo diferencia a los 8 años, con a la técnica de (ITC más CDC) en dientes anteriores superiores fue del 97.37% sin diferencia significativa a los 8 años, con la técnica de túnel con injerto de tejido conectivo ITC + túnel dientes incisivos centrales y laterales inferiores tuvo como porcentaje de cobertura a 6 meses el 73.10%, a los 8 años fue del 88%, porcentaje de sangrado menor al 10%, mejora estética significativa. **Conclusiones:** la técnica de colgajo desplazado coronal con o sin tejido conectivo permitió obtener un porcentaje parcial de cobertura radicular y estabilidad del hueso interproximal durante ocho años, en recesiones múltiples clase III de Miller, en este caso clínico se modificó el cepillado traumático y se obtuvo control periodontal.

Palabras Clave*:*

Cobertura radicular, colgajo desplazado coronal, tejido conectivo, lesiones radiculares no cariosas, cobertura radicular múltiple

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INTRODUCTION

The gingival recession has been defined as the apical migration of the gingival margin concerning the cement-enamel junction or the platform of an implant, generating periodontal attachment loss level.[1-3] Advanced gingival recession is considered a complex mucogingival problem, this condition generates the loss of alveolar bone and bone around implants, cementum, ligament, and mucosa. For this reason, periodontal recession has been suggested as the term.[4,5]

A study determined the prevalence of gingival recession in European patients, where it was observed that all patients had at least one tooth with recession, and 42% had a recession of 4 to 8 mm, demonstrating a significant association between maximum recession and age.[5]

The consequences of the presence of gingival recessions are mainly dentin hypersensitivity, non-carious cervical lesions, cervical erosion, and unsightly gums, including root caries; gingival recession is a retention factor for dentobacterial plaque due to the difficulty in carrying out oral hygiene.[4-7]

Gingival recession should be considered as a multifactorial condition. It is currently known that chronic inflammatory periodontal disease, occlusal trauma, chronic trauma, aggressive or traumatic brushing, and periodontal treatment (periodontal resective surgery) can lead to the presence of oral recessions.[8-10]

There are anatomical conditions, dental position, and orthodontic treatments that could generate tooth movement at the expense of the external bone cortex or decrease in the thickness of the alveolar bone crest, which produces bone dehiscence, orthodontic movement alone doesn't cause a gingival recession, in addition, the thickness of the periodontal tissues must be considered, muscle traction, the insertion of the labial frenulum, which favors the onset of gingival recession.[9-11]

Several surgical treatments aim to achieve root coverage, whether multiple or unitary. Among the most used surgical techniques are the pedunculated flaps, such as coronally advanced flaps and rotational flaps.[1] Pedicled grafts that have been used since the 20th century.[11] Another option for root coverage is free gingival grafting, which has been offered as an alternative in which gingival recession occurs when there is a deficient width of the adhered gum and a decrease in the depth of the vestibular sac fundus.[6]

A review concluded with data analyzed in the short term of one year, that one of the surgical treatment alternatives for treating gingival recessions when there are aesthetic demands or dental sensitivity, without loss of interproximal tissues, is achieved with a coronally advanced flap with a connective tissue graft. However, the degree of decrease in dental sensitivity is not known.[12]

The coronally advanced flap alone or associated with biomaterials or procedures such as guided tissue regeneration are options for treating multiple or unitary gingival recession. Using subepithelial connective tissue suggests a slight improvement when root coverage and keratinized tissue augmentation are required.[13]

Orthodontic treatment cannot resolve cases of gingival recession as the only treatment. Since a periodontal approach will always be recommended, one of the manifestations of occlusal trauma is the presence of v-shaped gingival recessions and the presence of non-carious root lesions, orthodontic correction of interference and occlusal trauma; it can reduce a surgical intervention of the site, due to the possibility of reversal of gingival recession.[10]

Available evidence indicates that gum regeneration includes free gingival grafts, coronally advanced flaps alone or with subepithelial connective tissue grafts, acellular dermal matrix grafts, enamel matrix protein, xenogenic matrix, laterally advanced flaps, and guided tissue regeneration, the information from the use of platelet-rich fibrin associated with coronally advanced flap is not comparable to the above.[13]

Regarding gingival recession treatment, it has been indicated that the outcome depends on the skill and experience of the operator and the individual characteristics of each case.[6]

Miller's classification of 1985 (Table 1)[14], together with a new Cairo classification system in 2011[15,16] (Table 2), is the most widely used in the literature, in which three types of gingival recession are identified. RT2 and RT3 gingival recessions have been associated with defects linked with periodontitis.[15,16]

Table 1. *Miller's classification of 1985.*[14]

Class	Description
Class I	Recession of the gingival margin doesn't extend to the mucogingival junction. There is no periodontal loss in the interdental area, and a root coverage of 100% is justified.
Class II	It's a gingival recession that is characterized by extending to or beyond the mucogingival junction. There is no periodontal loss in the interdental area, and a root coverage of 100% is expected.
Class III	Gingival recession extends to or beyond the mucogingival junction, with loss of interdental periodontal tissue or malposition of the teeth. Partial coverage.
Class IV	Gingival recession extends to or beyond the mucogingival junction and presents severe loss of interdental periodontal tissues. Therefore, coverage can't be anticipated.

One of the classifications gives categories and quantifies the extent of non-carious root lesions associated with recessions and evaluates the presence and absence of the cement-enamel bond in two groups, **Class A** detectable CEJ and **Class B** CEJ non-detectable. Another evaluating aspect is the presence of concavities, root abrasions, or **Class + steps** that indicate the presence of a step greater than 0.5 mm. **Class –** reveals the

absence of a cervical step. This classification gives value to the diagnosis of the cement-enamel junction because it is remarkably relevant as a reference for the diagnosis and measurement of the depth and breadth of gingival recession measurements (Table 3).[17]

Table 2. *Cairo's classification of gingival recession 2011.*[15,16]

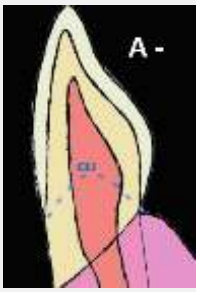
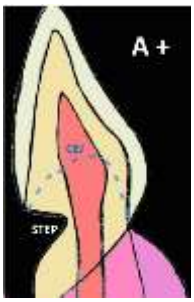
Class	Description	Image
RT1	Gingival recessions with no loss of the level of interproximal attachment.	
RT2	A type of recession in which an interproximal loss of periodontal tissues is less than or equal to the oral site.	
RT3	Gingival recession showing greater interproximal loss than the oral site.	

The importance of the classification mentioned above lies in the fact that one of the frequent problems during the surgical procedure is the location of the flap at the time of suturing, since the coronal position of the gingival margin concerning the cement-enamel junction CEJ is extremely important to obtain a complete root coverage, therefore, failure to identify the cement-enamel bond could compromise the results of root coverage.[18,19]

When there is a significant discrepancy in the root surface (step) caused by traumatic abrasion from tooth brushing or erosion of hard tissue, it may make it difficult to position the connective tissue during surgery and the positioning of the flap.[20]

A meta-analysis determined that non-carious root lesions lead to gingival recession and that there are restorative dental and surgical procedures in combination for their treatment; from the analysis of 222 studies, only 13 were selected for the evaluation and extraction of the data, it was concluded that in teeth with non-carious root lesions in combination with the presence of root recessions, when non-carious root lesions are restored, the percentage of root coverage is not altered. However, dental hypersensitivity is significantly reduced and patients' aesthetic satisfaction increases.[21]

Table 3. *Pini Prato's Classification of Non-carious Root lesions in Association with Gingival Recessions.*[17]

Class	Presence or absence of a step	Categories	Image
Class A Detectable CEJ	-	CEJ visible without step	
Class A Detectable CEJ	+	CEJ visible with step	
Class B Non-detectable CEJ	-	CEJ not visible without step	
Class B Non-detectable CEJ	+	CEJ not visible with step	

*CEJ: Cement-enamel junction

BRUNO'S SURGICAL TECHNIQUE FOR ROOT COVERAGE

It is a root technique that avoids the use of liberating incisions. For the recipient site, the initial horizontal incision is made at a right angle at the level of the papillae, slightly coronal to the cement enamel union of the teeth with exposed root, continuing with an incision inside the gingival sulcus, with the same angulation, the dissection of the partial thickness flap is performed using an acute dissection that will avoid perforation of the flap, dissection is performed beyond the mucogingival junction. The exposed root surface should be meticulously smoothed, and even drills can be used to smooth the root surface; conditioning the root surface with tetracycline is indicated.[22] For the donor site, the first incision is made perpendicular to the axial axis of the roots, 2 to 3 mm apical to the gingival margin of the teeth of the donor site. The incision extends in a mesiodistal direction, the size of which is dependent on the needs of the recipient site. The second incision is made parallel to the axial axis of the teeth from 1 to 2 mm apical to the first incision, internal incision liberators are made, and the connective tissue is raised with an elevator periosteal, the 1 to 2 mm band of epithelialized connective tissue of the palate can be removed, sutured with suture 4-0 in the form of a suspensory cross suture.[22] At the recipient site, the connective tissue graft is secured with suture 6-0, the flap is moved coronally and if the non-de-epithelialized tissue band is not removed, the connective tissue is not completely covered, the flap suturing technique is discontinuous in the mesial and distal papillae, surgical dressing and suture are removed after 7 days. Chlorhexidine is prescribed every 12 hours for 7 days.[22]

COMPLICATIONS OF ROOT COVERING SURGICAL PROCEDURES

Root-covering surgical procedures have been associated with bleeding, pain, inflammation and infection.[23] The result of root coverage processes is related to the systemic habits and conditions of the patients, within which hygiene habits (horizontal brushing technique) must be considered, which influences the generation of gingival recessions and bad habits. Additionally, smoking can negatively affect wound healing, by causing vasoconstriction, altering vascularity, and impairing both the immune and inflammatory responses, as well as the regenerative potential of connective tissue.[24,25] Intraoperative complications during root cover surgery include bleeding due to injury of the palatal artery[26], and can also occur due to inadequate medical evaluation before surgery, the use of anticoagulant and nonsteroidal anti-inflammatory drugs, and herbal dietary supplements[27]; other intraoperative complications include perforation of the flap and lesions of the mental nerve.[28] As for postoperative complications, pain, bruising, inflammation, primary bleeding from the site, flap necrosis, residual hypersensitivity, incomplete root coverage, flap dehiscence, exposure of biomaterials, keloid scarring, exposure of connective tissue, external resorption may occur. Therefore, an adequate preoperative and clinical evaluation is very relevant to avoid the aforementioned complications.[29]

CLINICAL CASE

This clinical case reports the treatment of multiple root coverage with coronally advanced flap technique, with subepithelial connective tissue graft, in combination of tunnel technique and coronally advanced flap alone, with 8 years of follow-up from 2012 to 2020, which was carried out under the authorization and signing of the informed consent according to the Regulations of the General Health Law on Health Research in Mexico, Article 20 and according to the Declaration of Helsinki of 1964.

A healthy 44-year-old female patient was treated for a consultation: "My gums are going down, and my teeth look bigger." She was received and treated for a diagnosis of moderate generalized periodontitis, secondary occlusal trauma, traumatic brushing, and central bruxism.

OBJECTIVE OF TREATMENT

To obtain a partial percentage of root coverage, increase, keratinized tissue, modify traumatic tooth brushing, periodontal control and maintenance, secondary occlusal trauma control, and centric bruxism.

CLINICAL PROCEDURE

Periodontal diagnosis was made: Moderate Generalized periodontitis, multiple Miller's gingival recession Class III, according to the Cairo's classification[15,16] of gingival recessions RT2, derived from the previous diagnosis, periodontal treatment phase I was performed, modification of brushing technique and type of brush, (scaling and root planing), the patient performed horizontal brushing technique and stiff-bristled brushes, force exceeded, she continuously presented ulcerations associated with tooth brushing. Once the oral hygiene habit was controlled, surgical coverage was performed by quadrants. According to Pini Prato's classification[17] of non-carious root lesions, it was determined that the patient had type A+ lesions in teeth 14,13,11,21,26,44,45,43,41,32,33,36, and type A- lesions in teeth 12,31 and 42, B+ lesions in teeth 25,24,45,16,15. (Figure 1).

Figure 1. Initial photograph, showing the presence of non-carious root lesions and gingival recessions, dental malposition and ulcerations due to traumatic brushing, mismatched restorations.

FIRST SURGICAL EVENT

A surgical procedure was performed with the technique of a coronally advanced flap of the right upper quadrant with Bruno's surgical technique 1994[22], with horizontal incisions at the level of cement-enamel junction, with total partial thickness, the papillae were de-epithelialized, dentinplasty was performed with a high-speed diamond drill on the root surfaces with the presence of a step, subepithelial tissue was obtained of the palate, flap was sutured with polyglycolic acid 5 0, with tension-free suture technique, analgesic and anti-inflammatory were prescribed, soft diet, 0.12% chlorhexidine rinse every 12 hours per day, no intraoperative and postoperative complications were presented (Figure 2).

Figure 2. Right upper quadrant root coverage with coronally advanced flap technique and subepithelial connective tissue graft of the palate.

SECOND SURGICAL EVENT

A right lower quadrant surgical periodontal procedure was performed with Bruno's surgical technique 1994[22], coronally advanced flap, with horizontal incisions at the level of cement-enamel junction, with total partial thickness, the papillae were de-epithelialized, a tunnel technique was performed in the area of the lower central and lateral incisor teeth, dentinplasty was performed with a high-speed diamond drill to reduce the steps of the Non-carious root lesions, subepithelial tissue of the palate was obtained, flap was sutured with polyglycolic acid suture 5-0, with tension-free suture technique, analgesic and anti-inflammatory were prescribed, soft diet, 0.12% chlorhexidine rinse every 12 hours per day, the procedure presented no complications (Figure 3).

Figure 3. Root coverage with right lower quadrant subepithelial connective graft.

THIRD SURGICAL EVENT

The root covering procedure of the two left quadrants was carried out, and these events are described below.

A surgical technique was performed for root coverage of the left upper quadrant, with a coronally advanced flap alone, because a connective tissue graft could not be obtained due to the limitation of tissue donation due to the events described above. Horizontal incisions were made at the level of the enamel cement and total partial thickness flap joint, dentinplasty was performed with a high-speed diamond drill to reduce the steps of non-carious root lesions, the exposed root surface was smoothed, flap was sutured with polyglycolic acid 5 0, with tension-free and suspensory suture technique, analgesic and anti-inflammatory were prescribed, soft diet, 0.12% chlorhexidine rinse every 12 hours per day.

The coronally advanced flap was performed with a left lower quadrant connective tissue graft, using Bruno's surgical technique 1994[22], planing root only of the exposed root surfaces and root dentinplasty to reduce the step at the cervical root level. Flap was sutured with polyglycolic acid 5 0, with a tension-free suspensory suture technique, analgesic and anti-inflammatory were prescribed, soft diet, 0.12% chlorhexidine rinse every 12 hours per day, intramuscular corticosteroid single dose. There were no complications during or after the surgical event (Figure 4).

For all surgical procedures, the suture was removed 2 weeks postoperative. At the end of the root coverage procedures, she was referred to her orthodontic care for control of secondary occlusal trauma and centric bruxism, in addition to the optimization of space for the future placement of an endosseous dental implant in the area corresponding to the left upper canine tooth.

Figure 4. Coronally advanced flap with subepithelial connective tissue graft, left lower quadrant.

RESULTS AND POST-SURGICAL FOLLOW-UP

The periodontal evaluation was performed, and the results at 6 months were as follows: with the connective tissue grafting technique with a coronally advanced flap in the upper right and lower right and left posterior teeth (CT + CAF), the percentage of root coverage was 95.51%, in the upper left posterior teeth

where the coronally advanced flap technique alone (CAF) was carried out, a coverage of 93.3% was obtained. As for the (CT + CAF) technique in upper anterior teeth was 97.37%, CT + tunnel central and lateral incisor teeth had a percentage of coverage of 73.10%, and the bleeding percentage was less than 10% (Table 1).

One year after the surgical procedure, orthodontic treatment was started to control occlusal trauma. The results did not change concerning the bleeding percentage at probing and root coverage.

In the postoperative year 8, the results obtained achieved periodontal health, reduced healthy periodontium, partial root coverage, and considerable aesthetic improvement, control of non-carious root lesions due to their persistence, especially in the area of upper posterior teeth (treatment of central bruxism was resumed) with occlusal guard, absence of periodontal pockets and decrease in tooth sensitivity and considerable aesthetic improvement.

The results of root coverage percentage after 8 years were comparable to those obtained at 6 months postoperative, with the technique of grafting connective tissue in upper and lower posterior teeth (CT + CAF), it was 83.33%, in the upper posterior teeth of the left side, where the coronally advanced flap technique (CAF) was carried out, and coverage of 93.3% was obtained. As for the (CT + CAF) technique in upper anterior teeth is 97.37%. CT + tunnel central and lateral incisor teeth had a coverage percentage of 88% and a bleeding percentage of less than 10% (Table 4). Figure 5 shows the postoperative clinical photograph 8 years after periodontal root cover plastic surgeries.

***Table 4**. Percentage of root coverage at 6 and 8 years postoperative.*

Sites and technique used	Root Coverage Percentage 8 years	Root Coverage Percentage 8 years
CT+CAF, coronally advanced flap with connective tissue graft in upper and lower posterior teeth.	95.51%	83.33%
CAF, Coronally advanced flap only, in upper posterior teeth.	93.3%	93.3%
CT+CAF, Coronally advanced Flap Connective with Tissue Graft in Upper Anterior Teeth.	97.37%	97.37%
CT + tunnel, Tunnel technique with subepithelial connective tissue graft. Lower central and lateral incisor teeth.	73.10%	88%

It is worth mentioning that the radiographic condition of the alveolar bone remained stable during the 8 years following the start of periodontal treatment. However, the prosthetic treatment was postponed due to the patient's economic condition. No symptoms or pulp pathology have been reported. Additionally, in the seventh year of surgery, an endosseous implant was placed in the area of the left upper canine tooth.

Figure 5. Photograph showing the post-surgical clinical results at 8 years of treatment, after orthodontic treatment.

The condition of the alveolar bone has remained stable, so her periodontal diagnosis until 2020 was a healthy reduced periodontium (Figures 6 to 8).

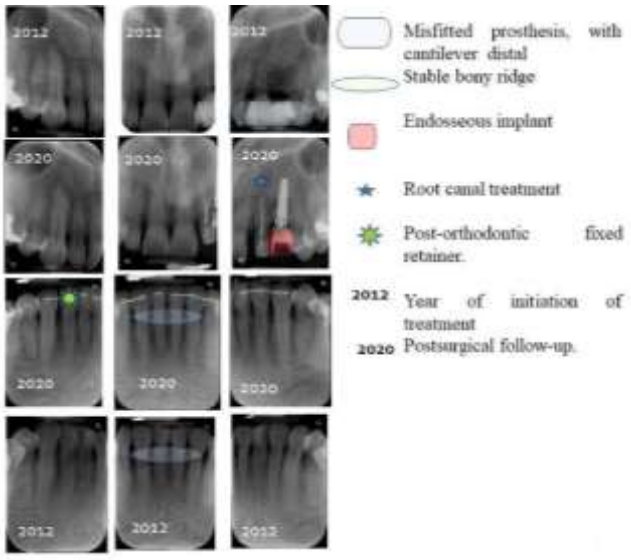


Figure 6. It shows the condition of the alveolar bone of incisors and canines, which remained stable from 2012 to 2020, and it also shows the changes in the dental treatment made in the course of their care.

DISCUSSION

A randomized controlled clinical trial determined that single gingival recession root coverages with loss of interdental attachment level are stable after 3 years, and the coronally advanced flap surgical technique with connective tissue grafting was associated with a high probability of obtaining complete root coverage.[16] In the clinical case, root coverage was performed with subepithelial connective graft in sites with loss at the insertion level. 97.37% and 83.33% were obtained for partial root coverage.

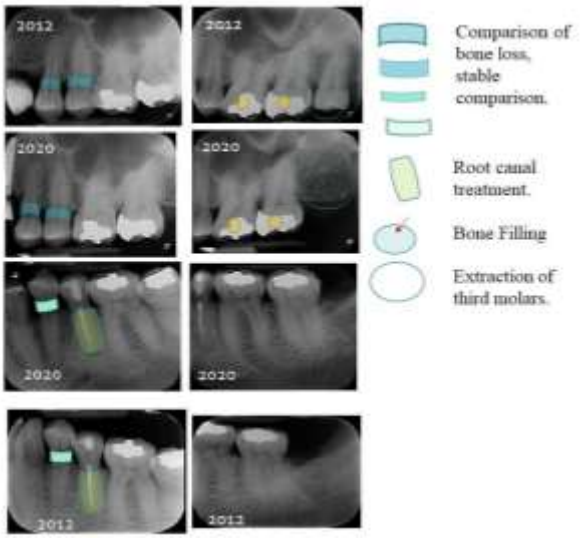


Figure 7. A comparison of the bone alveolar condition and radiographic changes of right molars and premolars from 2012 to 2020 was presented, in which bone filling is even observed.

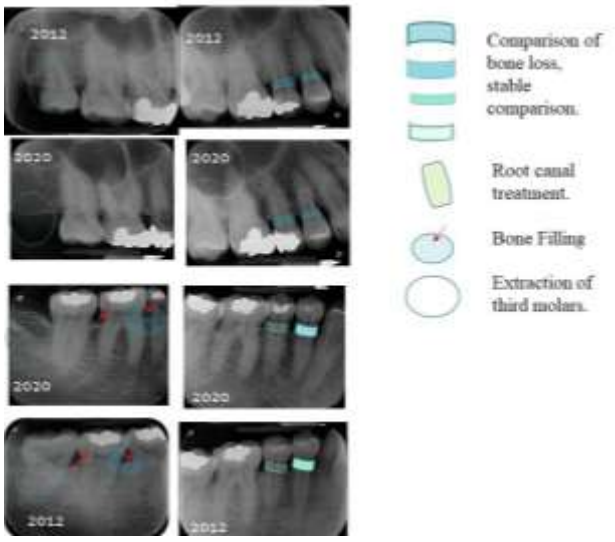


Figure 8. A comparison of the bone alveolar condition and radiographic changes of left molars and premolars from 2012 to 2020 was presented, in which bone filling was also observed.

The coronally advanced flap alone or in conjunction with biomaterials or procedures such as guided tissue regeneration are options to treat multiple or single gingival recession. Using subepithelial connective tissue suggests a slight improvement when root coverage and keratinized tissue augmentation are required.[13]

In this clinical case, we only used the coronally advanced flap with a connective tissue graft and obtained partial root coverage but with long-term stability.

A meta-analysis analyzed 173 randomized clinical trials, with a 6-month follow-up of the efficacy of the tunneling technique against coronally advanced flap, in multiple recession defects and found that the coronally advanced flap technique and the tunneling technique did not reduce complete root coverage. Both have similar primary and secondary outcomes (relative risk 0.65; 95% Confidence Index: 0.002 to 176.7; p = 0.51). The use of grafts did not affect the above results.[30]

One review found that the available literature on the treatment of gingival recession with non-carious root lesions using graft substitutes could not claim that graft substitutes can benefit periodontal outcomes.[31]

To address the loss of dental tissue caused by non-carious root lesions, we aimed to utilize subepithelial connective tissue grafting. However, there was a recurrence, so long-term control of bruxism is suggested, without ruling out restorative treatment.

Aging, interdental periodontal tissue and a band of keratinized tissue of less than 2mm are negative factors that can influence the stability of the gingival margin location during the 20-year observation period.[32]

CONCLUSIONS

The coronally advanced flap technique with or without connective tissue allowed obtaining a partial percentage of root coverage and stability of the interproximal bone for eight years, in Miller's Class III multiple recessions, in this clinical case traumatic tooth brushing was modified, and periodontal control, besides the control of secondary occlusal trauma and centric bruxism, were achieved. Many surgical techniques for coverage root can be used successfully in the long term to treat multiple gingival recessions, even in reduced periodontium, allowing partial root coverage and considerable aesthetic and functional improvement of the patient in the long term.

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