Case report

Microsurgical Coronally Advanced Flap Technique with Platelet-Rich Fibrin and Hyaluronic Acid Gel for Gingival Recession Coverage: A Case Report

ABSTRACT

Background:

Gingival recession, a prevalent condition in periodontics, often necessitates surgical management for associated attachment loss, dentin hypersensitivity, root caries, or esthetic deficiencies. It primarily results from plaque-induced inflammation, mechanical trauma, anatomic factors such as tooth malposition and mucogingival conditions. Numerous techniques, including free gingival autograft, subepithelial connective tissue graft (CTG), etc have been proposed. While the CTG remains the gold standard in terms of predictable outcomes, despite its clinical success, it is associated with inherent patient morbidity due to the need for a second surgical site for tissue harvesting, typically from the palatal mucosa. The coronally advanced flap (CAF) with platelet-rich fibrin (PRF) and hyaluronic acid offers advantages over the subepithelial connective tissue graft (CTG) by reducing patient morbidity, discomfort, and recovery time. It promotes faster healing, superior aesthetic outcomes, and improved tissue integration, while being less invasive than CTG.

Presentation of case: A 43-year-old male presented with concerns of unesthetic appearance and sensitivity in his maxillary right front tooth. Clinically, an isolated Miller's Class I gingival recession was noted at tooth 13, with adequate attached gingiva. Following initial therapy with scaling and root planing, baseline clinical parameters were recorded on the day of surgery. The surgical treatment involved a coronally advanced flap, along with platelet-rich fibrin (PRF) and hyaluronic acid gel, using microsurgical principles. The procedure achieved 95% root coverage and a significant increase in keratinized gingiva. Excellent color matching and improved tissue texture led to a natural aesthetic result. The patient was highly satisfied and experienced minimal postoperative discomfort.

Conclusions: The findings emphasize the importance of keratinized tissue width and gingival thickness in achieving successful root coverage. Utilizing advanced microsurgical techniques in coronally advanced flaps with adjuncts such as platelet-rich fibrin and hyaluronic acid gel resulted in excellent root coverage, significantly improving functional and aesthetic outcomes.

Keywords: Coronally advanced flap, gingival recession, hyaluronic acid, microsurgery, platelet rich fibrin, root coverage

INTRODUCTION

Gingival recession is characterized by the apical displacement of the gingival margin, exposing the root surface beyond the cemento-enamel junction. While "periodontal recession" is a more accurate term, both are used synonymously [1,2]. Gingival recession is a frequent clinical presentation of periodontal disease and is additionally associated with a range of contributing risk factors. Gingival recession results from both precipitating and predisposing factors. Traumatic factors, such as improper

brushing or abrasive agents, lead to mechanical damage, especially in areas with thin gingiva or prominent roots. Periodontal disease causes tissue breakdown and alveolar bone resorption through inflammatory processes, leading to attachment loss. Predisposing factors include thin gingival biotypes, malpositioned teeth, bone dehiscence, and systemic conditions like smoking, diabetes, and hormonal imbalances. Excessive occlusal forces from parafunctional habits can also contribute to recession by stressing periodontal structures. Gingival recession can be localized or generalized and may affect one or multiple surfaces [3].

Surgical root coverage is an effective treatment strategy, particularly when aesthetic concerns are paramount and periodontal health is stable. Several techniques such as pedicle flaps, free epithelialized gingival grafts, guided tissue regeneration, and subepithelial connective graft are employed for gingival root coverage, each with distinct limitations compared to the coronally advanced flap (CAF) combined with platelet-rich fibrin (PRF) and hyaluronic acid (HA). The free gingival graft (FGG) is associated with significant postoperative morbidity, including discomfort and bleeding at the donor site due to healing by secondary intention, and often results in suboptimal color and texture integration with adjacent gingival tissues [4]. The subepithelial connective tissue graft (SCTG), considered as gold standard for recession coverage, provides better aesthetics and long-term stability but shares the drawback of requiring a second donor site, increasing postoperative pain and surgical complexity.

The success and predictability of these procedures are influenced by multiple factors, including the viability and revascularization of grafted tissues over the avascular root surface, the classification and severity of the gingival recession, the anatomical position of the affected teeth, the surgical technique employed, the clinician's level of expertise, and the quality of postoperative management [5]. Among various mucogingival grafting techniques, the coronally advanced flap (CAF) is particularly reliable for Miller’s Class I and II gingival recessions (RT 1 according to Cairo et al 2011), when adequate keratinized tissue is present apical to the defect [6].

A coronally advanced flap (CAF) is a periodontal surgical technique designed to treat gingival recession by repositioning gingival tissue coronally to cover exposed root surfaces. This technique is especially effective for single or multiple adjacent recessions, particularly in patients with esthetic concerns or root sensitivity [2]. The innovative use of second-generation platelet concentrates i.e. Platelet-Rich Fibrin (PRF) that contains a high concentration of growth factors and cytokines, and hyaluronic acid gel in conjunction with CAF aids in optimizing the treatment outcomes for gingival recession [7,8].

Hyaluronic acid (HA) is a vital component of the extracellular matrix in most tissues, primarily functioning to bind water and facilitate the transport of essential metabolites, thereby maintaining structural integrity [9]. In vitro studies show that high-molecular-weight HA products are highly biocompatible and do not hinder healing in gingival tissues by prolonging inflammation or causing excessive matrix metalloproteinase (MMP) expression [10].

Periodontal plastic surgery focuses on developing less invasive techniques that promote rapid healing, minimize discomfort, and enhance patient satisfaction. The introduction of microsurgical loupes has significantly advanced these goals by

providing better illumination and magnification, which enable precise tissue handling and accurate wound edge alignment, facilitating primary intention healing [9]. This innovation has led to the evolution of periodontal microsurgery, initially proposed by Tibbetts and Shanelec and later adapted by de Campos et al. for root coverage procedures, resulting in improved treatment outcomes through minimally invasive techniques [11]

This case highlights the management of isolated Miller's Class I Gingival Recession defects with coronally advanced flap and platelet rich fibrin in conjunction with hyaluronic acid gel when done with the aid of 2.5 X loupes using microsurgical principles.

PRESENTATION OF CASE:

A 43-year-old male patient reported with a chief complaint of the unesthetic appearance and sensitivity in maxillary right front tooth. The patient had no significant medical history. Intraoral examination revealed a single isolated Miller's Class I gingival recession (RT 1) associated with tooth number 13, along with adequate width of attached gingiva (Fig.1). A detailed patient history indicated that he used a hard-bristle toothbrush and employed a horizontal scrubbing technique.

Fig 1: Pre-operative image showing

CASE MANAGEMENT

The treatment commenced by addressing and improving the patient's tooth brushing technique, which was consistently reinforced at subsequent visits. Initial therapy involved Phase I treatment, comprising ultrasonic scaling and root planing, followed by a 2-week maintenance period emphasizing proper brushing habits. The patient was also instructed to use a 0.12% chlorhexidine mouthwash twice daily for one week. Routine hematological tests were conducted, and written informed consent was obtained from the patient.

SURGICAL PROCEDURE:

Baseline clinical parameters were recorded on the day of surgery. Gingival tissue thickness was measured using a file with a rubber stopper, positioned between the gingival margin and mucogingival junction, and recorded with a digital vernier calliper.

Patients rinsed with 10 ml of 0.2% chlorhexidine gluconate before surgery, and the extraoral area was disinfected with 10% povidone-iodine. Local anesthesia (2% lignocaine with adrenaline 1:200,000) was administered via infiltration. Procedures were performed using ×2.5 magnification loupes, microsurgical instruments, and sutures, with all incisions made using an ophthalmic blade (Lancetip type).

PREPARATION OF PLATELET RICH FIBRIN:

L-PRF was prepared following the protocol described by Choukroun et al. (2006).

Phlebotomy using 10 ml blood was collected into glass-coated plastic tubes and immediately centrifuged at 3000 RPM (approximately 400 g) for 10 minutes, resulting in three layers: supernatant serum, fibrin clot, and red blood cells (RBCs). The fibrin clot was separated from the RBC layer, and fluids were gently expressed to obtain PRF as a membrane [12].

A sulcular incision was made around the recipient teeth, extending horizontally into the adjacent interdental areas at the cemento-enamel junction (Fig. 2), and connected to vertical incisions from the line angles of the neighboring teeth (Fig. 3). The exposed root surface was scaled and planed, and the papilla was de-epithelialized to prepare the recipient bed. A full-thickness trapezoidal mucoperiosteal flap was then raised, preserving the interdental papilla (Fig. 4). Hyaluronic acid gel (0.8%) was applied as a conditioning agent to the exposed root (Fig. 6), followed by the placement of a platelet-rich fibrin (L-PRF) membrane over the defect, secured with horizontal stabilizing sutures (Fig. 8 and 9). The flap was coronally advanced and stabilized using sling and interrupted 6-0 silk sutures (Fig. 10) followed by application of periodontal dressing.

Fig. 2: Horizontal incision with ophthalmic blade

Fig. 3: Two vertical releasing incisions with ophthalmic blade

Postoperatively, the patient was prescribed (Ibuprofen 400mg every 6 hours) when needed, antibiotic (Amoxicillin 500 mg every 8 hours for 7 days) and 0.12% chlorhexidine rinse (every 12 hours for 14 days). Sutures and the dressing were removed after 10 days.

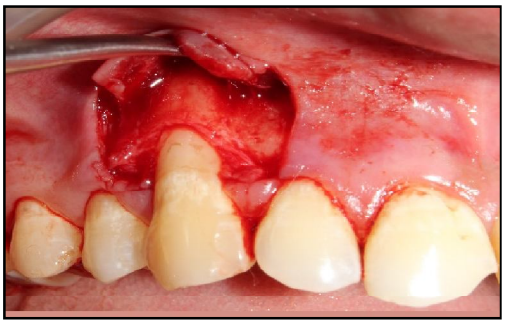

Fig.4: Full thickness flap reflection for recipient site

Fig. 5: Hyaluronic acid gel on applicator

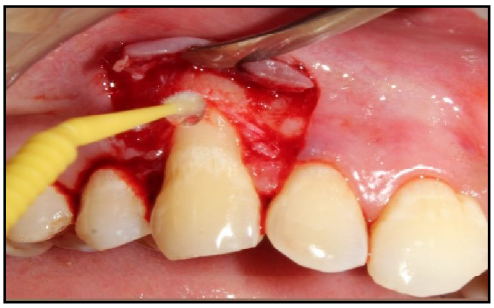

Fig. 6: Application of hyaluronic acid gel to exposed root

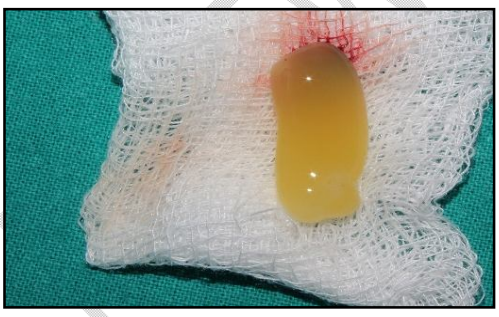

Fig. 7: Platelet rich fibrin (PRF) recession

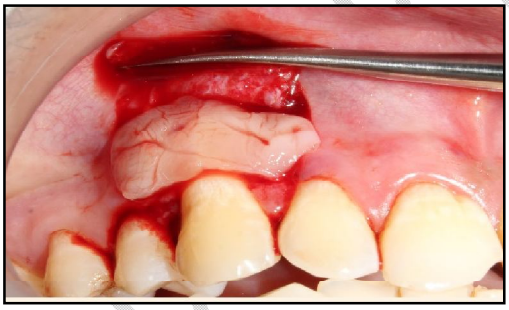

Fig. 8: PRF placement at recipient site

Fig. 9: PRF membrane stabilized with 6-0 silk sutures

Fig. 10: Flap coronally advanced and stabilized with 6-0 silk sutures

RESULTS

The patient was monitored periodically, with follow-up and photographs captured at 6-months post-operatively (Fig. 11). At this final assessment, percentage of root coverage (RC) reached 95 %. A comparison of pre- and post-surgical data, presented in (Table 1), highlights the changes observed over the 6-month period. The postoperative assessment revealed notable enhancements in root coverage, as well as in the texture and color of the tissue. Additionally, there was a noticeable increase in gingival thickness (GT).

Table 1: Clinical data comparing clinical parameters at baseline and 6 months post-operatively

CLINICAL PARAMETERS	BASELINE	6 MONTHS
Gingival Recession Depth (mm) (GRD)	4	0.2
Gingival Recession Width (mm) (GRW)	3.5	0.5
Gingival Thickness (mm) (GT)	1.51	1.60

Fig. 11: Image showing healing at 6 months

DISCUSSION:

The amount and thickness of keratinized tissue width (KTW) and gingival thickness (GT) have been shown as predictors for ideal root coverage outcomes, with thicker tissues and a greater amount of residual keratinized tissue pre-operatively considered as favourable. Keratinized tissue provides a protective barrier against mechanical irritation and microbial invasion, thus enhancing the long-term prognosis for the affected teeth. Thus, increase in keratinized tissue also contributes to the aesthetic appearance of the gingiva [13]. Clinicians opt for a coronally advanced flap or a sliding flap when there is a substantial amount of residual keratinized tissue. Many a times, a graft is placed under the flap when the keratinized tissue is insufficient in thickness and width. However, the involvement of a second surgical site increases patient morbidity. Therefore, newer approaches have been developed using PRF as an adjunct to replacing grafts in root coverage procedures [6,14].

Platelet-rich fibrin (PRF) is rich in cytokines and growth factors like PDGF, TGF-β, and VEGF, which play key roles in wound healing by regulating inflammation, angiogenesis, and enhancing tissue biotype and thickness through tissue regeneration. Studies [16,17] have shown that these cytokines are naturally embedded within the fibrin mesh, allowing for their gradual release as the fibrin degrades, ensuring sustained bioavailability. Furthermore, the PRF membrane also acts as a biological bandage, providing a scaffold for cell migration and protection, accelerating wound healing and soft tissue recovery [18].

In this case, a remarkable root coverage percentage of 95% was achieved, indicating a high level of success in the surgical intervention aimed at restoring the gingival tissue over the exposed root surfaces. This significant coverage can be attributed to the well-known angiogenic properties of HA, its role as a hydrating agent, and its ability to enhance the motility of lymphocytes, inflammatory cells, and connective tissue cells [19]. When applied to dentin and cementum, HA improves surface roughness and enhances the adhesion and spreading of human periodontal ligament (PDL) cells. Additionally, HA exhibits a range of beneficial properties, including bacteriostatic, fungistatic, anti-inflammatory, anti-edematous, and osteoinductive effects. Recent studies have demonstrated that the adjunctive use of HA in the surgical treatment of periodontal and mucogingival defects leads to promising outcomes [20,21].

Furthermore, the procedure was conducted using 2.5x magnification with a pair of loupes. The American Academy of Periodontology (AAP) states that magnification can greatly improve root coverage outcomes by facilitating smaller, more precise incisions while minimizing tissue trauma. This enhanced visibility contributes to meticulous tissue handling and the accurate placement of grafts and sutures [22,23].

Studies by Huang et al., [24] demonstrated that an initial gingival thickness of over 1.2 mm is a strong predictor of success for root coverage in coronally advanced flap (CAF) procedures, with 100% coverage achieved in 14 out of 23 patients six months post-surgery. Additionally, Pilloni et al., [25] found that incorporating hyaluronic acid (HA) significantly enhances root coverage in CAF surgeries, resulting in a mean coverage of 93.8% compared to 73.1% in the control group.

Prior studies [26,27] have also shown a significant increase in gingival thickness associated with the use of hyaluronic acid, which was reflected in this case, showing an increase of 0.4 mm. In the current case report, the procedure not only achieved optimal root coverage but also restored the natural gingival contour and provided excellent color matching. This technique has been recognized as promising, showing success in both clinical parameters and patient-centered outcomes, such as reduced surgical time and enhanced esthetics.

CONCLUSION

In conclusion, the discussed findings emphasize the importance of keratinized tissue width and gingival thickness in achieving successful root coverage outcomes. The use of advanced surgical techniques, such as coronally advanced flaps, along with adjuncts like platelet-rich fibrin and hyaluronic acid, significantly enhances clinical outcome while minimizing patient morbidity. The impressive root coverage percentage of 95% achieved in this case reflects the efficacy of these modern approaches, underscoring their potential to improve both functional and aesthetic outcomes in periodontal treatments. Overall, these advancements represent a pivotal shift in periodontal practice, providing clinicians with effective strategies to optimize patient care and satisfaction.

CONSENT

As per international standard or university standard, patients' written consent has been collected and preserved by the author(s).

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