

## Original Article

# Clinical evaluation of Class II and Class III gingival recession defects of maxillary posterior teeth treated with pedicled buccal fat pad: A pilot study

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## ABSTRACT

**Background:** Buccal fat pad (BFP) is a specialized vascular tissue adequately present in buccal space and is close to the maxillary posterior quadrant. The aim of this clinical study was to evaluate the utility of pedicled BFP (PBFP) in the treatment of Class II and III gingival recession.

**Materials and Methods:** Ten systemically healthy patients with age ranging from 35 to 55 years with Class II and Class III gingival recession in the maxillary molars were selected. Before the surgical phase, patients were enrolled in a strict maintenance program including oral hygiene instructions and scaling and root planing. A horizontal incision of 1–1.5 cm was made in the buccal sulcus of the maxillary molar region; buccinator muscle was separated bluntly to expose the BFP. The fat was then teased out from its bed and spread to cover defects adequately. It was then secured and sutured without tension. Clinical parameters such as probing depth, recession width, recession length (RL), and width of keratinized gingiva were recorded at baseline and at 6 months postoperatively, and weekly assessment was done at 1 week, 2 weeks, 3 weeks, and after 4 weeks for observations during the postoperative healing.

**Results:** Treated recession defects healed successfully without any significant postoperative complications. Decreased gingival recession horizontal width values from  $4.65 \pm 0.4327$  to  $0.94 \pm 1.350$  and RL from  $6.4 \pm 1.075$  to  $0.7 \pm 0.6750$  were observed postoperatively ( $P < 0.05$ ). Percentage of root coverage average was 89.3%. There was a statistically significant decrease in the width and depth of recession.

**Conclusion:** Pedicled buccal fat showed promising results as the treatment modality in the management of Class II and Class III gingival recession of maxillary posterior teeth.

**Key Words:** Adipose, stem cell, fat pad, gingival recession, Miller's Class III, II

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## INTRODUCTION

Gingival recession is defined as the displacement of the gingival margin apical to the Cement-enamel junction. It indicates the loss of periodontal connective tissue fibers along with root cementum and alveolar bone. Primary

causes of recession are periodontal disease and improper oral hygiene practice<sup>[1]</sup> leading to dental hypersensitivity and affect esthetics when anterior teeth are involved.

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Treatment of gingival recession aims to cover the exposed root surface and to arrest the progression of tissue loss. Various periodontal plastic procedures have been used including pedicle flaps and free gingival grafts. It has been demonstrated that recessions treated with pedicle flaps heal with a long junctional epithelium between the root surface and the covering tissue in animals and in humans.<sup>[2,3]</sup> Only a limited amount of regeneration has been observed in varying degrees in the most apical portion of the exposed root surface. Mucogingival surgery can therefore result in satisfactory root coverage without significant enhancement of the attachment apparatus.<sup>[4]</sup> All of these procedures resulted in an increase in the amount of keratinized tissue, with appreciable results in terms of root coverage ranging from 56% to 98%.<sup>[5]</sup> Guided tissue regeneration has also shown good results in the treatment of buccal recessions. Procedures for the treatment of severe gingival recession of posterior teeth are limited.

Egyedi first reported the use of buccal fat pad (BFP) in the closure of oro-antral/nasal communications. BFP is also used in the defects resulting from traumatic or malignant tumors in oral soft tissue.<sup>[6]</sup> The BFP has also been used to reconstruct defects in the hard palate, soft palate (up to midline), the retromolar trigone, the buccal mucosa, the anterior tonsillar pillar, the superior alveolar ridge (up to the canine region), and the superior buccal sulcus.<sup>[7]</sup> It could be used alone or in combination with other flaps such as the pedicled temporalis muscle myocutaneous flap or the pectoralis major myocutaneous flap, where the posterior portion of the defects (palatal region and tonsillar pillar) was reconstructed by the BFP, leaving the anterior and inferior portion to be covered by myocutaneous flaps.<sup>[8]</sup>

The buccal space is bounded anterolaterally by muscles of facial expression and superficial layer of deep cervical fascia, medially by buccinator muscle, posteriorly by masseter and parotid gland, and no definite true superior or inferior boundaries. The buccal fat fills the space largely and has four projections (buccal, temporal, pterygoid, and pterygopalatine) arising from a central body. The central body and buccal extension constitute 50% of total volume and are commonly used for intraoral reconstruction.<sup>[9]</sup> Other contents of buccal space are facial and buccal arteries, facial vein, parotid duct, minor salivary glands and accessory parotid lobules,

lymphatic channels, and branches of facial and mandibular nerves.<sup>[10]</sup>

Buccal fat is a specially organized fat tissue also called syssarcosis, a fat that enhances intermuscular motion (muscles of mastication). It is not subjected to lipid metabolism unlike subcutaneous fat where it has a different rhythm of lipolysis.<sup>[11]</sup> The anatomical region is consistent, and surgery has no influence on either its appearance or function. Excellent blood supply provided by the rich plexus of blood vessels, proximity between the donor and recipient site, simplicity, and its ease to mobilize, stabilize/adapt, and suture along with its strong anti-infective and keratinizing properties makes it a suitable choice for oral reconstructions and root coverage procedure in the region of maxillary posterior teeth.<sup>[12]</sup>

Hence, the aim of the present study was to clinically evaluate the effect of pedicled BFP (PBFP) in the treatment of Class II and Class III gingival recession defects of maxillary posterior teeth.

## MATERIALS AND METHODS

Ten patients including 6 males and 4 females in the age range of 35–55 years with Class II and Class III gingival recession in the maxillary molars were selected from the Outpatient Department of Periodontology, Subharti Dental College and Hospital, Meerut, Uttar Pradesh, India. The study was conducted in accordance with the Helsinki Declaration of 1975, as revised in 2000. Ethical committee clearance was obtained from the Institutional Ethical Committee board. Systemically healthy patients with gingival recession on the buccal side of maxillary first molar or second molar measuring about 3 mm and above were selected. Inclusion criteria further considered were vital tooth, teeth without caries, or restorations. Exclusion criteria included patients with poor oral hygiene, tobacco users, pregnant and lactating patients, and patients on steroid therapy. Surgical procedure was explained to the patients, and informed consent form was duly signed by the patients. They were educated and motivated about the oral hygiene maintenance and reinforced the need to report to the re-call visits to assess the progress of healing and also to record if any postoperative complications occurred.

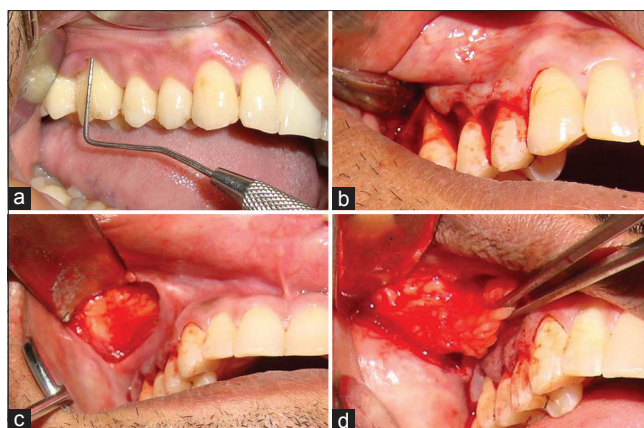
Clinical parameters recorded during the course of the study were recession length (RL), recession width, width of keratinized gingiva (KGW), and percentage

of root coverage. William's graduated probe was used to measure the readings [Figure 1a] and was recorded at baseline and at 6 months. All patients received oral hygiene instructions and Phase I therapy including scaling and root planing before surgery.

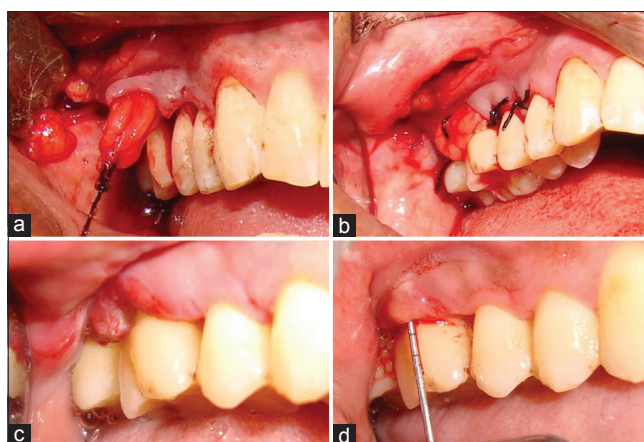
### Surgical procedure

Nerve blocks and infiltration along the proposed incision were achieved with lignocaine hydrochloride 2% with adrenaline (1:100,000). Crevicular incision was made and a full-thickness mucoperiosteal flap was raised [Figure 1b]. A horizontal incision of 1–1.5 cm was made in the mucobuccal fold in relation to the maxillary first molar region and extended backward [Figure 1c]. Buccinator muscle was separated bluntly to expose the buccal BFP. The fat was teased out from its bed; the anterior portion was gently grasped and spread onto the defect site to cover adequately [Figure 1d]. It was then secured and sutured without tension using resorbable sutures [Figure 2a]. Excessive stretching of the flap is avoided as it invariably impairs the vascularity. Care was taken not to tear the capsule to enable easy handling of the BFP tissue. It is suggested that the fat pad is applied adequately or little excess to cover the entire surgical defect to compensate for postoperative shrinkage during healing. Postoperative instructions included the prescription of the antibiotic amoxicillin 500 mg three times a day for 5 days and ibuprofen 600 mg three times a day for 5 days, soft semisolid to liquid diet, and brushing other areas except the operated site for 1 week. Chlorhexidine mouth rinses twice daily were advised.

In the immediate postoperative period, most of the patients fared well except one, who developed hematoma 24 h postoperatively in the buccal space which was managed conservatively. The transposed BFP appeared light yellow and bulbous 1 week after surgery [Figure 2b]. The epithelialization was evident from periphery onto the surface of BFP in 2–4 weeks and completed in 4–6 weeks [Figure 2c and d]. Surface was smooth, pink, and developed an appearance similar to normal tissues. Patients were followed up at 1 week, 2 weeks, 3 weeks, and 4 weeks for the assessment of postoperative healing. Three cases required gingivoplasty to attain the physiologic contour of the gingiva. Clinical parameters recorded at baseline and at 6 months were analyzed and calculated to obtain the percentage of root coverage and also KGW gained. Fat tissue was sent to histopathological examination under microscope with hematoxylin and eosin staining [Figure 3].



**Figure 1:** (a) Preoperative photograph showing the gingival recession #16, (b) prepared recipient site (c) horizontal incision given in the mucobuccal fold, (d) blunt dissection to procure buccal fat pad.



**Figure 2:** (a) Pedicled buccal fat pad being placed over the recession defect, (b) pedicled buccal fat pad sutured, (c) postoperative photograph (10 days), (d) postoperative photograph (4 weeks).

## RESULTS AND DISCUSSION

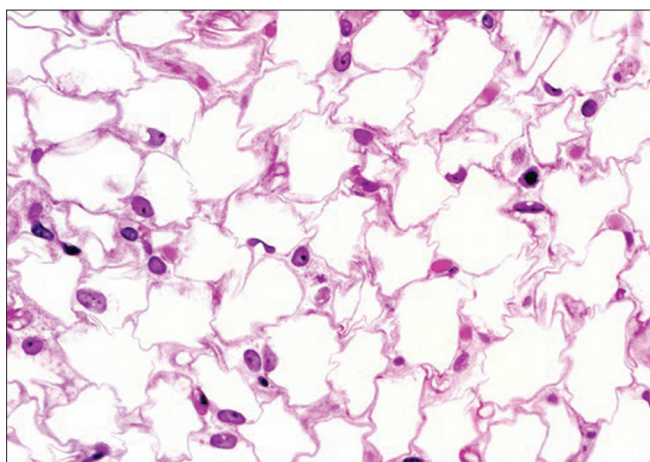
The present study aimed to evaluate the application of PBFP in the treatment of gingival recession defects. A total of ten patients were treated with BFP in Class II and Class III gingival recession defects of maxillary first and second molars. The periodontal parameters at baseline together with the 6-month outcomes are summarized in Table 1. Among the ten defects treated, two were second molars and eight were first molars and four Class II and six Class III defects. All patients completed the study and attended all the recall visits. Postoperative healing was uneventful and the parameters observed are summarized in Table 2. Supragingival plaque control was maintained throughout the study period, and if required, oral prophylaxis was performed.

**Table 1: Measurement of clinical parameters**

Case No.	Age/Gender	Gingival recession length		% of root coverage	Mean %	Gain in the width of keratinized gingiva
		Pre-op	Post-op			
1.	37/F	05 mm	01 mm	80	89.3	01 mm
2.	50/M	06 mm	01 mm	83.3		02 mm
3.	42/M	06 mm	00 mm	100		01 mm
4.	46/F	07 mm	01 mm	85.7		02 mm
5.	36/M	08 mm	00 mm	100		01 mm
6.	41/F	07 mm	01 mm	85.7		01 mm
7.	53/M	06 mm	01 mm	83.3		01 mm
8.	53/M	06 mm	00 mm	100		01 mm
9.	44/F	05 mm	00 mm	100		01 mm
10.	51/M	08 mm	02 mm	75		01 mm

**Table 2: Observations in the post-operative healing period**

Case No.	Pain			Swelling			Restriction in mouth opening			Infection			Damage to stenson’s duct			Damage to buccal branch of facial nerve		
	1 wk	2 wk	4 wk	1 wk	2 wk	4 wk	1 wk	2 wk	4 wk	1 wk	2 wk	4 wk	1 wk	2 wk	4 wk	1 wk	2 wk	4 wk
1.	++	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3.	+	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4.	++	+	-	+	-	-	+	-	-	-	-	-	-	-	-	-	-	-
5.	+	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6.	++	+	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7.	++	+	-	++	-	-	+	-	-	-	-	-	-	-	-	+	-	-
8.	+	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9.	+	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10.	++	+	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-



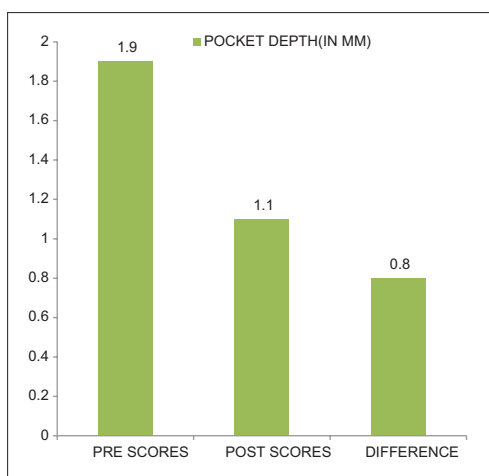
**Figure 3:** Histopathological picture of the pedicled buccal fat pad used for the recession coverage.

Tables 1, 3, 4 and Graphs 1-3 demonstrate the measurements of the gingival recession defects preoperatively and postoperatively along with the gain in KGW. Percentage of the root coverage was calculated and the mean of root coverage was 89.3% [Graph 4]. Average of 1–2 mm of gain in keratinized tissue was achieved. Table 2 shows the observations noticed

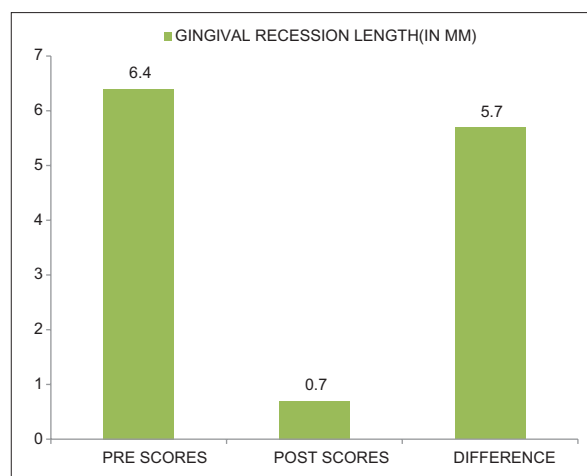
during the postoperative healing period. Two patients who had Grade I mobility before surgery reduced to Grade 0 mobility at the end of 3 months.

Decreased gingival recession horizontal width values from  $4.65 \pm 0.4327$  to  $0.94 \pm 1.350$  and RL from  $6.4 \pm 1.075$  to  $0.7 \pm 0.6750$  were observed postoperatively ( $P < 0.05$ ). At 6 months, percentage of root coverage average was 89.3%. There was a statistically significant decrease in the width and depth of recession ( $P < 0.05$ ). The KGW was also statistically significant from  $0.6 \pm 0.4$  to  $1.2 \pm 0.42$  ( $P < 0.05$ ).

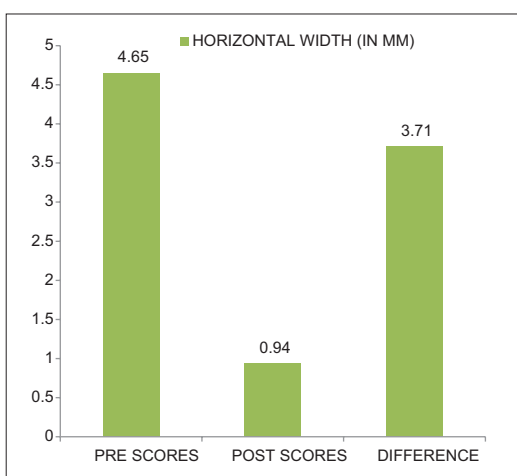
In our cases, we observed the epithelialization of the BFP within the 2<sup>nd</sup> week with complete epithelialization in 4–6 weeks. There was not much difference in the healing pattern with either BFP capsule intact or in patients with tear in capsule. However, the BFP easily slipped while suturing when the capsule was broken. The histological nature of the healing process of the BFP was first reported by Samman *et al.*<sup>[8]</sup> He observed that there was a complete absence of the fat cells in sections taken from healed sites, indicating fibrosis of the fat



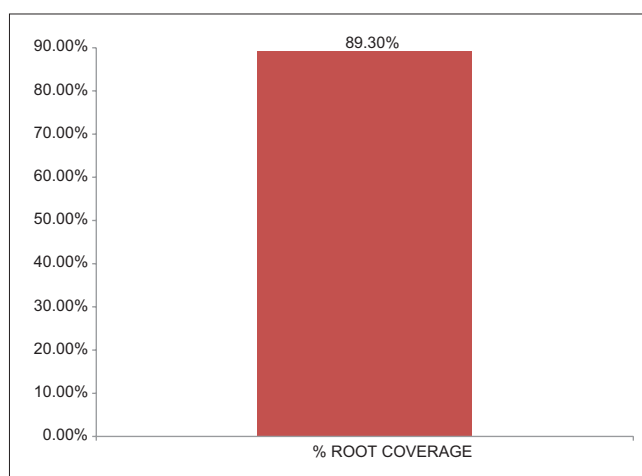
**Graph 1:** The pocket depth score changes.



**Graph 3:** The changes in the length of gingival recession.



**Graph 2:** The changes in horizontal width of gingival recession.



**Graph 4:** The percentage of root coverage.

**Table 3: Mean and standard deviation of different measurements in pre- and post-scores and the percentage difference between pre- and post-scores**

Measurements	Mean±SD		
	Prescore	Postscore	Percentage difference
Pocket depth(mm)	1.9±0.5676	1.1±0.3162	38.33±20.86
Gingival recession horizontal width(mm)	4.65±0.4327	0.94±0.1350	79.59±3.72
Gingival recession length(mm)	6.4±1.075	0.7±0.6750	89.31±9.69*
Gain in width of keratinized gingiva(mm)	0.6±0.4	1.2±0.4216	89.3±9.700*

\*Mean and SD of percentage of root coverage and width of keratinized gingiva gain. SD: Standard deviation

tissue, and the reconstructed area was covered by parakeratotic stratified squamous epithelium. Fat cells of BFP were replaced by collagen fibers slowly over time until all fat cells had disappeared. However, the mechanism by which the fat tissue is replaced is still not clear and needs further investigation.

Since the inner portions of the temporal and pterygoid extensions are located deeply, are small in volume, and difficult to operate upon, the two parts are rarely used. Furthermore, vital role played by the adipose-derived fat cells in differentiation and regeneration needs elaboration. Stem cells are considered to be the cells possessing self-replicating potential and the ability to give rise to terminally differentiated cells of multiple lineages.<sup>[13]</sup> Adipose tissue, such as bone marrow, is derived from the mesenchyme and contains a supportive stroma that is easily isolated. Based on this, adipose tissue may represent a source of stem cells that could have far-reaching applications. Processed lipoaspirate (PLA) cells could be isolated from the adipose tissue in significant numbers and exhibit stable growth and proliferation kinetics in culture. PLA cells, such as mesenchymal stem cells (MSCs), differentiate *in vitro* toward the osteogenic, adipogenic, myogenic, and chondrogenic lineages

**Table 4: Comparison between pre- and post-scores for different types of measurements (by paired t-test)**

Measurements	Probability of paired t-test between pre- and post-test score	P
Pocket depth	0.0002*	<0.05 (significant)
Gingival recession horizontal width	0.0000*	<0.05 (significant)
Gingival recession length	0.0000*	<0.05 (significant)
Gain in width of keratinized gingiva	0.0000	<0.05 (significant)

\*A significant difference between pre- and post-measurements at 0.05 level of significance

when treated with established lineage-specific factors.<sup>[14]</sup> This further led to the conclusion that a population of multipotent stem cells comparable with mesenchymal stem cells could be isolated from human adipose tissue.<sup>[15]</sup> Pyo *et al.* showed the differentiation of adult stem cell derived from BFP into osteoblast, which confirms the presence of stem cells within the BFP that can aid in periodontal regeneration.<sup>[16]</sup>

Advantages of using BFP are that it is a quick, simple, and easy flap to use, heals with minimal scarring, negligible morbidity, and failure rate is very low. However, reported complications with BFP reconstruction are bleeding, hematoma, partial necrosis, excessive scarring, and infection.<sup>[17,18]</sup>

**Limitations**

PBFP cannot be stretched till the maxillary anterior teeth and neither could be used for mandibular teeth.

Future recommendations include (1) histological study of healed tissue to correlate the stability of the achieved results could be considered and (2) larger sample size with longer follow-up period could be considered for meaningful results.

**CONCLUSION**

Within the limitations of this study, it can be concluded that the PBFP has proved useful entity in the treatment of severe gingival recession in maxillary posterior teeth. Its major advantage is its anatomical proximity to the maxillary posterior teeth, adequate volume, definite vascularity, and remarkable resistance to infection, thus making PBFP an alternative for severe recession in maxillary posterior teeth.

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**Conflicts of interest**

The authors of this manuscript declare that they have no conflicts of interest, real or perceived, financial or nonfinancial in this article.

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