Original Research Article

Laterally positioned flap with periosteal graft for the treatment of gingival recession, novel technique - A pilot study

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Abstract

Introduction: Periosteum is a highly vascular connective tissue sheath covering the external surface of all bones except sites of articulation and muscle attachment. Regenerative potential of periosteum is due to inner layer which contains mesenchymal progenitor cells. Laterally pedicle flap technique is frequently used for recession coverage in isolated, denuded roots that have adequate donor tissue laterally and vestibular depth. Pedicle flaps have been modified in past, this pilot study utilized the technique which included auto transplant of periosteum in combination with laterally positioned flap.
Materials and methods: 20 teeth with gingival recession, Millers's class 1 and 2 with ≥ 3 mm defect were included and laterally positioned flap with periosteal graft was performed.
Results: After 12 months of follow up, a stable result was obtained and the pilot study revealed significant reduction in recession defect. There was a mean percentage of 95.6% for root coverage, 80% predictability for recession coverage.
Conclusion: Laterally positioned flap with periosteal graft technique can successfully be clinically utilized for the treatment of gingival recession defects, with less trauma and good esthetic results.

Key words

Periosteum, Lateral pedicle, Sub-epithelial connective tissue graft, Partial thickness flap, Recession defect coverage.

Introduction

By clinical definition, gingival recession is exposure of root surface by an apical shift in the position of gingival. Recession is very commonly seen periodontal defect. Numerous factors may result in gingival recession [1]. Untreated recession sites in patients are more likely to progress than sites treated with gingival augmentation procedures [2], therefore appropriate treatment is indicated to prevent further loss of periodontal tissues as well as to improve aesthetics. Multiple surgical procedures have been adopted for root coverage [3]. Amongst all the techniques used for the treatment of gingival recession defects, the sub epithelial connective tissue graft (SCTG) is considered the gold standard [4, 5]. The SCTG has its drawbacks; it requires a second surgical site for donor tissue procurement. The donor site undergoes secondary wound healing .This is traumatic and uncomfortable for the patient. The graft obtained may not be sufficient. Periodontitis have been working to develop more patient compliant procedures with greater predictability for root coverage. Recent advances show use of periosteum for the coverage of root recession. The periosteum is a highly vascular connective tissue sheath covering the external surface of all the bones except sites of articulation and muscle attachment [6]. The periosteum comprises of at least two layers, an inner cellular or cambium layer and an outer fibrous layer [7]. Bone undergoes continuous remodeling. The mesenchymal cells are supplied to the site of remodeling, these cells have a potential to form bone by forming osteoblasts and cause resorption by differentiating in to osteoclasts. They can undergo differentiation to form fibroblasts depending on the various local factors. These mesenchymal cells are supplied by the vasculature. Periosteum is osseous covering it is highly vascular. Its inner layer 'cambium layer' is niche of pluripotent cells .These pluripotent stem cells at all ages have the ability to differentiate to fibroblasts, osteoblasts, chondrocytes, adipocytes, and skeletal myocytes. It also harbors fibroblasts, osteoblasts. To obtain new attachment we require regeneration of cementum, bone, periodontal fibers. Thus periosteum can be harvested to supply progenitor cells for regeneration. Unlike SCTG donor tissue harvesting, periosteal pedicle graft is not an extensive process leading to large wound in second surgical site. The periosteum is harvested from the same surgical site apical to the defect. Periosteal pedicle graft technique shows good predictability of root coverage. Drawback of pedicle graft being that in recession defects ≥4 mm the attached gingiva may not be sufficient for coronal shifting of flap. If the vestibular depth is less, then the coronal placement of the flap further decreases the vestibular depth in the surgical area. Lateral pedicle with periosteum encases the beneficial effects of periosteal pedicle graft and omits the drawbacks of it.

Materials and methods

Twenty patients both females and males in the age group 20–50 years were randomly selected from the outpatient department of Periodontics, Government Dental College and Hospital, Srinagar with isolated gingival recession defects in relation to labial aspect of maxillary or mandibular anterior teeth. Patients were selected based on following inclusion criteria: systemically healthy and no contra-indication for periodontal surgery, Miller Class I or II2recession defect ≥ 3 mm in maxillary or mandibular anterior teeth, the no periapical pathology. Exclusion criteria were: smokers or substance abuse, endodontically treated sites, root caries, pregnant and lactating women, use of fixed orthodontic or removable appliances and a previous periodontal surgical procedure at defect site. Pre-surgical procedure consisted of scaling root planing, removal of traumatic factors if any. If high frenum was the causative factor then frenectomy was under taken before the recession coverage procedure.

Surgical procedure

After local anesthesia, horizontal incision was made on the adjacent tooth perpendicular to the inter dental papillae, at the level apical to CEJ

preserving the gingival sulcus of the tooth. Two oblique vertical releasing incisions were extended beyond the mucogingival junction and a full thickness mucoperiosteal flap was raised 2–3 mm apical to the horizontal incision. Flap was then pulled buccally to create tension on the periosteum and with a sharp 15 no BP blade it was separated from the underlying periosteum and some thickness of connective tissue, to create a split thickness flap. The split thickness flap was then raised to expose a sufficient amount of the periosteum. Graft consisting of periosteum and a connective tissue layer is then harvested in a size to approximately to cover the defect from the underlying bone at a position apical to the root of the tooth using a 15 no. BP blade and a Glickman periosteal elevator. The tooth with the defect was prepared to receive the graft by creating a raw bed around the defect by de-epithelizing the gingiva. Graft obtained was secured over the denuded root surface at the recipient site and sutured with a synthetic resorbable 5-0 suture. Laterally positioned flap was sutured over the raw bed using 4-0 silk suture through sling suture technique. The vertical incisions were approximated with interrupted sutures following which the surgical site was covered with aluminium foil and then with non eugenol periodontal pack (coe-Pak) for protection**.**

Post-surgical instructions were given .Patients were instructed not to brush over the pack. The tooth was brushed with ultra soft toothbrush for two weeks. Patients were advised to rinse the oral cavity with chlorhexidine (0.2%) mouthwash twice daily for at least two weeks. Amoxycillin and clavulanate dosage regimen was given for 5 days. After one week, the periodontal dressing and sutures were removed and the surgical area was flushed with antimicrobial solution. The site was evaluated and if required pack was placed again at the surgical site again. Patients were then recalled after one week. Maintenance instructions were given to the patient, recall visits were scheduled every month till the end of the study. (**Figure – 1 to 3**)

Results

Lateral pedicle with periosteal graft showed a mean percentage of recession coverage of 95.66%. The predictability of root coverage was 80%. The recession defect in mm on the first day when the patient reports and 12 months after the surgical procedure were as per **Table - 1**. The postoperative discomfort was less compared to sub-epithelial connective tissue graft which is the gold standards there was no second donor site. The recession coverage showed morphologic and chromatic resemblance to adjacent gingiva. Thus a good patient satisfaction was perceived.

Discussion

Periosteum is a highly vascular connective tissue sheath covering the external surface of all bones except sites of articulation and muscle attachment. The regenerative potential of periosteum is due to inner layer which contains osteoblasts and osteoprogenitor cells [8], and the outer fibrous layer is composed of dense collagen fibres, fibroblasts and their progenitor cells [9, 10], thus the periosteum has immense regenerative potential. Periosteum has been used since decades in dentistry. Periosteum a niche of pluripotent cells at all ages has the ability to differentiate to fibroblasts, osteoblasts, chondrocytes, adipocytes, and skeletal myocytes. These cells have the ability to regenerate cementum with periodontal ligament fibers and bone which is the benchmark for new attachment. Periosteum has a rich vascular plexus and is regarded as the “umbilical cord of bone” [11]. A recent study has even shown that periosteal cells release vascular endothelial growth factor [12], which promotes revascularization during wound healing. Recently, studies have reported the existence of osteogenic progenitors, similar to mesenchymal stem cells (MSCs), in the periosteum [13, 14]. Various research papers have been published explaining the osteogenic potential of human periosteal grafts [15-17]. The use of periosteum as a barrier membrane for the treatment of periodontal defects was published by Lekovic, et al. in 1991 [18], and again in 1998 by Lekovic, et

al. [19], and Kwan, et al. [20]. Recent papers published have shown promising results with the use of periosteum in the treatment of gingival recession defects [21, 22]. In this pilot study, the technique utilized periosteum and a thin layer of connective tissue apical to the denuded root surface as a donor tissue, which provides vascularity and progenitor cells for root coverage. The pedicle over the graft is procured from the adjacent tooth, which is easy to harvest in a single tooth recession.

Table – 1: Recession defect in mm.

Sr. No.	Recession Defect in mm on Day 1	Recession After 12 Months	Root coverage in mm	Percentage Of Root Coverage	Predictability frequency ≥ 90% root coverage
1	4	0	4	100	1
2	6	1	5	83.33333333	0
3	4	0	4	100	1
4	6	1	5	83.33333333	0
5	6	0	6	100	1
6	3	0	3	100	1
7	4	0	4	100	1
8	3	0	3	100	1
9	4	0	4	100	1
10	4	0	4	100	1
11	4	0	4	100	1
12	5	1	4	80	0
13	5	0	5	100	1
14	5	0	5	100	1
15	4	0	4	100	1
16	6	2	4	66.66666667	0
17	4	0	4	100	1
18	5	0	5	100	1
19	3	0	3	100	1
20	5	0	5	100	1

Percentage Mean Root Coverage 95.66666667 %, A predictability of 80%

Conclusion

The results of the Periosteal Pedicle Graft technique for the treatment of gingival recession defects were predictable. More work in future with the use of periosteum for root coverage is anticipated. In this technique the pedicle was raised from apical region to cover the graft, which was difficult if recession was more than 4mm creating a difficulty in offering enough gingiva for coronal placement. Coronal advancement can also lead to decrease in vestibular depth. Cambium layer of the periosteum has progenitor cells but in this technique the periosteum is inverted, this lead to root approximated to thin layer of connective tissue not periosteum. Lateral Pedicle Periosteum Graft technique is an attempt to use periosteum for root coverage with lateral pedicle was on same lines of research. This pilot study showed a good 80% predictability and 95.6% root coverage. Additional benefits it offered were that the graft was placed with periosteum adjacent to root surface. The pedicle was harvested from adjacent tooth thus sufficient amounts can be harvested and less chances of decrease in

vestibular depth. Thus this technique offers good root coverage.

Figure - 1a: Horizontal incision perpendicular to tooth surface.
Figure - 1b: Vertical releasing incisions given, crossing mucogingival sulcus.
Figure - 1c: 1-2 mm full thickness flap raised.
Figure - 1d: Partial thickness flap raised.
Figure - 1e: Periosteal graft harvested of same dimentions as that of defect and de-epithelization done around the recipient tooth.
Figure - 1f: Graft sutured to the defect site.
Figure - 1g: Flap repositioned laterally over the graft.

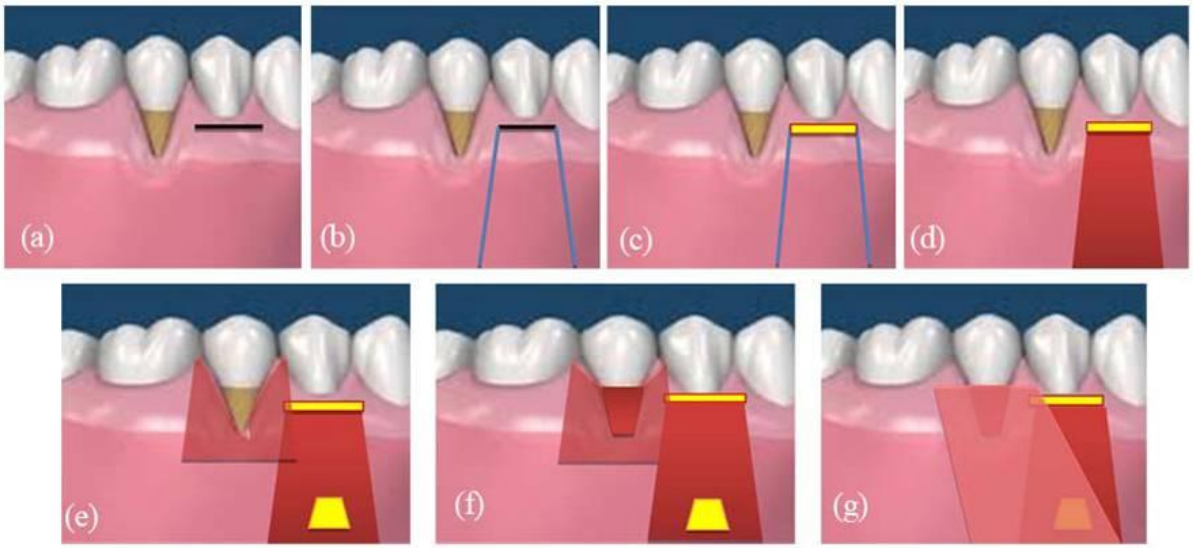

Figure - 2a: Patient 1 recession defect before the procedure.
Figure - 2b: Horizontal incision parallel to interdental papilla.
Figure - 2c: 2 mm full thickness flap raised, further split mucoperiosteal flap raised.
Figure - 2d: Periosteal graft harvested.
Figure - 2e: Graft placed over the recession defect.
Figure - 2f: Lateral pedicle flap sutured over the graft.
Figure - 2g: After one week.
Figure - 2h: After 12 months.

Figure - 3a: Patient 2 before surgery.
Figure - 3b: Periosteum graft placed at the defect site.
Figure - 3c: Week after at the time of suture removal.
Figure - 3d: 12 months after suture removal.

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