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Case Report

Dentistry Section

Periosteum Transposition Technique for Coverage of Exposed Root Surface

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ABSTRACT

Coverage of exposed root surface should be evaluated not only by the amount of exposed root coverage, but also by the reduced risk of donor site recession, minimal secondary intension healing and improved colour match. To achieve these goals, a new technique, the periosteum transposition technique was designed. A patient with an isolated Miller Class I labial gingival recession at lower left central incisor of 6.0 mm was treated by this technique. In this technique, a partial thickness flap was reflected and underlying periosteum was elevated and transposed on exposed root surface and sutured. The partial thickness flap was sutured at its original position. After one year, complete root coverage was obtained. Thus, the periosteum transposition technique is an assuring technique that has the potential for complete coverage of exposed root surface.

Keywords: Gingival recession, Mucogingival surgery, Partial thickness flap, Periodontal plastic surgery, Root coverage

CASE REPORT

A 17-year-old female patient reported in the Department of Periodontology with chief complaint of exposure of tooth root in lower front tooth region. On intraoral examination, an isolated Miller Class I labial gingival recession was present at lower left central incisor (tooth no. #31). Tooth no. #31 was malaligned and slightly out of arch. The depth of gingival recession was 6.0 mm when measured from cementoenamel junction to the gingival margin by PCP UNC15 probe (HU- FRIEDY, USA) [Table/Fig-1a]. Probing depth and width of keratinized gingiva were equal, that is, 1.0 mm each. Width of functional mucosa was 0.0 mm. Intraoral periapical radiograph showed no bone loss [Table/Fig-1b].

[Table/Fig-1a]: Preoperative photograph showed exposed root surface at tooth no #31.

[Table/Fig-1b]: Preoperative radiograph showed no bone loss.

Despite the aetiology of gingival recession was malocclusion, the aetiology was not corrected first because after orthodontic opinion patient was not willing for orthodontic treatment. Hence, periodontal treatment was attempted first instead of orthodontic treatment.

The patient underwent periodontal treatment of Phase I therapy including scaling, root planing and instructions for proper oral hygiene measures. Surgical treatment of recession was not scheduled until the patient was able to maintain full mouth and local plaque score of less than 20% and full mouth and local bleeding score of less than 15% according to index proposed by O' Leary TJ et al., [1]. Before treatment, surgical procedure was briefed to patient and asked to sign written consent form including permission or no objection of photographs for publication in any journal. Patient was instructed to do presurgical rinse by 0.2% chlorhexidine solution. The perioral skin was cleaned with spirit and scrubbed by 7.5% povidone iodine solution. Intraoral surgical site was painted with 5% povidone iodine solution [2].

After presurgical rinse and part preparation for surgery, 2% lignocaine hydrochloride with 1:80,000 adrenaline was administered to anesthetize left mental nerve. An internal bevel incision was made around the receded gingival margin to remove infected gingival tissue [Table/Fig-2a]. Two vertical incisions were placed, one at the distal line angle of lower left central incisor and other at the mesial line angle of lower left canine. Both vertical incisions were extended into base of vestibule and joined by a submarginal horizontal incision [Table/Fig-2b]. A sharp dissection was made to prepare a partial thickness flap on the functional mucosa and alveolar mucosa [Table/Fig-3a]. Care was taken in performing this dissection so that the periosteum and some connective tissue can be retained over underlying alveolar bone and basal bone of the mandible. The periosteum was elevated from underlying alveolar bone and basal bone of the mandibule with the help of a Molt periosteal elevator [Table/Fig-3b]. The root surface convexity was reduced by micromotor with round diamond bur and conditioned with 24% EDTA by active burnishing technique with the help of applicator tip for three minutes, which were changed every 30 seconds so as to maintain a steady concentration [Table/Fig-4a]. After conditioning of root surface, it was washed with continuous current of normal saline solution for two minutes [Table/Fig-4b]. The periosteum was stretched and transposed to approximate the exposed root surface. This stretching effect brought the pivot point coronally around which periosteum rotates, thus increasing its effective length. The periosteum was coapted to the tissue on opposite side of recession defect without tension by further

extending the two vertical incisions beyond the mucolabial fold into lip mucosa and a cutback incision of 100 degrees to the base at the distoapical part of the periosteum [Table/Fig-5a]. The periosteum was sutured by sling suturing technique around the neck of tooth with 5-0 absorbable suture [Table/Fig-5b]. The partial thickness flap was sutured at its original place by direct loop suturing technique with 5-0 absorbable suture. The periosteum and flap were sutured by holding suturing technique with 5-0 absorbable suture [Table/Fig-5c]. After completion of suturing, no area of exposed root and bone of donor site were seen. Finger pressure through a moist gauze piece was applied at the surgical site for about 10 minutes in order to close adaptation of tissue and to reduce the incidence of bleeding, microhematoma or dead space. Periodontal dressing was applied to protect the surgical area from mechanical forces [Table/Fig-5d].

[Table/Fig-3b]: After the periosteum reflection.

[Table/Fig-2a]: After internal bevel incision.

[Table/Fig-4a]: Root conditioning with 24% EDTA.

[Table/Fig-2b]: After vertical and horizontal incisions.

[Table/Fig-4b]: After washing with normal saline.

[Table/Fig-3a]: After partial-thickness flap reflection.

[Table/Fig-5a]: Transposition of the periosteum on exposed root surface.

[Table/Fig-5b]: After suturing of transposed periosteum on exposed root surface.

[Table/Fig-5c]: After suturing of partial thickness flap on its original position.

[Table/Fig-5d]: Periodontal dressing applied on surgical area.

Antibiotic (amoxicillin 500 mg, 1 tablet every 8 hours, for 7 days) and analgesic (nimesulide 100 mg, 1 tablet every 12 hours, for 3 days) were prescribed. Patient was instructed to be extremely cautious during mastication at meals and no tooth brushing or chewing on the operated area for three weeks. After this period patient was advised to mechanical cleaning of the operated area using an extra soft toothbrush by coronally directed roll technique. Plaque control was obtained by 0.2% chlorhexidine rinses twice daily for one minute during the first two weeks [3], and then application of 0.2 % chlorhexidine gel onto the operated area two times in a day for another two weeks after meal.

Clinical follow-up was performed once a week in the first postoperative month, every two weeks in the second postoperative month, once a month up to six months and then three months interval till 12 months. At each visit, recall programs including professional tooth cleaning and reinforcement of daily oral hygiene measures were done [2].

Periodontal dressing and sutures were removed one week after surgery. Healing was without any complications. Patient was happy to see the results of surgery. As the postoperative time increased, tissue maturity and colour blending with surrounding of surgical site were obtained. After one year, 6.0 mm, that is, 100% root coverage, 7 mm of keratinized gingiva, 5 mm of functional mucosa and 2.0 mm of probing depth were obtained [Table/Fig-6].

[Table/Fig-6]: One year postoperative photograph showed complete root coverage.

DISCUSSION

The primary concern in this case was lack of functional mucosa with #31 leading to persistent inflammation and an unfavourable periodontal environment. Hence, mucogingival surgery was planned before start of orthodontic treatment [4]. For stabilisation of periodontal condition, all periodontal tissues should be present in optimum dimensions as well as health. Sufficient amount of keratinized gingiva is essential to preserve healthy periodontal status and to offer more support to the dentogingival unit during normal functions [5]. Coatoam GW et al., from their study concluded that when keratinized gingiva was initially lacking, none was formed by orthodontic treatment and as a result final quality of gingival health was affected. They also found that when there is insufficient width of keratinized gingiva before orthodontic treatment, gingival clefting results in 28.6% cases. Such patients require gingival augmentation prior to orthodontic therapy in order to establish a zone of keratinized gingiva which can resist inflammation and prevent further progression of periodontal disease [6].

Gingival recession is defined as the exposure of root surface in the oral cavity, resulting from the detachment and migration of junctional epithelium toward the apex of the root [7]. Coverage of exposed root surface should be evaluated not only by the amount of exposed root coverage, but also by the reduced risk of donor site recession, minimal secondary intension healing and improved colour match [8]. To achieve these goals, a new technique, the periosteum transposition technique was designed.

The periosteum transposition technique is a versatile technique because of the coronal extension of its pivot point. The extension of the two vertical incisions beyond the mucolabial fold into lip mucosa and a cutback incision of 100 degrees to the base at the distoapical part of the periosteum increases its effective length, as well as reduces the chance of shallowing of vestibule. The transposition pattern of periosteum should be decided before the surgery. The vascularity of transposed periosteum is determined during reflection and during cutback incision and this is the most critical factor for survival of the periosteum [9,10]. After transposition and before suturing of the periosteum, tension and kinking that interrupt blood supply must be checked [9].

Absolute haemostasis is essential for re-establishment of the capillaries of the transposed periosteum with adjacent tissue and prevention of internal pressure that eventually may cause necrosis [11].

In this technique, a coronal marginal band of tissue is left at the donor site that prevents marginal tissue recession at the donor site [12]. The partial thickness flap is sutured at its original position to overcome the problem of fenestration and surface bone resorption at the donor site.

The primary surgical procedure in mucogingival surgery is the flap. Because of recent laboratory studies, the flap most desirable to utilise is the partial thickness flap. This permits the periosteal connective tissues to remain intact on the bone and a flap with epithelium and its underlying connective tissue to manipulate in whichever way desired. This flap is probably used in the majority of mucogingival procedures. By contrast, the full thickness flap is used less frequently in mucogingival surgery. Characteristic of the partial thickness flap procedure relating to the bone is that the circumferential lamellae show localised areas of resorption going to the depth of two, three or four reversal lines, however not going into the haversian systems, and this activity takes place at the six to eight days period. With the full thickness flap the resorptive activity in the six to eight day period affects the entire layers of circumferential lamellae and a portion of the haversian systems that are immediately subjacent to those lamellae, so it is a distinct quantitative difference as to the amount of bone that is resorbed. There is also a distinct difference in the rate of healing histologically. The full thickness flap is a few days behind the partial thickness flap in the repair rate. This is due to the difference in the surgery performed. In the full thickness flap, there was total exposure of bone, resulting in direct tissue damage and some surface infection, while in the partial thickness flap; there was not this direct tissue damage and surface infection of the bone. Also, the interface was between two soft connective tissues in the partial thickness flap in contrast to a hard connective tissue and a soft connective tissue in the full thickness flap [13]. In this case, we chose partial thickness flap because there was no need of osseous surgery and above mentioned advantages of partial thickness flap.

Periosteum is an outer covering of all bones except sites of articulation and muscle attachment. Periosteum contains two layers. The outer fibrous layer is composed of dense collagen fibers, fibroblasts and their progenitor cells. The inner cambium layer contains osteoblasts and osteoprogenitor cells. Periosteum has immense regenerative potential due to presence of niche of pluripotent cells at all ages which has the ability to differentiate into 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 of new attachment [14,15]. Periosteum has a rich vascular plexus and is regarded as the "umbilical cord of bone" [16]. Frost HM in 1983 described "Regional Acceleratory Phenomenon (RAP)". Frost HM recognised that original injuries resulted in accelerated normal regional healing process. RAP was described as a local response to a noxious stimuli resulting in accelerated regional regeneration process. However, this response was directly related to size, duration, intensity and magnitude of stimuli. RAP may last for four months in human bone and increase the bone healing by 10-50 times faster than normal bone turnover [17]. Elevation, stretch and transposition of periosteum on exposed root surface in the periosteum transposition technique can be considered as noxious stimuli. Thus, RAP concept is applied in the periosteum transposition technique that speeds up the healing process.

The chances of recurrence of gingival recession/risk of gingival recession was minimised by flattening of root surface convexity within alveolar bone housing as Richman C suggested that teeth malpositioned beyond the alveolar bone housing strongly correlated with gingival recession [18].

The finding of the periosteum transposition technique was comparable to other techniques in which periosteum used for treatment of gingival recession. Similar finding that is 100% root coverage was achieved in Miller Class I gingival recession by the periosteum eversion technique for coverage of denuded root surface at the end of six months. In the periosteum eversion technique, a full thickness flap was reflected. The periosteum was incised at the baseline and separated from the submucous connective tissue upto the borderline of the attached gingiva. The periosteum pedicle coronally to attached gingiva was everted and transposed on denuded root surface [2]. About 84.6% root coverage was obtained in Miller Class II gingival recession after six months by vestibular incision subperiosteal tunnel access technique where periosteum was used as a platelet-rich fibrin-reinforced periosteal pedicle graft [7].

The advantage of transposed periosteum is that it is vascularised which is superior to free periosteum. The osteogenic capacity of vascularised periosteum is less affected by the environment of the recipient site as compared with free periosteum [19]. Another advantage is that the configuration of the transposed periosteum can be adjusted to the shape of the recipient site [3]. The only disadvantage is the profuse bleeding during extension of vertical incisions beyond the mucolabial fold into lip mucosa and during cutback incision of 100 degrees to the base at the distoapical part of the periosteum. This problem can be overcome by 3Ps, i.e., pressure, patience and prayer.

CONCLUSION

The periosteum transposition technique is a technical sensitive procedure. Gentle soft tissue handling is essential to prevent tissue injury/tear. When surgery is precisely executed, optimal outcome of surgery can be obtained.

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