

## A Case Report of Ridge Augmentation using Onlay Interpositional Graft: An Approach to Improve Prosthetic Prognosis of a Deficit Ridge

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### ABSTRACT

Periodontal therapy has developed beyond the scope of the treatment of periodontal pathoses. Periodontal plastic surgery consists of the reconstructive procedures designed to enhance the both function and esthetics. Deficient ridges pose a severe problem to the restorative dentist in restoring the natural form, function and esthetics of the prosthesis replacing the natural dentition. Depending upon the severity, location of these defects and the prosthetic option chosen, hard and soft tissue ridge augmentation or non-surgical approach or a combination may help to address them. The present clinical report describes a soft tissue ridge augmentation of a localized ridge defect in maxillary aesthetic region using onlay interpositional graft followed by fixed partial denture.

**Keywords:** Alveolar resorption, Tissue graft, Alveolar ridge augmentation.

### INTRODUCTION:

The post extraction resorption of an extraction socket occurs in horizontal, vertical, buccal as well as lingual directions. The consequent bone loss is greatest in the horizontal direction and on the buccal aspect of the ridge leading to transposition of the ridge to palatal/lingual aspect. This resorptive pattern may form a residual ridge which is not suitable for optimum prosthodontic rehabilitation<sup>1</sup>.

A deformed ridge may result from traumatic tooth extractions, advanced periodontal disease, abscess formations, congenital defects and surgical procedures<sup>2</sup>. The deformity that exists in the ridge is directly related to the volume of root structure and associated missing

or destroyed bone<sup>3</sup>.

The localized alveolar ridge defects have been classified quantitatively<sup>4,5</sup>, on the basis of their three dimensional form and on the basis of their severity and extent<sup>5-7</sup>. Such preoperative classification systems are of great clinical relevance in estimating the prognosis and the degree of difficulty of the surgical intervention.

Prosthetic treatment of uncorrected ridge defects with a fixed restoration may lead to esthetic as well as functional complications<sup>7</sup>. The esthetic complications include the open interdental spaces due to lack of papillae i.e. black triangles, difficult design of an esthetic pontic rest causing inadequate emergence profile, unaesthetic gingival texture or missing gingival breadth<sup>8</sup>. The functional problems may comprise of food impaction under the pontic,



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phonetic problems and percolation of saliva during speech<sup>2,7</sup>.

The localized ridge defects can be solved in one of the two ways i.e. non surgical and surgical. The non surgical modality includes compensation of the defect with fixed or removable prosthesis, using pontic teeth that are longer than their natural counterparts or use of palatally inclined design of the pontic. Other non-surgical means can be the use of a flange placed to simulate the missing soft tissue contours using pink ceramic or silicon in the cervical region of pontic. Though this saves the patient from a surgical intervention, such prostheses lack realism and are readily detectable when patients smile<sup>9</sup>.

The surgical methods used during the preprosthetic phase include correction of the ridge defect by soft tissue augmentation<sup>10-13</sup>, correction with autogenous bone and/or alloplastic bone substitutes, correction through guided bone regeneration alone or in combination with bone graft materials<sup>14-16</sup>. The severity of the ridge deficiency and method of tooth replacement dictate the method of choice. For small to moderate defects, soft tissue augmentation may give satisfactory outcome, especially when an FPD is scheduled. Severe defects may require a staged approach or hard tissue augmentation, the latter is of choice when implant therapy is planned<sup>17</sup>.

The present case report describes an interdisciplinary approach of soft tissue ridge augmentation procedure utilizing an autogenous soft tissue onlay interpositional graft (OIG) followed by porcelain fused to metal (PFM) fixed partial denture to replace the missing teeth and to achieve optimal form, function and esthetics.

## CASE REPORT

A 32 year-old male patient reported to the Department of Prosthodontics for replacement of missing right maxillary canine and right first premolar. The dental history revealed that the patient underwent extraction of canine and first premolar, 1 year back due to the failure of endodontic treatment. On clinical examination a Siebert's class III defect was observed in the edentulous region<sup>4</sup> (Figures 1 and 2).

The patient was then referred to the Department of Periodontics for the correction of the ridge defect. The treatment plan was explained to the patient and a written consent was obtained from him. Prior to the surgical phase, the abutment teeth were prepared. Partial veneer preparation for the right second premolar and full crown preparation for right lateral incisor was done. This was followed by fabrication of provisional restoration with auto-polymerizing acrylic resin (DPI RR Cold cure, Dental Products of India, Mumbai, India) and its cementation was carried out (Figure 3). The provisional prosthesis helped in estimating the size of the ridge defect to be repaired and in shaping the outline of the augmented ridge to the desired form during post surgical phase. The provisional pontic contours and tissue surface were fabricated in such a way that it simulated the final prosthesis. The tissue surface of the provisional restoration was highly polished to reduce the plaque accumulation and subsequent tissue irritation.

## TECHNIQUE

The surgical technique as described by Seibert (1996)<sup>12</sup> was followed.

**Recipient site preparation:** After obtaining the written consent form the patient, the surgical procedure was performed under local anesthesia using 2% Xylocaine with 1:100,000 adrenaline. A mesiodistal crestal incision was made at the crest of the deficient ridge and was continued as a sulcular incision along the right lateral incisor (Figure 4). The incision was then carried labially to create a labial partial thickness envelope flap with sufficient apical extension to create a pouch (Figure 5). The interdental papilla distal to right lateral incisor was completely elevated and included in the flap. The palatal side of the incision was not elevated as this immobile palatal tissue served as a source of anchorage for the graft after suturing. The amount of relaxation of the envelope flap was then tested with a periosteal elevator.

**Determination of interpositional onlay graft dimensions-** For this, the provisional prosthesis was replaced and the prepared pouch was gently displaced labially until it is in the desired relationship to the cervical areas of the pontic teeth. A calibrated probe was then used to measure the



**Fig 1:** Ridge deficiency in vertical and horizontal dimensions.



**Fig 4:** Marking for the pouch to receive the onlay interpositional graft.



**Fig 2:** Ridge deficiency in vertical and horizontal dimensions.



**Fig 5:** Soft tissue pouch created to receive the onlay interpositional graft.



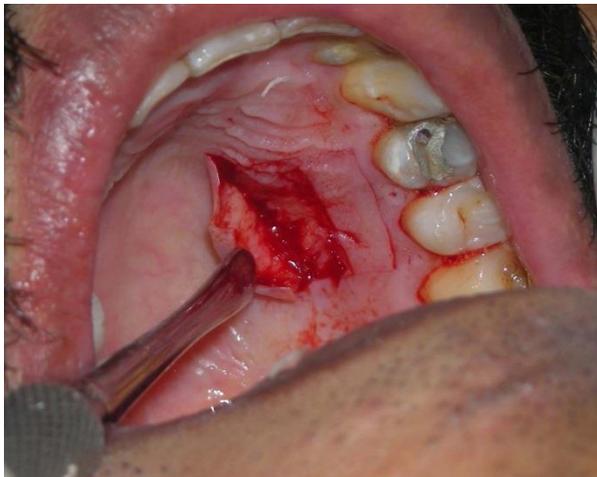
**Fig 3:** Temporary prosthesis cemented.



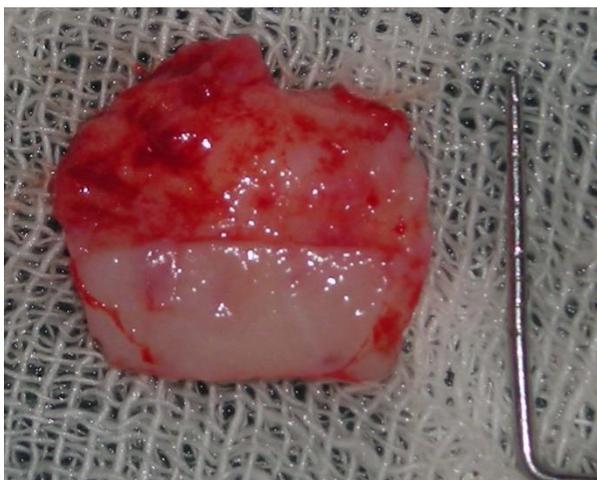
**Fig 6:** Measuring the onlay interpositional graft to be harvested.



**Fig 7:** Incision placed at the donor site to harvest onlay interpositional graft.



**Fig 8:** Onlay interpositional graft being harvested.



**Fig 9:** Onlay interpositional graft.



**Fig 10:** Onlay interpositional graft sutured at the recipient site.



**Fig 11:** Onlay interpositional graft sutured at the recipient site.



**Fig 12:** Onlay interpositional graft sutured at the recipient site.



**Fig 15:** Result after 1 month follow up.



**Fig 13:** Result after 15 Days follow up.



**Fig 16:** Result after 1 year follow up with final PFM bridge.



**Fig 14:** Result after 1 month follow up.

horizontal distance to which the flap was displaced (Figure 6). This determined the width of the onlay portion of the OIG to be harvested. The height of the interpositional portion of the OIG was also measured using the probe and a template was fabricated from the sterile aluminum foil to transfer the desired shape to the surface of the palate.

**Procedure to harvest the interpositional onlay graft** – The graft was harvested from palatal side of opposite premolar, as the palate is thickset in that area and the use of premolar area avoids interference with the larger branches of greater palatine artery located posteriorly. After anaesthetizing the donor site, the template was placed on the surface of palate leaving atleast 2 mm of gingiva with left premolars to avoid postsurgical gingival recession. The borders of the template were scribed 1.5 mm deep with a #15 no. scalpel

blade. For harvesting the onlay portion, two vertical incisions (anterior and posterior) and a horizontal incision (occlusal) were made perpendicular to the surface and deep into the periosteal region of the palate. The incision on the palatal border was made in the same manner as the incision for the subepithelial connective tissue graft for root coverage procedure is prepared (Figure 7). From the initial depth of 1.5 mm the incision was continued as a long bevel aimed upto the desired length towards the midline of the palate over the entire mesiodistal incision (Figure 8). This secured the de-epithelized connective tissue segment of the interpositional part of the graft.

The harvested graft was then soaked with isotonic saline and kept on wet sterile gauze (Figure 9). Hemostasis was achieved at the donor site with the help of pressure applied using moistened gauze. The edges of the palatal wound were drawn together as closely as possible with multiple sutures to minimize the exposed surface area.

**Placement and suturing of the graft-** The harvested graft was tried in the prepared recipient site and the necessary adjustments were made in it.

The first sutures were placed on the crestal-palatal border from the graft into the immobile palatal tissue, which stabilized the graft and fixed it into position. The de-epithelized connective tissue segment of the graft was tucked into the pouch and was sutured to the labial flap of the pouch (Figure 10). The edge of the labial flap of the pouch was sutured to the onlay graft along its labial-epithelial border, flushing at the level of epithelium (Figures 11 and 12).

The postoperative discomfort was adequately controlled with analgesic medication during the first postoperative period, and patient was instructed for oral hygiene maintenance. To prevent undue pressure from the pontics on the grafted tissue, the pontics were shortened in the cervical area prior to the recementation of the provisional prosthesis.

The tissue in the augmentation site was permitted to mature for 8 weeks, during which the patient was periodically recalled and reviewed for home care instructions. The healing at the recipient and donor site was uneventful (Figures 13, 14 and

15). Full crown preparation was done with right second premolar and impressions were made for the fabrication of four unit PFM-partial denture.

The final prosthesis was tried for its fit and necessary occlusal adjustments were made prior to its cementation with zinc phosphate cement.

The patient was scheduled for recall after two weeks, 1,3,6,12 months. At all the recall appointments home care instructions were reviewed again and the ridge-prosthesis assembly was examined for acceptability with respect to esthetics, form and function (Figure 16).

## DISCUSSION

Successful tooth replacement depends on appropriate management of hard and soft tissues adjacent to the edentulous ridge<sup>17</sup>. Esthetic reconstruction of deficient ridges specially class III type, pose a major challenge to clinicians who attempt to provide life like prostheses.

In the present case, an onlay interpositional type of autogenous graft was used for the correction of deficient ridge. This type of graft was developed in an attempt to incorporate the best features of both the onlay and subepithelial connective tissue graft procedures, thus permitting a wider scope to improve the soft tissue bulk of the ridge in horizontal and vertical planes in a single procedure<sup>12</sup>. The procedure has the advantages like, the submerged connective tissue section of the interpositional graft aids in revascularization of the onlay portion of the graft. Vestibular depth and mucogingival junction remain unchanged thereby eliminating the need for follow up corrective procedures. Smaller postoperative open wound at the donor palatal site accelerate the healing and reduced the patient discomfort. Follow up of the patient at 12 months demonstrated the clinical success of the procedure in satisfactorily restoring the esthetics, form and function.

Thus to conclude, recognition of the mucogingival problems associated with partially edentulous ridges and full understanding of the appropriate techniques available for their correction are the prerequisites for the esthetic and functional success in prosthodontic rehabilitation.

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## CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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