The Edentulous Ridge in Fixed Prosthodontics

David A. Garber, BDS, DMD
Director, Group Clinical Practice
Assistant Professor
Departments of Restorative Dentistry and
Form and Function of the Masticatory System

Edwin S. Rosenberg, BDS, H Dip Dent, DMD
Director, Postdoctoral Periodontics
and Periodontal Prosthesis
School of Dental Medicine
University of Pennsylvania
Philadelphia, Pennsylvania

In those clinical situations in which missing teeth are replaced with fixed prosthodontics, the clinician is faced with the task of fabricating the pontics to fulfill the requirements of esthetics, form and function, and oral physiotherapy.

The relationship of the “dummy tooth” or pontic to the underlying ridge is inordinately complex, since the esthetic requirements invariably conflict with those of function and hygiene. Although pontic designs have been discussed in some depth in the literature, descriptions of the pontic form assume the presence of an ideal recipient site. Little attention has been directed to the problem of how the various pontic designs relate to the deformed edentulous ridge or pontic recipient site.

Pontic Designs

Following are the pontic designs most commonly described:

1. Sanitary pontic. This form fulfills the prerequisites for the health of the underlying attachment apparatus or periodontium, because it does not come into any form of contact with the ridge and leaves the proximal areas of the adjacent teeth or abutments free of encumbrances which make oral physiotherapy difficult. The form is certainly not esthetic and it may present a problem to many patients, since the space between the pontic and the ridge becomes a depository for large pieces of food and a site into which the tongue invariably strays.

2. Ridge lap pontic (Fig 1A). This pontic design presents problems due to the inability of either the patient or clinician to keep the interface between the pontic and the underlying ridge free of plaque. The tissue becomes inflamed, loses its keratinized surface, and ulcerates. It is generally considered inadvisable to use this type of pontic.

3. Modified ridge lap pontic (Fig 1B). This is the most commonly used pontic design; the contact of the pontic with the underlying ridge is maintained only on the buccal aspect of the ridge. This limited contact in only one plane allows the area to be readily cleansed with dental floss and maintained free of inflammation. This type of pontic fulfills most of the needs of the restorative dentist in cases involving ideal edentulous ridges.

4. Ovate pontic (Fig 1C). This is a pontic form with a rounded base; it is indicated when esthetics are of paramount importance. It also ideally
fulfills the requirements of function and oral physiotherapy. However, it can be utilized only if the recipient site is initially prepared to receive it by some form of surgical procedure, or if the pontic is inserted into the extraction socket at the time of tooth removal. The rounded base of the pontic must be accurately formed to fit the prepared concave recipient site precisely. The intimate relationship allows floss to pass over the convex base, simultaneously cleaning the pontic and the concave surface of the pontic recipient site.

It is the authors' contention that the ovate pontic is the most useful pontic form. This article will discuss the development of pontic recipient sites, in both the normal and deformed edentulous ridge, to accommodate the ovate pontic design.

The Edentulous Ridge and Pontic Recipient Site

The ultimate physical and anatomical form of the pontic recipient site is a direct result of the state of the periodontium and the tooth prior to extraction. The presence of periapical pathosis, periodontal disease, or trauma will have a direct influence, as will the age of the patient and the body's healing potential. It is the responsibility of the exodontist to use judicious care in removing any tooth, since too often the labial or buccal plates are fractured and removed along with the tooth or sequestrated at a later date, resulting in iatrogenic deformities. Improper extraction should be particularly avoided in the anterior region of the mouth, as it can create an unesthetic pontic-to-ridge relationship.

The pontic recipient site can, therefore, be defined as being potentially adequate or inadequate depending on whether the ridge area is normal (flat) or deformed (collapsed), as viewed in an apicocoronal (vertical) dimension or a buccolingual (horizontal) dimension.

The preparation of the pontic recipient site in each of the above situations requires individualized attention and specific considerations.

The Normal (Flat) Ridge

For this type of ridge, it is first necessary to determine the anatomical characteristics of the site. When the tooth was removed there may have been osseous fill of the healing socket, making it level with the two interdental peaks of bone (Radiograph 1). This situation obviously is not ideal, because the bone in the center of this flat pontic site is now at a level more coronal to that point at which the maximal curvature of the cementoenamel junction (CEJ) normally would have been (Radiograph 1).

The rise and fall of the CEJ of any particular tooth form can be characterized as being highly scalloped or flat, corresponding to the underlying osseous topography and gingival form. The dimension of the additional healing bone fill will equal the distance between the tip of the interdental papilla and the most apical curvature of the free gingival margin. The net effect of this type of flat socket healing is inadequate space for a pontic with dimensions similar to those of the adjacent teeth. The form of the pontic recipient area must, therefore, be assessed relative to that of the adjacent teeth, which may be highly scalloped or flat.

Ideally, the clinician should have the temporary bridge and pontic prepared at the time of extraction so that the ovate pontic can be immediately inserted into the socket and the attachment apparatus allowed to heal around this form. This will prevent the flat healing of the socket straight across the tips of the interdental osseous crests, and will result in an ideal concave pontic recipient site.

If the pontic is not inserted at the time of extraction and esthetics are of prime importance, surgical reduction of the pontic recipient site may become necessary. Surgical Preparation of the Pontic Recipient Site

If the level of the healing ridge is too far coronal for an esthetic pontic, the anatomical topography of the site must be determined by needle probing under local anesthesia (Fig 2A). If there is a thickness of 3 or 4 mm of soft tissue above the alveolus in the center of the ridge, it is necessary only to perform soft tissue gingivoplasty, developing an anatomical configuration compatible with the two adjacent teeth. This is easily accomplished with a rotary diamond instrument (Fig 2B). A 1-mm concavity for the base of the pontic, further apical to the maximal curvature of the adjacent marginal gingiva, is developed. To fit into this area, the temporary pontic is relined with self-curing acrylic, trimmed, and polished, allowing the tissue to heal around this ovate form (Fig 2C).

If the needle probing reveals a soft tissue depth of only 2 mm (Fig 3A and Radiograph 1), a surgical procedure with osteoplasty of the ridge is invariably necessary to develop the ideal pontic recipient site. A full thickness mucoperiosteal flap is raised and the edentulous ridge is fully exposed (Fig 3B). The flap is raised from the palatal aspect to prevent any subsequent unesthetic labial scarring. The interproximal tissue on the abutment teeth is not included in the dissection to ensure the constancy of the crown margin-to-tissue relationship. The "trapdoor" of tissue is gently dissected towards the labial and the osteoplasty procedure performed (Fig 3C and Radiograph 2).
Depending on the type of pontic to be used, the flat osseous ridge is reshaped in one of two ways.

**Ovate Pontic**—The flat ridge is reshaped so that when viewed from the direct buccal aspect, it is in harmony with the scalloped osseous form of the adjacent teeth. Next, a depression 1 mm deep and 5 mm in diameter is created midway between the two abutments in line with the central fossa (Fig 3C).

**Modified Ridge Lap Pontic**—The flat ridge is decreased in width from the lingual aspect only, allowing the pontic to make contact predominantly on the buccal aspect, thereby facilitating oral physiotherapy. For esthetic reasons, an indentation is then created on the buccal aspect which permits the placement of a pontic which is not in extreme labioversion and which blends in with the adjacent teeth (Fig 3D).

The flap is sutured in position over the reshaped alveolar ridge (the pontic recipient site) and held by the pontic in close apposition to the concavity. Healing will result in either a pontic recipient site which is concave in both a buccolingual and a mesiodistal direction, and into which the ovate pontic can fit, or in a pontic recipient site of correct dimension to accept a modified ridge lap.

Teeth with no antagonists invariably erupt into the space in the opposing arch, bringing the alveolus and attachment apparatus with them. If, for any reason, these teeth are lost at a later stage, the resulting edentulous area or potential pontic recipient site will be at a level coronally lower than the adjacent teeth. In such situations, the ostectomy and osteoplasty procedures necessary to recreate a dimension capable of receiving esthetic functional pontics will be identical to those described above, but far more radical.

**The Deformed (Collapsed) Ridge**

The deformed pontic area or collapsed ridge (Fig 4) has long posed a severe problem to the esthetically conscious restorative dentist. Due to the many factors involved in tooth loss, areas where teeth have been extracted can resorb severely, resulting in bizarre anatomical deformities which are ineffectively compensated for prosthetically.

The bone loss in any localized pontic area can be considered to be one of two distinct types: **vertical or horizontal**.

In vertical resorption, the resulting ridge is considerably shorter in an apicocoronal dimension than that of the adjacent teeth. In the second type of bone loss, the resorption is more horizontal, taking place when the buccal plate is lost, and causing a concavity in a buccolingual dimension. Either type of bone loss results in an unesthetic situation in which the pontic needs to be considerably oversized as compared to the adjacent teeth.

To date, several methods have been utilized to attempt to compensate for this problem. The first, and simplest, solution is to place a pontic that blends as well as possible into the edentulous area. For more severe deformities, it may be necessary to add pink-colored acrylic or porcelain to the apical end of the pontic to simulate normal gingivae. A third solution is to make a portion of the prosthesis (the gingival tissue) removable, as with an Andrew's bridge. Recently, an interesting concept of surgical ridge augmentation was described in the literature, and an extension of that approach is the subject of the remainder of this article.

**Surgical Augmentation of the Deformed Edentulous Ridge**

Several distinct types of surgical procedures are available for treating the deformed residual edentulous ridge, depending on the nature of the deformity.

**Loss of Dimension of a Vertical Nature**—Two periodontal surgical plastic procedures are presently utilized to augment ridges with a predominantly vertical deformity.

**The De-Epithelialized Connective Tissue Pedicle Graft (Roll Technique)**—This procedure has been described in detail in the literature (Fig 5A). Basically, it is a form of contiguous grafting (pedicle graft) which utilizes as the donor site only the connective tissue of the palate adjacent to the ridge. The epithelium over the pedicle is first removed. This is readily done, using a...
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Fig 2A—The normal ridge. Tissue more coronal than that of the adjacent teeth. Hemorrhage droplet due to needle probing indicates level of osseous crest and 3 to 4 mm of soft tissue below this.

Fig 2B—Reduction of excessive soft tissue with rotary diamond. An arcuate form of the adjacent teeth is first developed in the soft tissue, and then a mild concavity for the base of the rounded pontic is developed at the height of this curvature, midway between the two abutments in both a buccolingual and a mesiodistal dimension.

Fig 2C—Final esthetic result. Pontic appears to be “growing out” of the gingivae with normal physiologic configuration.

Fig 2D—Clinical appearance of a situation with tissue more coronal than that of the adjacent teeth; i.e., a flat ridge without the normal degree of scallop or rise and fall of the adjacent teeth. Needle probing reveals the osseous form of this extraction site and a layer of only 1.5 mm of soft tissue above the osseous.

Fig 3A—Mucoperiosteal “trapdoor” flap is raised from the palatal aspect, providing access to the underlying flat osseous ridge.

Fig 3B—Osteoplasty of the ridge to develop rise and fall similar to that of the adjacent teeth.

Fig 3C—Final result showing concave pontic recipient site with simulated interdental papillae.

Fig 3D—Clinical appearance of a typically deformed ridge following extraction of two maxillary lateral incisors.
The roll technique showing de-epithelialized palatal contiguous graft about to be rolled into position and sutured. Graft is easily recognized due to lack of pigmentation.

Fig 5C—Contiguous graft sutured into position and showing increase in vertical dimension of the soft tissue.

Fig 5A—Clinical appearance of gross vertical loss in dimension of a deformed edentulous ridge. (Courtesy of Dr. Jay Seibert, University of Pennsylvania.)

Fig 6B—Ridge graft sutured in position. Note that no definitive shaping procedures are undertaken at this stage. (Courtesy of Dr. Jay Seibert, University of Pennsylvania.)

Fig 6C—Healing 2 weeks after wedge procedure. Note the difference in color between the normal tissue and the graft and the reduced size of the central incisors and the upper left lateral incisor of the prosthesis to accommodate the increase in soft tissue dimension. (Courtesy of Dr. Jay Seibert, University of Pennsylvania.)
The donor site from which the flap was rolled will initially heal as an epithelial-covered depression, which will slowly granulate in and fill.

The pontic is reduced (Fig 5D), and the area is dressed and allowed to heal for 10 days, when the sutures are removed. The area is then redressed for 1 week, when a plasty is done to prepare a concave pontic recipient site for an ovate pontic. There are occasions when an ovate pontic can be placed at the time of the initial surgery and the tissue allowed to heal and form around it. Such situations usually require less gingivoplasty at a later date.

This type of procedure is excellent if the loss of dimension is predominantly vertical. It also allows the mucogingival junction to be repositioned by the extension of two vertical incisions out to the buccal surface of the involved area.

The procedure should not be used when there is inadequate thickness of palatal tissue available or when the edentulous ridge area is knifelike, with scant underlying bone and soft tissue. That is, there must be a scaffold of underlying bone to support the graft; otherwise, excessive shrinkage could result. These situations can be assessed utilizing needle probing under anesthesia prior to surgery.

THE AUTOGENOUS COMBINED EPITHELIAL AND CONNECTIVE TISSUE FREE GRAFT (Wedge Technique)—This procedure is most useful in knifelike edentulous ridge areas or when there is insufficient palatal tissue available in the ridge area for use of the roll technique. It is also particularly useful when a large amount of gingiva must be added in a vertical dimension (Fig 6A). This technique, in contrast to that using the pedicle graft, described above, requires the utilization of a donor site distant from the ridge to be augmented. An excellent site, which invariably yields the required adequate thickness of donor tissue, is the tuberosity area distal to the maxillary molars.

The recipient site is prepared first by a partial thickness dissection which removes the epithelium and a nominal portion of the underlying connective tissue. The tissue is then infiltrated with an anesthetic containing a hemostatic agent, and a connective tissue pedicle flap is outlined through to the osseous, and then elevated from the palate within the de-epithelialized zone (Fig 5B). In this procedure, it is important that the proximal marginal tissue of the adjacent abutment teeth is not involved. This will ensure stability of the crown margin-to-tissue relationship.

A zone of tissue is de-epithelialized corresponding to the amount of augmentation required, and the pedicle may even be rolled in upon itself twice before being placed on the apex of the residual osseous ridge. Next, a pouch on the labial aspect of the ridge is created by blunt dissection and the flap is inverted upon itself and placed into it.

A specific suturing technique is used to maintain stability of the pedicle graft. The needle is initially inserted from the buccal surface through the rolled pedicle to the palatal side and then back through the pedicle and the pouch, through to the buccal surface once again, where the suture is tied off (Fig 5C).

Non-epinephrine bearing anesthetic, by sharp dissection or by use of a rotary diamond instrument. Free bleeding, permitted by the non-epinephrine anesthetic, is evidence of complete epithelial removal. The tissue is then infiltrated with an anesthetic containing a hemostatic agent, and a connective tissue pedicle flap is outlined through to the osseous, and then elevated from the palate within the de-epithelialized zone (Fig 5B). In this procedure, it is important that the proximal marginal tissue of the adjacent abutment teeth is not involved. This will ensure stability of the crown margin-to-tissue relationship.

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surgery but only at a subsequent visit, following the "take" of the graft.

Loss of Dimension of a Horizontal Nature (Fig 7)—The subepithelial connective tissue graft generally is used to augment ridges with a predominantly horizontal deformity. Depending upon the anatomy of the deformity, two types of surgical plastic procedures are available to the clinician: the flap or the pouch (single or double).

The basis of all these procedures is the placement of a graft of only connective tissue from a remote site, subepithelially, in the area of the ridge requiring augmentation.

The decision about which type of procedure to use in any given case depends upon whether there is an alteration in the mucogingival junction line of the ridge relative to the adjacent teeth, and on the number of teeth involved, that is, the lateral dimension of the graft.

The flap procedure (Fig 8) is indicated only if the mucogingival junction in the deformed area is to be repositioned. This type of situation arises from problems associated with tooth extraction and the ultimate healing of the mucogingival junction at a level more coronal than that of the adjacent teeth. However, if it is in line with the mucogingival junction of the adjacent teeth, one of the pouch procedures is more suitable.

The double pouch procedure (Fig 9) generally is used only when the deformity crosses the midline or is of too great a dimension to allow all the donor tissue to be placed in through a unilateral incision.

In all of these procedures, the removal of the connective tissue graft from the donor site is similar; the only differences are in recipient site preparation, as will be demonstrated below.

Donor Site Preparation—The most readily available sources of donor tissue are found in the lateral aspects of the palate and in the tuberosity region. The tissue for the graft may be removed from these areas either as part of a maxillary periodontal surgical procedure (secondary flap) or as an individual procedure (envelope flap). In the first case, the tissue for the graft is removed either as part of the wedge and ledge procedure or in the thinning out of the primary palatal flap. After the secondary flap is removed, it is de-epithelialized of marginal gingiva and inflamed sulcular tissue.

In the case of the envelope flap, a rectangular form is first outlined in the posterior aspect of the palate. The base of the flap is towards the midline of the palate and the most coronal aspect approaches within 2 to 3 mm of the free gingival margin, but does not encroach upon it. The lateral dimension of the flap depends upon the recipient site deformity and the amount of tissue needed. The split thickness envelope flap is then raised by a procedure similar to that used for taking a free epithelial graft for mucogingival procedures. The epithelium and connective tissue are not removed, however, but are left attached along the midline. The underlying connective tissue is then removed down to the palatal osseous, and this donor tissue is placed on saline-soaked gauze. Next, the initial envelope flap is sutured back in position and held in close apposition with the underlying bone for 6 or 7 minutes. This covers the denuded bone, facilitating healing with only a mild depression that will fill to its normal level over a period of time, at the same time decreasing both the amount of pain associated with the exposed bone and the problems associated with dressing the area.

The connective tissue graft can now be placed in a prepared recipient site and sutured in position.

Recipient Site Preparation—Preparation of the recipient site for both the flap and pouch procedures will be discussed.

1. Flap procedure. This is the most useful procedure for correcting deformities in the horizontal dimension when the mucogingival junction has moved coronally, leaving insufficient masticatory mucosa for pontic reception directly over the ridge.

A split thickness flap is first elevated on the buccal aspect of the deformed ridge, leaving the periosteum and a portion of the connective tissue overlying the alveolar ridge (Fig 8A). The vertical incisions extend in an oblique fashion on either side of the deformed ridge and into the labial fold as high as is necessary to reposition the mucogingival junction. The horizontal incision is made on the palatal aspect of the ridge so as to increase the zone of masticatory mucosa available for repositioning. The connective tissue from the donor site is placed on this somewhat concave base and, if necessary, sutured in position with resorbable gut (Fig 8B). The elevated split thickness flap is then sutured down over the connective tissue to immobilize it in the desired position and realign the mucogingival junction (Fig 8C). This overlying flap, together with the underlying connective tissue base, should provide an adequate source of nutrients for the connective tissue graft.

The sutures are removed at 10 days and the area redressed with a periodontal pack. Next, the required pontic recipient concavities are created in the augmented ridge, and the pontics of the provisional restoration relined with acrylic and adapted to these concavities.

2. Pouch procedures. The pouch procedure is used in those situations in which the dimensional loss of the ridge is predominantly horizontal (Fig 10A), and the mucogingival junction is essentially in line with that of the adjacent teeth. There are two approaches to placement of the initial incision: a vertical oblique incision or a horizontal incision.

In the first approach, preparation of the recipient site is initiated by a vertical oblique incision extending from the ridge apex, just mesial to one of the abutment teeth, and up towards the vestibular fornix (Fig 10B). The integrity of the interproximal marginal tissue should not be disturbed, in order to maintain the crown margin-to-tissue relationship. Through this initial incision, a split dissection of the tissue overlying the ridge is performed.
Fig 7—Clinical appearance of typical horizontal loss in dimension of a deformed edentulous ridge, due to loss of buccal plate during extraction of lateral incisors.

Fig 8A—Surgical approach to flap procedure. Split thickness flap is raised to reposition mucogingival junction and to provide a base on which to place the connective tissue graft. (Courtesy of Dr. E.S. Rosenberg, University of Pennsylvania.)

Fig 8B—Diagrammatic representation of flap procedure. Connective tissue graft is sutured onto the periosteum of the deformity.

Fig 8C—Diagrammatic representation of elevated flap sutured back into position over the connective tissue graft in such a way as to realign the mucogingival junction.

Fig 9—Diagrammatic representation of double pouch procedure extending across the midline. The lateral extent of the deformed ridge requires that grafts must be placed in position through a bilateral incision on either side of the midline.

Fig 10A—The preoperative appearance of horizontal bone loss in an edentulous ridge.

Fig 10B—Clinical appearance of the vertical oblique incision. Note that the marginal integrity is left undisturbed.
It extends through the masticatory mucosa and the mucogingival junction into alveolar mucosa.

The tissue over the entire deformity and slightly beyond is elevated to create a pouch (Figs 10C and E). The fact that the deformity is concave permits the elevation of the tissue towards the buccal aspect without any tension being placed on it.

The connective tissue from the donor site is cut into the appropriate size and tried in position within the pouch (Figs 10D and E). It may be necessary to try one or more pieces of connective tissue to ascertain if the amount of augmentation is adequate and of the correct form. The tissue graft is sutured in position as described below (Figs 10F and G), dressed, and allowed to heal for 4 weeks when the pontic concavities are developed. The temporary restoration is relined and recemented, and 13 weeks is allowed to elapse before the augmented ridge (Fig 10H) is ready for the final prosthesis.
Fig 11A—Clinical appearance of horizontal incision at the crest of edentulous ridge.

Fig 11B—Diagrammatic representation of horizontal incision. In cislal view.

Fig 11C—Diagrammatic representation of horizontal incision with pouch development. Dissection has been extended laterally and apically over the entire deformity via the initial incision.

Fig 11D—Clinical appearance of the small initial incision and pouch.

Fig 11E—Connective tissue being placed into the pouch

Fig 11F—Connective tissue graft sutured into position

Fig 11G—Clinical view of preoperative ridge

Fig 11H—Postoperative view of the same ridge following augmentation. Note the dramatic increase in horizontal dimension.
In the second approach, a horizontal incision is made at the base of the edentulous ridge and extends apically through the entire length of the deformity (Figs 11A and B). The pouch is then developed by extending the split thickness incision laterally in order to elevate the tissue lying within the area of the deformity and slightly beyond (Fig 11C).

Next, the donor tissue is slipped through the primary horizontal incision into position in an inciso-apical direction (Figs 11D, E, and F).

Healing takes place as with the vertical incision, and the augmented ridge (Figs 11G and H) undergoes a gingivoplasty to develop the concave pontic recipient site.

If the deformity has an added vertical component as well (Fig 12D), the placement of the horizontal incision

Fig 12B—Clinical view of incision similar to that shown in Fig 12A.

Fig 12C—Clinical view showing connective tissue graft in position. It was slipped in through the initial palatal incision over the osseous crest and around onto the buccal aspect of the deformity, leaving the base of the graft overlying the actual crest of the osseous ridge. This will facilitate augmentation in a horizontal dimension as well as a vertical dimension. Note, however, that the initial incision cannot be closely coapted and should not be tightly tied off. This area must heal by secondary intention. Note the donor site on the right side of the palate.

Fig 12D—Preoperative view with provisional restoration in place and pink acrylic on the apical end of the provisional restoration.

Fig 12E—Postoperative view of the same site following ridge augmentation. Note the dramatic amount of vertical as well as horizontal ridge augmentation. Note, too, that the provisional restoration has been cut back on its apical end to allow for the increase in ridge dimension.
connective tissue grafts in the positions decided upon where the pouch is to be developed and where the tissue is to be placed in the augmentation process. A deformity may require, therefore, the utilization of both vertical and horizontal incisions, in both the palatal and buccal aspects.

SUTURING TECHNIQUE—A suturing technique is required which accurately localizes and stabilizes the connective tissue grafts in the positions decided upon during the try-in phase of the procedure.

The needle is inserted from the labial surface at the point at which it is desired to anchor one of the connective tissue grafts. It then passes through the undersurface of the pouch and out through the initial incision. The needle is then passed through the connective tissue, back through the initial incision, into the pouch, and out onto the labial surface (Fig 10F). The two ends of the suture are now gently pulled and the connective tissue graft is eased through the primary incision into the pouch in the position determined by the placement of the initial insertion of the suture needle. The suture is now tied off in the usual manner (Fig 10G).

It is important to the cosmetic success of the procedure that the donor tissue be immobilized accurately in position and held there. The tissue can be immobilized in two or three different positions which will result in a specifically shaped pontic area. The initial incision is still easily closed (Fig 10G) despite the plumping, because elevation of the pouch from within the concavity of the deformity results in an extra dimension of available tissue to bridge the gap:

The sutures are removed at 10 days and the area redressed. After a further 2 weeks, the augmented deformity can be shaped with a diamond stone to develop the concave form for the pontic. The temporary pontic is relined with self-curing acrylic and placed while still soft into this newly formed concave recipient site. The acrylic, once set, is trimmed, the ovate base polished, and the temporary bridge recemented in position. The whole complex is allowed to heal a further 8 weeks before final impressions for the prosthesis are taken.

Summary

The techniques described in this paper can be utilized to augment edentulous ridge concavities, irregularities, and deformities in those cases in which esthetics is of prime importance or in which the deformed ridge interferes with the function of speech or the ability to perform oral physiotherapy. The resulting soft tissue areas closely mimic normal gingival contours and form a concave soft tissue pontic recipient site for the desired convex pontic. These procedures are extremely useful adjuncts for correcting esthetic and functional problems in fixed prosthesis.

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REFERENCES

ARTICLE #2 REVIEW QUESTIONS

The article you have read qualifies for 1/2 hour of Continuing Education Credit from the University of Pennsylvania School of Dental Medicine. For your reference, record your answers on this page and then transfer them to the registration form inserted in *The Compendium*.

1. The physical and anatomical form of the pontic recipient site is influenced by
   a. the state of the extracted tooth.
   b. the mode of tooth removal.
   c. the patient’s age.
   d. the healing potential of the body.
   e. all of the above

2. The ovate (egg-shaped) pontic design can be used only if the pontic recipient site is first prepared by some form of surgical procedure.
   a. true
   b. false

3. Horizontal ridge deformities can be corrected utilizing
   a. the flap procedure.
   b. the single pouch procedure.
   c. the double pouch procedure.
   d. all of the above

4. The flap is the most useful procedure for correcting those horizontal ridge deformities in which the mucogingival junction needs to be elevated.
   a. true
   b. false

5. The most readily available sources of donor tissue are found in the lateral aspects of the palate and in the tuberosity region.
   a. true
   b. false

6. The autogenous combined epithelial and connective tissue free graft is most useful
   a. in knifelike ridge areas.
   b. when there is insufficient palatal tissue available for a de-epithelialized connective tissue pedicle graft.
   c. when a large amount of gingiva must be added in a vertical dimension.
   d. all of the above

7. Which of the following methods have been offered as solutions to the problem of the deformed residual edentulous ridge?
   a. blending of pontic to ridge area with poor axial angulation
   b. Andrew’s bridge
   c. ridge augmentation
   d. all of the above

8. Which of the following pontic-residual ridge designs has been presented as the most desirable in the anterior part of the mouth?
   a. total ridge lap with concave pontic surface in contact with convex ridge tissue
   b. modified ridge lap with convex pontic surface in contact with convex ridge tissue
   c. ovate pontic surface in contact with concave ridge tissue
   d. modified ridge lap with no tissue contact to allow for self-cleaning
   e. none of the above

9. The roll technique is contraindicated when
   a. there is inadequate osseous scaffolding.
   b. there is very thin soft tissue covering the alveolar ridge.
   c. the edentulous ridge is knifelike.
   d. the defect is predominantly horizontal.
   e. all of the above

10. Which one of the following statements regarding the process of de-epithelialization for the roll technique is correct?
    a. Epinephrine-bearing anesthetics are used to control bleeding during de-epithelialization.
    b. Non-epinephrine bearing anesthetics are used to encourage bleeding during de-epithelialization.
    c. The choice of anesthesia is unimportant in the de-epithelialization process.
    d. Anesthetic injections are necessary to distend tissue during de-epithelialization.