

Dear Friends

This newsletter reaches back, technologically, to the days of Helmut Zander as head of the Department of Perio at the University of Minnesota, 1955-56, and his concern for plaque control and the wellness of the person through the interception of etiology.

His concern for the dentist being an iatrogenic factor was acute and, "muckraker" that he was, shyness did not preclude his discussing it at length. Some ten years following the initiation of this idea system, NAPILI, then publishing *Teethtalk*, produced a blurb called "Tertiary Prevention #2", which follows. It carefully ferreted out the important factors in pontic design and clumsily labeled the process

THE IMPLANT PONTIC

"Tertiary preventive procedure is defined as being the restorative phase that follows secondary prevention, which is the interception of disease causes so as to not allow disease to recur once arrested. (Primary prevention being the interception of causes of diseases prior to the disease taking place.) Tertiary prevention is the restorative phase that rehabilitates the damaged structure after secondary preventive procedures have been initiated.

"All restorative does not qualify as tertiary prevention. It is obviously true that dentists and dental laboratories on some occasions have become the etiological factors in dental disease. Morphology oftentimes prostitutes the oral cavity in quantity sufficient to disallow proper plaque control and to encourage food retention, both lateral and vertical.

"It's true that the embrasure form has often been so violated, either because of under-preparation or over-contouring the fabrication, that the papilla has been 'evicted' from the 'house' we call the embrasure.

"Pontic form has indeed been one of the misunderstood points in the history of crown and bridge restorative procedure. Great men in dentistry have spent time studying pontic morphology and in several articles in recent years the pontic has even been called the etiological factor in that it is either materially accused or morphologically accused of creating inflammation. A recent investigator, in a published study, designed the pontic so as to give it minimal ridge contact in an effort to keep it from producing pathology. Plaque control and lateral food accumulation were hardly being mentioned at all.



REED'S
INTERNATIONAL
LETTER

**Floss. . .
only the
ones you
want to
keep.**

"A saddle pontic will create a beautiful plaque trap that is not cleansable with any of the presently available tools. Floss will circumcise the crestal tissue as it's passed beneath the saddle pontic, as the floss will belly across the saddle from the buccal to the lingual high point and will leave the plaque in position and badly lacerate the crestal tissues.

"Most dental operators have had the opportunity of removing bridges that have been placed for various periods of time to find the bright red easily hemorrhagic area beneath that pontic. Earlier studies called this area 'over protected' and 'hypo-keratinized' due to lack of 'stimulation'. This, in the face of the fact that no study is available to show that 'stimulation' produces keratinization. Current studies, however, tend to show that the lycins such as hyaluronidase and the collagenases produce the de-epithelialization and the obstruction of inter-cellular material in quantity sufficient to expose the capillary bed and produce the lesion.

"If indeed, then, a pontic could be EGG-SHAPED so that floss or tape could easily be passed from the embrasure under the pontic into the next embrasure, cleanly sweeping it free of organized bacterial debris with one application, it would indeed be to the patient's best interest.

"For some obscure reason dentists have found themselves willing and able hard-structure surgeons, but somehow do more poorly with soft-tissue surgery. (Most periodontists agree. . .) It seems strange that it hasn't

occurred to us that we modify the soft tissue ridge for the patient's best interest as well as modifying the abutment teeth in order to get a restoration that holds sacred the function of the tooth, periodontal attachment apparatus, gingival tissue and bone. To insert the pontic keeping axial walls of the pontic parallel and dimensionally equal to the walls of the abutment teeth is quite simple if an indentation can be created in gingival tissue to receive the spherical or. . . as sentiment would have us call it. . . to insert the dental 'suppository.'

"After the routine preparation of the abutment teeth, the ridge tissue can be sampled with a perio probe to adequately determine its depth. This can be reported to the laboratory and the technician can indent the stone prior to wax-up so as to morphologically shape the intaglio of the pontic at the time of fabrication. In case of a high, bony ridge the morphology of bone across the pontic area could easily be prostituted for insertion of the pontic. In fact, even a flap procedure leaving the epithelium against bone could be accomplished. These procedures slightly prolong the seating time in the average crown and bridge case, but in the long run are pleasing to the patient cosmetically, food-flow pattern-wise, and preventively.

"On a three-unit bridge lower or upper posterior, the insertion of the pontic into soft tissue can easily be accomplished by bringing the bridge to place, prior to surgically modifying the ridge. An indentation of the pontic marks the spot for the surgical insertion, and as the bridge may rock a millimeter or two millimeters high off the preparations. On compression, a

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bleeding point can be made with a scalpel, with a Bard Parker #15 blade around the pontic area to mark the surgical approach. The blade is then placed in the center of the insertion sight and twirled or rotated to 'apple core' out a cone-shaped area for the insertion of the pontic. An electrosurge could easily be used to remove this section of tissue.

"There are two or three things in dentistry that we find to be challenging. To quote Bob Barkley, ' . . . to think is indeed an important act too seldom accomplished in dentistry.' In reference to this, it's easy to recombine the idea presented here with various situations and design your pontic and design your tissue modification to appropriately reflect the needs of the individual case, as to lateral food accumulation, embrasure form, cosmetics, morphology, and plaque removal.

"The second thing that has been alluded to is that it is very difficult for man to convert something he knows into something that works. Oftentimes it seems dentists must see an idea several times before they find a way to translate it into a function of their practice.

"Third, and not the least of the three philosophical thoughts that apply to dentistry, is that to change what one knows is not what learning is all about, but to change what one does is indeed the true act of learning.

"And we continue to place saddle pontics over ridges of tissue fully realizing their non-cleansability and their being etiological factors in creating bad breath, hemorrhagic tissue and perhaps even

contributing to periodontal 'lesions.'

"A simple three-unit posterior bridge should be attempted initially and should be recalled to the office six days after seating for removal after interim cementation. (The silicone that comes with ethobenzoic acid cements is an excellent interim cementation media in that has a 113 degree melting point and provides a seal hydraulically without melting like vaseline or other lubricants. It rather carefully seals saliva and food out of the preparation without actual cementation. The bridge should again be removed in six weeks and again the pontic area observed. At this point, it will be found to be pink, firm, well epithelialized, being the same color as the adjacent tissue. Study cases have been removed six months and a year after, ten years after, initial cementation, and have been found to be well-healed, and well-epithelialized; in fact, it is difficult for the patient, with his tongue or with his eyes, to tell which tooth is pontic and which is abutment, yet they actually floss under the pontic daily.

"In the last 25 years, over 10,000 such pontics have been inserted with excellent clinical results. Even though this is a quantified result, it certainly has no statistical significance, serving only to support as case history to the clinical observation that this is indeed a successful way to resolve the question of pontic cleansability.

"With a little imagination, one might picture in the mind's eye an anterior pontic inserted carefully into the crest of the anterior ridge by taking a small wedge of

The design that passes the mouth odor test.

The synonyms of success. . .
Change
Grow
Learn.

Periostially elevate. . .
Osteoplasty. . .
Soft tissue closure. . .
Voila!

The cone
of the pontic
is placed
lingually in
soft tissue.

tissue out and blunt-dissecting the adjacent tissue so that the pontic on insertion is a supportive stint, but does not put tissue under tension. As long as the tissue isn't under pressure it will not recede into a relaxed position and the pontic will even support the tissue, creating the illusion of the pontic having a festooned area of tissue supporting it. The healing of tissue against this pontic, particularly if it is contoured appropriately, is almost a knife-edge design of the healed attachment apparatus.

"These pontics are carefully flossable. (The patient, of course, must have had behavior modification in quantity sufficient to de-plaque his mouth on a daily basis.) We find this to be an extremely acceptable and satisfying prosthesis.

"If the anterior ridge doesn't have enough tissue, a small split flap can be created from the rugae area, flapping the tissue forward to form a curtain supported by the pontic, and the broad nutritional base of the labial aspect. The tissue can be trimmed to lay against this pontic as long as the laboratory interpolates the amount of thickness of the split flap and the pontic seats firmly against the lingual aspect of the incision, patient comfort and phonetics can be assured as well as an extremely acceptable cosmetic result.

"An imaginative dentist can picture this in his/her mind's eye. . . and those who are already doing this can well appreciate what is meant."

As previously stated, if there is a triumverate in periodontal prosthesis, Dr. Leonard Abrams is one of the sturdy legs of the big

three. In 1980, he presented a paper at the 25th anniversary of the post-doctoral program in perio at the University of Pennsylvania. As he approaches the anterior ridge in a slightly different manner, his diagrams easily take the imaginative eye to the stint descriptive that we have so frequently used. However, if more tissue is needed, his procedure works exceptionally well.

Along with that particular article, Lennie had a large number of color photographs, not included, but which are in my file and available for scrutiny upon request.

Although this newsletter is reviewing a relatively simplistic concept, it is wise, in my opinion, to cover it as thoroughly as possible.

Garber, et al, followed Dr. Abrams in 1981 in publishing a review of his philosophy and spelling it out a bit more. That article is also enclosed for those who intend to follow the pattern more closely.

Not to be out done, the West Coast awakened and Drs. Saadoun and Farnoush, Department of Perio at the University of Southern California, in 1984 concerned themselves with the Esthetic Reconstruction of Residually Deformed Ridges for Prosthetic Purposes. Again, an article that spells out the philosophy in a slightly different way.

The expansion of the post perio rehab in our practices as a result of the values driven clientele wanting us to create an illusion of reality without removable appliances certainly substantiates the intensity of our effort to cover this subject in this newsletter.

Augmentation of the Deformed Residual Edentulous Ridge for Fixed Prosthesis

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This article is directed towards resolving the problem caused by residual edentulous ridges that are deformed by tissue loss or collapse, thereby creating difficulty in fixed prosthodontics with esthetic pontic replacement.

Introduction

The so-called collapsed ridge is generally caused by severe bony loss prior to or during tooth removal. The loss can be due to advanced periodontal disease, surgical trauma during tooth removal, or accidental traumatic injury, or can be a result of periodontal surgery. Up until now, three basic solutions have been offered. The first is to try to carve a pontic that blends with the edentulous area but may require placing it in poor axial angulation in order to achieve this end (Fig 3C). The second is to add pink colored plastic or porcelain to the apical end of the pontic in order to simulate normal gingiva. The third solution is to make the pontic portion of the fixed prosthesis removable, such as that seen in Andrew's Bridge.^{1,2}

Solutions offered in this paper are surgically plastic in nature, in that a connective tissue pedicle graft is placed labial to the edentulous area in order to create a desired esthetic effect. A by-product of the procedure is the formation of a subtly concave edentulous ridge. When there is a concave tissue area, a convex pontic can be prepared for tissue contact (Fig 1). Under these circumstances, when dental floss is used, it scrapes the pontic and not the tissue. A concave ridge with proper close convex pontic adaptation ensures good cleansing.^{3,4} The concave pontic receptor ridge tissue also simplifies laboratory procedures because it precisely locates pontic placement on the laboratory cast for the technician. As a result of utilizing pontics in the manner to be described, the author has found it beneficial to try to form concave soft tissue pontic receptor ridges surgically, whenever possible.

The proposed ridge augmentation procedure is recommended only if the residual ridge defect interferes with the esthetic appearance of the restoration, as determined by experimentation with the provisional restoration. The author has found it difficult to try to predict, in advance, the contours of the soft tissue edentulous areas prior to provisional restoration. The temporary prosthesis is the ideal testing mechanism to determine precisely what the soft tissue needs will be.

⁴Presented at the 25th Anniversary of the founding of the Postdoctoral Program in Periodontics, University of Pennsylvania, May 17, 1980.

Variations in pontic design and soft tissue conformations

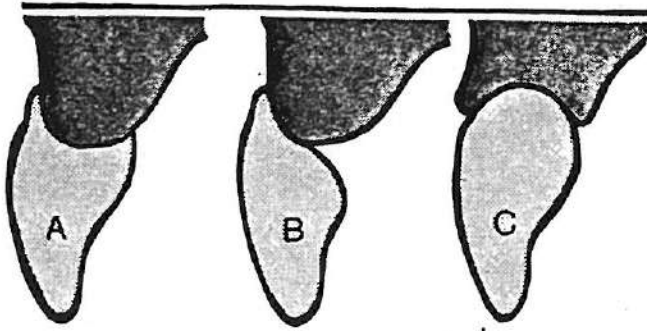


Fig 1—A—Total ridge lap. This is the least desirable of pontic configurations. Any attempt to cleanse the undersurface of the pontic with dental floss causes the convex tissue, rather than the concave pontic, to be scraped by the floss. B—Modified ridge lap. This is more desirable since it provides a convex pontic for flossing. Its major disadvantage is that there are areas where debris can lodge easily. C—Ridge lap with concave edentulous ridge. This is the most desirable of pontic shapes as it provides a convex pontic with concave tissue and allows for a minimum of food and debris retention. This pontic design also permits the pontic surface to be cleansed by dental floss. Close pontic-tissue configuration is desirable since it minimizes plaque retention.

Technique for Ridge Augmentation (Figs 2, 3, 4, 5, and 6)

The procedure begins with a nonepinephrine-bearing local anesthetic to ensure generous bleeding at the tissue site. The first step is to remove the surface epithelium, by scalpel or by rotary diamond instrument, utilizing the free bleeding as a guide; the presence of bleeding in the entire area indicates complete epithelium removal. It is important to note that the proximal marginal periodontium of adjacent teeth must be preserved intact.

At this time, an epinephrine-containing local anesthetic is introduced for hemostatic control. A triangular flap is elevated from the palate within the de-epithelialized zone. It can be either a full- or partial-thickness flap, as determined by surgical convenience. A pouch is created by blunt dissection labial to the alveolar bone, and the flap is inverted and guided into place by a retaining suture in the area of the mucogingival junction. Sufficient distance between the entrance and exit of the retaining suture, based on the friability of the soft tissue, will ensure a strong tissue base with which the inverted flap can be pulled into place and secured.

The area from which the flap has been removed will appear as a depression with angular sides which will heal as a rounded, depressed, subtly concave area. Prolonged bleeding can be controlled, if necessary, by additional suturing. The area is then packed with periodontal dressing. Suture and dressing removal are performed approximately 8 to 10 days postoperatively. At that time, the pontic can be relined with self-curing resin to fit the defect and polished to a high gloss.

Whenever possible, the collapse of the edentulous ridge should be prevented. Precautions can be taken during tooth extraction or during periodontal surgery. During tooth removal procedures, an immediate re-

placement should be fabricated and placed approximately 5 mm into the edentulous socket. As the edentulous socket heals, the immediate pontic replacement can be gradually shortened. In many instances, a concave pontic zone can be created which will present a contour on the labial that resembles the alveolar process and gingiva of the adjacent teeth.

During periodontal surgery, too often, the entire edentulous area is thinned out as part of pocket elimination. It is strongly urged that the soft tissue overlying the edentulous areas be preserved during periodontal surgery and left for final surgical trimming until after the provisional restoration is made. This will ensure adequate thickness of edentulous area soft tissue and will allow the restorative practitioner to exercise those options necessary to create an esthetic pontic-soft tissue relation. Often, this precaution will require retreatment of the proximal surfaces of the teeth of the edentulous area for final pocket elimination. However, the esthetic benefits greatly outweigh the problems of multiple reentry.

Diagrammatic representation of the de-epithelialized connective tissue pedicle graft for residual ridge augmentation

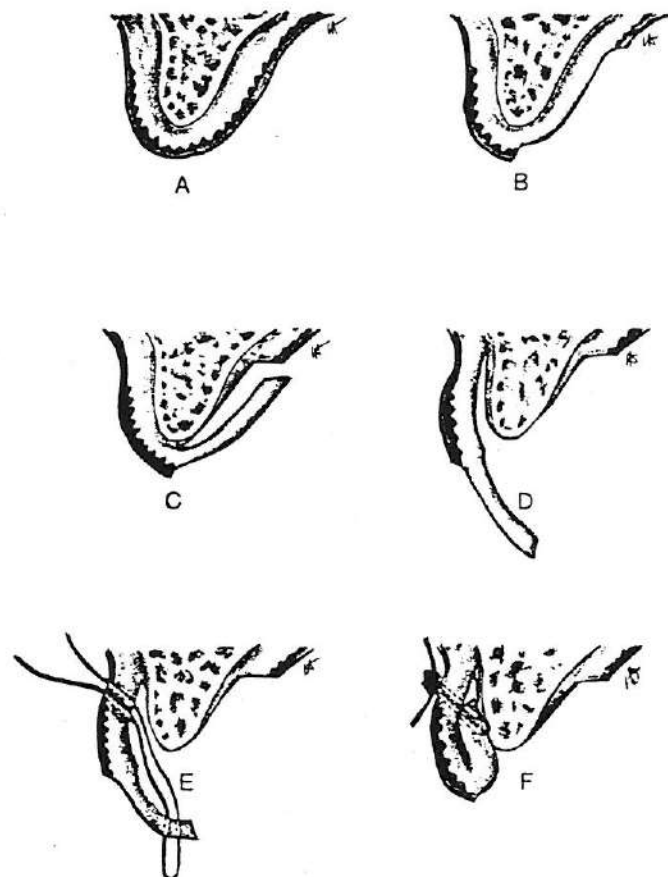


Fig 2—A—Cross section of the residual edentulous ridge prior to the procedure. B—The first step is to remove the epithelium. C—The elevation of the triangular flap takes place in the area of de-epithelialization. D—The pouch is created anterior to the alveolar ridge. E—The sutures are placed in the mucogingival junction to catch the tip of the flap and pull it into place. F—The flap is secured and the concavity created.

Pedicle connective tissue augmentation is contraindicated when there is a knife-like edentulous ridge with very scant bone and underlying soft tissue. In this case, there will be insufficient flap thickness for adequate *plumping* of the area. If the procedure should be attempted under these circumstances, a great deal of postoperative shrinkage can be anticipated, with counterproductive esthetic results. A solution to the latter problem is to take free connective tissue grafts from elsewhere in the posterior portion of the palate. Several possibilities for the free connective tissue grafts will soon be described in the literature; they include free wedges of soft tissue that are completely embedded in a surgical pouch and other grafts that allow the epithelium to be used at the exposed incision site. Discussion of these procedures is beyond the scope of the present paper.

Whenever gingivoplasties are to be performed in the edentulous ridge to create a concave pontic receptor area, consideration should be given to the thickness of the soft tissue overlying the osseous crest. To determine whether sufficient tissue exists over the osseous crest (a minimum of 1½ to 2 mm following surgery), a radiograph or periodontal probe with anesthesia can be used. If insufficient soft tissue is anticipated, the surgical procedure will require some osseous reduction. Again, discussion of this procedure is beyond the scope of this

paper; it is mentioned only to give the reader some idea of the complexities that can be encountered.

Summary

The previous discussion presented a simplified technique for ridge augmentation in deformed residual edentulous areas in fixed prosthodontics. The technique is recommended only when the soft tissue defect interferes with esthetics, function, comfort, or ability to be cleansed. The proposed technique is simple to perform, requires very little time, and causes few or no complications. The resulting soft tissue area closely mimics the contours of the gingiva overlying the roots that are present in the adjacent teeth and creates a concave soft tissue pontic receptor area which allows for close approximation of a desirable convex pontic. The technique is contraindicated in areas where there is insufficient soft tissue, or where the residual ridge defect does not interfere with the lip line esthetic pattern.

REFERENCES

1. Goldstein RE: *Esthetics in Dentistry*. Philadelphia, JB Lippincott Co, 1976, pp 121-122.
2. Preiskel HW: *Precision Attachments in Dentistry*. St. Louis, The CV Mosby Co, 1968, pp 141-145.
3. Stein RS: Pontic-residual ridge relationships: A research report. *J Prosthet Dent* 16:283, 1966.
4. Goldstein RE: *Esthetics in Dentistry*. Philadelphia, JB Lippincott Co, 1976, pp 90-92.

Last, but not least, a dental matrix or "contact lens" can be made out of Swiss-a-Dent acrylic. The acrylic is pressure-pot cured on a very carefully created anterior model usually taken with hydrocolloid, carefully outlining the cervical contours that one would choose to have. One can replicate the exact position of gingival tissue with this somewhat pliable (but not soft-cure) acrylic stint, or matrix, that gives live support to facial tissues, closes osseous defects, and creates a social presentation that is absolutely magnificent. Properly handcrafted in the hands of the master, this can be sculptured and shaped to a point of near perfection. I've had one made for my mouth to replace a couple of contours and to reshape papillae areas, to cover a foil and to serve me as a model in discussing this with others. I can be very close to the person and present the entire concept and then reach in with my index finger and slip the matrix out. There's hardly anything more powerful than human modeling. The person didn't see it, it didn't appear to be there at all, and that person, too, can have the illusion of reality created in the face of a not-ideal anterior morphology. Several of our cleft palate cases have been rebuilt with fixed bridgework even though the morphology of the soft tissue is far from ideal. The only removable appliance they then have, rather than a precision attachment partial with a mass of obturator-type acrylic on it, is the matrix that covers the labial, creates an excellent seal for phonetics and an illusion of reality of gingival contour. . . . indescribable.

For those who are into wanting further study on this, select a

case and send the model to Mike at Prescott Dental Studio, 233 White Spar road, #4, Prescott, AZ 86303. They're inexpensive, masterfully accomplished, and once Mike gets the idea of what your interests are, he'll produce an illusion of reality for you and your people that will knock your socks off!



The "matrix"
"Hollywoods"
upper or lower
anterior gingival
deficiencies
and scars.

I've worn a
matrix for
a week and
even Marci
hasn't noticed it!

Napili News

It's March already! . . . We're just completing another terrific workshop with new friends at The People Game - Dentistry, and looking forward to the Clinical Sessions (Part 3) of the Three-week People Without Perio Advanced Course.

This three-week experience has been so meaningful to each of us . . . even me, though I've not attended/comprehended any of the technical aspects, I'm very aware of the importance of what's occurring in regard to those persons who come to the dental office for care.

REMINDER . . .

April 13: Wednesday Special, Inlay Rehab workshop, Phoenix. Limited Attendance.

April 13-16: Micro Teaching Experience in Case Presentation, Phoenix. (Seven openings available at this time.)

May 4-7: Three-day People Without Perio workshop, Perry Ratcliff will be with us! An additional/different three day workshop in this regard will be presented October 12-15 with Dr. Wynand Dreyer from South Africa.

Reserve NOW for the Silver Anniversary Workshop on the Big Island, August 6-13! Omer is enjoying putting together a new format.

We look forward to being with you!

Marci Reed

President
Napili Seminars

Robert A. Zampieri, D.D.S.

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Fort Lee, New Jersey 07024

201 - 944-1027

Hi,
Just a note to tell you that you hit a nerve last time —

If a dentist or anyone sells crowns, inlays, extractions, ortho, wigettes, etc he will burn out — but if he gives a service he regenerates from giving that service —

I've heard that for 12 years from L. O. Parkey - 10 years from F. Halded Auth - 7 yrs from you — But I've finally heard it — Thanks it changed me,
ZAMP

Esthetic reconstruction of residual deformed ridges for restorative purposes

*by Andre P. Saadoun, DDS, MS
and
Ali Farnoush, DDS, MSD, PhD

It is well known that the alveolar ridges resorb after the teeth are extracted. The resorption of the alveolar bone is a physiological process which has been extensively described in the literature. In general a 0.1mm bone loss per year for the maxillary bone ridge has been noted as opposed to a 0.4mm bone loss per year for the mandibular ridge.¹ However, the usual amount of bone resorption could be more dramatic and result in ridge deformities or depressions, when the teeth are extracted because of advanced periodontal disease or apical pathosis, developmental defects, or when the accidental fracture of the root(s) require(s) the removal of the labial cortical plate, or as a result of periodontal surgery.²

The subsequent alteration in ridge contour requires cosmetic compromise in the prosthetic restoration by modifying the thickness and/or the height of the pontic to compensate for the tissue depression and to achieve harmonious contour. The result is an overcontoured surface, which is difficult to clean and alveolar tissue above the pontic which appears darker than the adjacent gingival tissue. This will also result in an uneven gingival margin and a poor esthetic appearance.^{2,3}

Therefore, the restoration of the deformed residual ridge after dental extractions remains a challenging

problem for the restorative dentist to achieve the requirements of form, function, oral physiotherapy and esthetics especially for a patient with a high lip line who needs an anterior bridge.⁴

The purpose of this article is to present recent techniques which can be utilized to resolve the problems associated with the residual edentulous ridge deformed by tissue loss (vertical and/or horizontal) and to minimize the difficulties encountered in fixed prosthodontics for the esthetic replacement of the lost teeth. The rationale and indications of various treatment modalities available such as the preservation of the alveolar ridge by root retention, and the reconstruction of deformed ridges using connective tissue graft or ceramic grafting materials will be discussed. Several cases have been successfully treated utilizing the above periodontal procedures in conjunction with restorative treatment. To illustrate the technique and clinical application of these procedures three clinical examples will be presented.

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Preservation of the alveolar ridge by vital root retention

Forced eruption and submerging of either endodontically treated or vital roots have been used to preserve and maintain the alveolar bone.^{5,6}

No apparent bone loss was found by Howell⁷ in submerged endodontically treated teeth and it was suggested that the procedure could be utilized by maintenance of the residual ridge height supporting a complete denture.

Comparative histologic studies have indicated that vital submerged roots were free of inflammatory infiltrate and have a greater potential for repair than endodontically treated teeth.⁸ Bone regeneration was found over submerged vital roots and was enhanced when the roots were sectioned 2mm below the crestal bone with primary surgical closure.⁹ It has been shown that such roots remain vital and asymptomatic, minimize alveolar bone resorption, preserve the stability of the osseous tissues and maintain the ridge contour.^{6,10,11} In fact, alveolar rate measurement done 6 months later at the reentry procedure indicated a relative overall loss of alveolar crest height of 0.44mm.¹²

Follow-up of vital root retention in humans during a 20 to 36 month period showed that the height and contour of alveolar ridge were better

maintained as compared with edentulous areas.^{13,14}

It seems that the retention of vital submerged roots offers a successful modality for alveolar bone preservation and maintenance, specially on patients with fixed restorations with pontics in slight contact with the ridge.

The following case report presents the submergence of lower anterior teeth as a pre-prosthetic procedure to avoid subsequent resorption of the ridge both in an apical direction and loss of the vestibular depth. Pontics will be fabricated to be in contact with the ridge.

Case No. 1

A healthy 70-year-old woman was evaluated for elective retention of her mandibular anterior teeth #23, 24, 25, 26 to preserve the ridge prior to the construction of a metal ceramic bridge from canine to canine. The teeth met the following criteria for vital root burial as outlined by Garver and Fester¹⁵ (Fig. 1).

1. No more than 1mm horizontal mobility.
2. Reducible refractory defects at the time of surgery.
3. Sufficient healthy mucogingival tissue for final closure.
4. Root length/bone ratio 1/3.
5. Asymptomatic vital teeth.

After local anesthesia, an internal beveled marginal subcrestal incision was used to remove the crevicular epithelium around the necks of the teeth and to provide clean wound edges for adequate healing by primary intention. Full thickness mucoperiosteal flaps were raised on the buccal and lingual aspects of the involved teeth (Fig. 2).

Two labial releasing incisions extending beyond the mucogingival line were made on the mesial aspect of teeth #22 and #27; a partial thickness dissection was used to provide sufficient relaxation for reflection of the flap and good coaptation of the flap edges without tension for suturing. All calculus and granulation

tissue were removed and the roots were planed with sharp curettes. The crown of the teeth were sectioned at the level of the alveolar process with a diamond fissure bur with high speed under water spray. The vital root stumps were then reduced 1mm below the alveolar crest, and the bony crest was contoured to provide a round bony surface. The buccal and lingual flap were coapted without tension to achieve primary closure. A continuous suture, as well as a few interrupted sutures were used to close the wound over the submerged vital roots (Fig. 3). No periodontal dressing was placed over the surgical site. Tetracycline 250 mg. QID for five days was prescribed to prevent infection and Tylenol #3 was recommended for discomfort. The sutures were removed after one week and the healing was uneventful. One week later a gingivoplasty of the ridge was performed to correct residual tissue deformities. A periodontal pack was then placed to cover the wound.

Six weeks later the area was re-evaluated (Figs. 4 and 5) and a metal ceramic fixed partial denture was fabricated with convex pontics in a slight contact with the residual ridge. The patient was followed post-operatively every three months for a period of 12 months following the surgery without any complication (Fig. 6).

There have been however some reports of problems, such as exposure of submerged vital roots through the gingiva, cyst formation and alveolar bone loss, on patients with removable partial or complete dentures.^{14,16}

Reconstruction of alveolar ridges using connective tissue graft

Recently several articles,^{24,17,18} have described different mucogingival procedures to manage and resolve the esthetic restoration of a deficient partially edentulous maxillary anterior ridge (mutilated pontic area) or so-called collapsed or deformed

ridges. Abrams in 1980¹⁷ described the roll technique or the de-epithelialized connective tissue pedicle graft. Basically this is a form of contiguous pedicle graft which utilizes only the connective tissue of palate adjacent to the ridge as the donor site.

The autogenous combined epithelial and connective tissue free graft (full thickness onlay grafts as described by Seibert 1983),¹⁸ has also been used to treat moderate to severe ridge defects. This technique requires the utilization of a donor site distant from the ridge to be augmented.

The subepithelial connective tissue graft procedure reported by Langer and Calagna²³ and Garber and Rosenberg,⁴ has also been shown to be successful in reconstructing, enhancing the anterior cosmetic, and restoring normal bucco-lingual dimension for ridges with adequate height. Two surgical approaches have been described, the flap procedure and the double pouch procedure. The basis of 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 following case report describes the reconstruction of an anterior deformed ridge with a bucco-lingual loss of tissue by means of the flap and the use of the subepithelial connective tissue graft procedure.

Case No. 2

A healthy 35-year-old woman was not satisfied with her anterior bridge fabricated to replace teeth #9, 10 which were lost with the buccal alveolar plate during a bicycle accident. She was referred to our office by her prosthodontist in order to correct the depression in the bucco-lingual width of the residual partial ridge (Fig. 7), to minimize the cosmetic problem of the planned fixed restoration and to provide the upper lip with a normal bulk and contour. The subepithelial connective tissue graft procedure was used to achieve this goal.

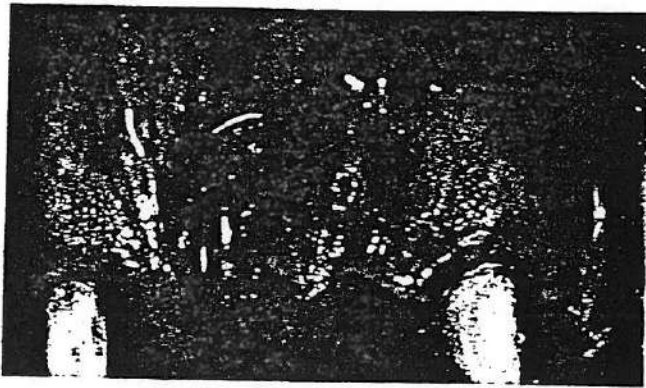


Figure 10. Subepithelial connective tissue graft placed on the recipient bed.

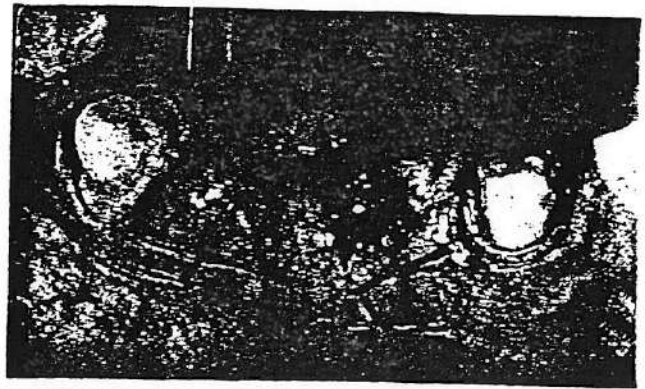


Figure 11. Occlusal view of the residual ridge following the reconstruction of the buccolingual dimension.

ral appearing bone cementing mechanisms and have been used as bone graft substitutes.²⁶

The synthetic materials do not stimulate bone growth, they are not osteogenic or osteoinductive, and they do not induce new attachment which is the major goal in treatment of periodontal osseous defects.²⁷ However, they are very useful as alveolar ridge maintainer and space filler to help "plump out" an area for esthetic purpose.²⁸

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form of hydroxylapatite material (Calciite) as a means to correct a deficient alveolar ridge and create a cosmetic result for an anterior prosthetic restoration.

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A 24-year-old man, in good health, was referred for treatment. Teeth #9, 10, with a fractured segment of the buccal cortical plate, were removed following a car accident (Fig. 14). A metal ceramic bridge was planned. As the pontic area was depressed in a bucco-lingual direction and deformed in the apico-occlusal direction, it was decided to augment the ridge height and to fill out the labial depression with hydroxylapatite (Calciite 2040).

Following local anesthesia with a vaso constrictor (1/50,000 epinephrine), a single vertical incision of 10-15mm from the alveolar crest to the vestibule was done (Fig. 15). The vertical incision was extended through the periosteum and a subperiosteal

tunneling was performed with a thin periosteal elevator to obtain an adequate tunnel size and create a pouch in the facial vestibule above the ridge to allow insertion of the syringe containing grafting material (Fig. 16).

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Continued on page 44

Figure 12. Gingivoplasty of the augmented ridge, creating the proper concavities for the ovate pontics.

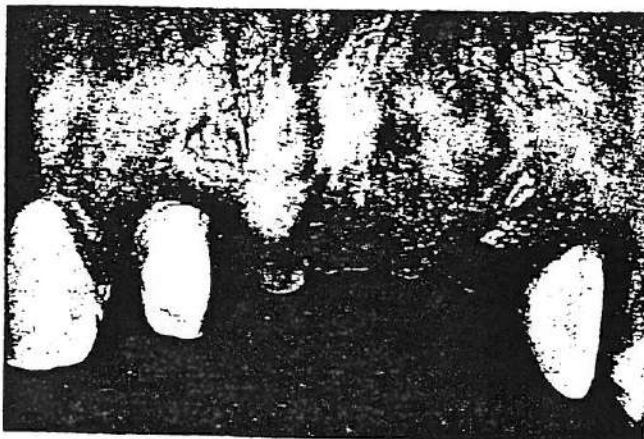


Figure 13. Metal ceramic bridge (before staining) with even gingival margins and correct physiologic cosmetic contours.



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Conclusion

Restoration of the deformed residual ridge remains a challenging problem for the restorative dentist to achieve the requirements of form, function, oral physiotherapy and esthetics. Esthetic appearance of the prosthetic replacement of such ridges is often compromised due to the bulk and/or the height of the pontic necessary to compensate for the tissue depression.

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* Cook-Waite, New York, N.Y. 10016

** Calcitite, Inc., San Diego, CA 92121

*** Johnson and Johnson Dental Product Co., East Windsor, N.J. 08526

Esthetic reconstruction of residual deformed ridges for restorative purposes

*by Andre P. Saadoun, DDS, MS
and
Ali Farnoush, DDS, MSD, PhD

It is well known that the alveolar ridges resorb after the teeth are extracted. The resorption of the alveolar bone is a physiological process which has been extensively described in the literature. In general a 0.1mm bone loss per year for the maxillary bone ridge has been noted as opposed to a 0.4mm bone loss per year for the mandibular ridge.¹ However, the usual amount of bone resorption could be more dramatic and result in ridge deformities or depressions, when the teeth are extracted because of advanced periodontal disease or apical pathosis, developmental defects, or when the accidental fracture of the root(s) require(s) the removal of the labial cortical plate, or as a result of periodontal surgery.²

The subsequent alteration in ridge contour requires cosmetic compromise in the prosthetic restoration by modifying the thickness and/or the height of the pontic to compensate for the tissue depression and to achieve harmonious contour. The result is an overcontoured surface, which is difficult to clean and alveolar tissue above the pontic which appears darker than the adjacent gingival tissue. This will also result in an uneven gingival margin and a poor esthetic appearance.³

Therefore, the restoration of the deformed residual ridge after dental extractions remains a challenging

problem for the restorative dentist to achieve the requirements of form, function, oral physiotherapy and esthetics especially for a patient with a high lip line who needs an anterior bridge.⁴

The purpose of this article is to present recent techniques which can be utilized to resolve the problems associated with the residual edentulous ridge deformed by tissue loss (vertical and/or horizontal) and to minimize the difficulties encountered in fixed prosthodontics for the esthetic replacement of the lost teeth. The rationale and indications of various treatment modalities available such as the preservation of the alveolar ridge by root retention, and the reconstruction of deformed ridges using connective tissue graft or ceramic grafting materials will be discussed. Several cases have been successfully treated utilizing the above periodontal procedures in conjunction with restorative treatment. To illustrate the technique and clinical application of these procedures three clinical examples will be presented.

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Preservation of the alveolar ridge by vital root retention

Forced eruption and submerging of either endodontically treated or vital roots have been used to preserve and maintain the alveolar bone.^{5,6}

No apparent bone loss was found by Howell⁷ in submerged endodontically treated teeth and it was suggested that the procedure could be utilized by maintenance of the residual ridge height supporting a complete denture.

Comparative histologic studies have indicated that vital submerged roots were free of inflammatory infiltrate and have a greater potential for repair than endodontically treated teeth.⁸ Bone regeneration was found over submerged vital roots and was enhanced when the roots were sectioned 2mm below the crestal bone with primary surgical closure.⁹ It has been shown that such roots remain vital and asymptomatic, minimize alveolar bone resorption, preserve the stability of the osseous tissues and maintain the ridge contour.^{6,10,11} In fact, alveolar rate measurement done 6 months later at the reentry procedure indicated a relative overall loss of alveolar crest height of 0.44mm.¹²

Follow-up of vital root retention in humans during a 20 to 36 month period showed that the height and contour of alveolar ridge were better

maintained as compared with edentulous areas.^{13,14}

It seems that the retention of vital submerged roots offers a successful modality for alveolar bone preservation and maintenance, specially on patients with fixed restorations with pontics in slight contact with the ridge.

The following case report presents the submergence of lower anterior teeth as a pre-prosthetic procedure to avoid subsequent resorption of the ridge both in an apical direction and loss of the vestibular depth. Pontics will be fabricated to be in contact with the ridge.

Case No. 1

A healthy 70-year-old woman was evaluated for elective retention of her mandibular anterior teeth #23, 24, 25, 26 to preserve the ridge prior to the construction of a metal ceramic bridge from canine to canine. The teeth met the following criteria for vital root burial as outlined by Garver and Fester¹⁵ (Fig. 1).

1. No more than 1mm horizontal mobility.
2. Reducible refractory defects at the time of surgery.
3. Sufficient healthy mucogingival tissue for final closure.
4. Root length/bone ratio 1/3.
5. Asymptomatic vital teeth.

After local anesthesia, an internal beveled marginal subcrestal incision was used to remove the crevicular epithelium around the necks of the teeth and to provide clean wound edges for adequate healing by primary intention. Full thickness mucoperiosteal flaps were raised on the buccal and lingual aspects of the involved teeth (Fig. 2).

Two labial releasing incisions extending beyond the mucogingival line were made on the mesial aspect of teeth #22 and #27; a partial thickness dissection was used to provide sufficient relaxation for reflection of the flap and good coaptation of the flap edges without tension for suturing. All calculus and granulation

tissue were removed and the roots were planed with sharp curettes. The crown of the teeth were sectioned at the level of the alveolar process with a diamond fissure bur with high speed under water spray. The vital root stumps were then reduced 1mm below the alveolar crest, and the bony crest was contoured to provide a round bony surface. The buccal and lingual flap were coapted without tension to achieve primary closure. A continuous suture, as well as a few interrupted sutures were used to close the wound over the submerged vital roots (Fig. 3). No periodontal dressing was placed over the surgical site. Tetracycline 250 mg. QID for five days was prescribed to prevent infection and Tylenol #3 was recommended for discomfort. The sutures were removed after one week and the healing was uneventful. One week later a gingivoplasty of the ridge was performed to correct residual tissue deformities. A periodontal pack was then placed to cover the wound.

Six weeks later the area was re-evaluated (Figs. 4 and 5) and a metal ceramic fixed partial denture was fabricated with convex pontics in a slight contact with the residual ridge. The patient was followed post-operatively every three months for a period of 12 months following the surgery without any complication (Fig. 6).

There have been however some reports of problems, such as exposure of submerged vital roots through the gingiva, cyst formation and alveolar bone loss, on patients with removable partial or complete dentures.^{14,16}

Reconstruction of alveolar ridges using connective tissue graft

Recently several articles,^{24,17,19} have described different mucogingival procedures to manage and resolve the esthetic restoration of a deficient partially edentulous maxillary anterior ridge (mutilated pontic area) or so-called collapsed or deformed

ridges. Abrams in 1980¹⁷ described the roll technique or the de-epithelialized connective tissue pedicle graft. Basically this is a form of contiguous pedicle graft which utilizes only the connective tissue of palate adjacent to the ridge as the donor site.

The autogenous combined epithelial and connective tissue free graft (full thickness onlay grafts as described by Seibert 1983),¹⁸ has also been used to treat moderate to severe ridge defects. This technique requires the utilization of a donor site distant from the ridge to be augmented.

The subepithelial connective tissue graft procedure reported by Langer and Calagna²⁵ and Garber and Rosenberg,⁴ has also been shown to be successful in reconstructing, enhancing the anterior cosmetic, and restoring normal bucco-lingual dimension for ridges with adequate height. Two surgical approaches have been described, the flap procedure and the double pouch procedure. The basis of 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 following case report describes the reconstruction of an anterior deformed ridge with a bucco-lingual loss of tissue by means of the flap and the use of the subepithelial connective tissue graft procedure.

Case No. 2

A healthy 35-year-old woman was not satisfied with her anterior bridge fabricated to replace teeth #9, 10 which were lost with the buccal alveolar plate during a bicycle accident. She was referred to our office by her prosthodontist in order to correct the depression in the bucco-lingual width of the residual partial ridge (Fig. 7), to minimize the cosmetic problem of the planned fixed restoration and to provide the upper lip with a normal bulk and contour. The subepithelial connective tissue graft procedure was used to achieve this goal.

Recipient site

Two vertical incisions were made in a divergent fashion beyond the mucogingival junction in the labial fold to facilitate elevation and mobility of the flap. The interproximal papilla adjacent to the abutment teeth were not included in the flap design. A horizontal incision was made on the palatal aspect of the ridge and connected the two vertical incisions (Fig. 8). A partial thickness flap was elevated on the buccal aspect of the deformed ridge to leave periosteum and connective tissue covering the alveolar bone intact. This was to provide an adequate source of nutrient and vascular supply for the connective tissue graft.

Donor site

Secondary flap removed during palatal flap procedure for pocket elimination could be used as a connective tissue graft for ridge augmentation.

In this patient, no periodontal surgery for pocket elimination was indicated, therefore two horizontal incisions were made on the palate as seen in Figure 9. The first one was placed 4-5mm apical to the free gingival margin, and primary partial thickness was elevated, leaving a layer of connective tissue on the palatal bone. The second incision was placed 1-2mm more coronal from the first one, beveled toward the bone, at a safe distance from the free gingival margin to avoid recession at the donor site (Fig. 9). Two vertical releasing incisions reaching the palatal bone connected the previous incisions. The connective and adipose tissues over the bone were carefully removed, trimmed to the desired size

and then stored on a moistened gauze with saline solution. The beveled portion of the palatal primary flap was sutured to the beveled coronal edge of the donor site to facilitate flap coaption, prevent bone exposure, and ensure good healing.

The subepithelial connective tissue was then placed on the recipient bed to augment the alveolar ridge (Fig. 10). The elevated split thickness flap was then sutured down over the graft to immobilize it (Fig. 11).

The pontic of the provisional bridge was reshaped in the gingival portion to prevent any pressure on the grafted site. The sutures were removed seven days later. Three weeks later, a gingivoplasty was performed using a round diamond bur under water spray to create proper gingival concavities in the augmented ridge (Fig. 12). The gingival portion of the provisional pontic was relined with acrylic to create ovate pontic fitting these concavities. The final ceramic bridge was started eight weeks later (Fig. 13).

Ridge augmentation via ceramic grafting materials

Recently dense hydroxylapatite particles such as Alveograf* (brand of

durapatite 18-40 mesh — Cook-Waite) and Calcitite** (hydroxylapatite 2040-12-Calcitek) and Synthograft*** are now available to the dental profession.

There are two basic types of synthetic bone grafting materials: basic tricalcium phosphate (hydroxylapatite) such as periograft (durapatite) and calcitite which are considered permanent and nonresorbable material, and beta tricalcium phosphate such as synthograft which has been shown to resorb in an unpredictable way when implanted.²⁰ The hydroxylapatite has dense, microcrystalline structure, and the particles are rounded (calcitite) or sharp (Periograft).

These new ceramic grafting materials which are radiopaque, biocompatible, have been evaluated in a number of animals²¹ and human studies for "filling" of infrabony defects²² and alveolar ridge augmentation.^{19,23,25} The grafting materials have been shown to be extremely biocompatible when implanted in hard or soft tissue, eliciting no inflammatory, toxic or foreign body responses. The grafting materials have demonstrated the ability to become chemically bonded to bone via natu-



Figure 10. Subepithelial connective tissue graft placed on the recipient bed.

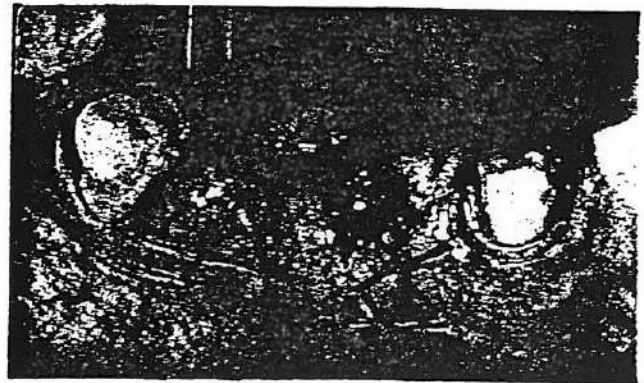


Figure 11. Occlusal view of the residual ridge following the reconstruction of the buccolingual dimension.

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The synthetic materials do not stimulate bone growth, they are not osteogenic or osteoinductive, and they do not induce new attachment which is the major goal in treatment of periodontal osseous defects.²⁷ However, they are very useful as alveolar ridge maintainer and space filler to help "plump out" an area for esthetic purpose.²⁸

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Figure 12. Gingivoplasty of the augmented ridge, creating the proper concavities for the ovate pontics.

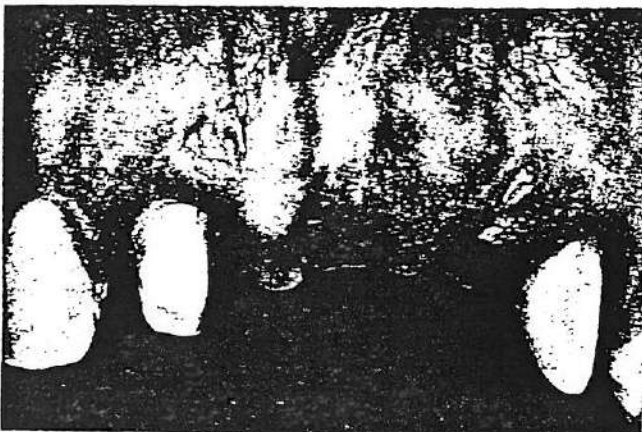


Figure 13. Metal ceramic bridge (before staining) with even gingival margins and correct physiologic cosmetic contours.





Figure 14. Buccal view of a deformed residual ridge.



Figure 16. Insertion of the syringe and injection of the synthetic ceramic particles.

Figure 17. Closure of the pouch with interrupted sutures.

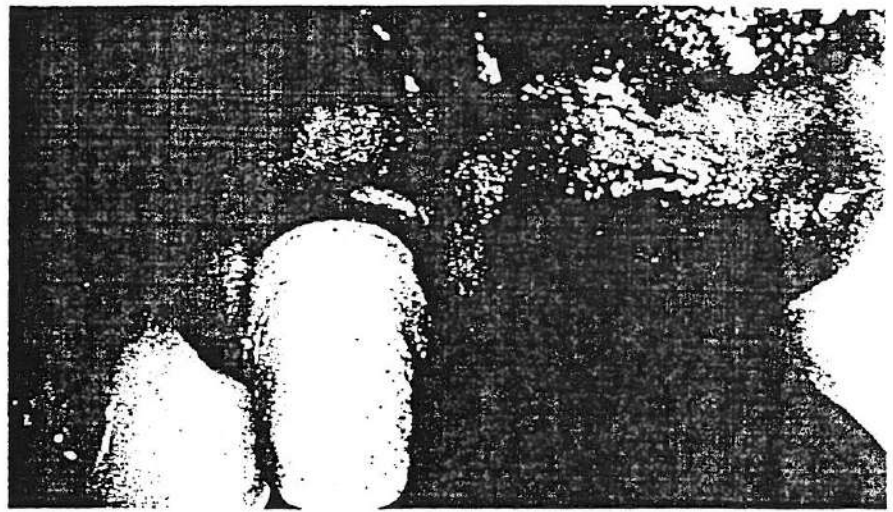
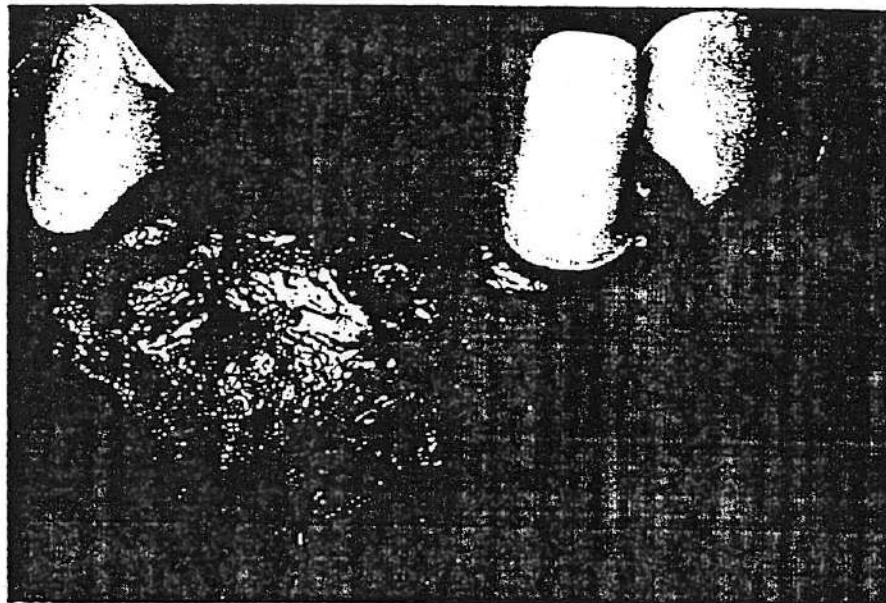


Figure 15. Vertical line of incision extending beyond the mucogingival line.

Residual deformed ridges

(continued from page 43)

cumulation of hydroxylapatite on the augmented ridge.

A slight gingivoplasty was performed to correct the tissue deformities and create concavities on the ridge for the pontic. The temporary bridge was relined, modified and inserted.

Two months following the surgical procedure, the gingiva and alveolar ridge appeared healthy and normal (Fig. 18).

Discussion

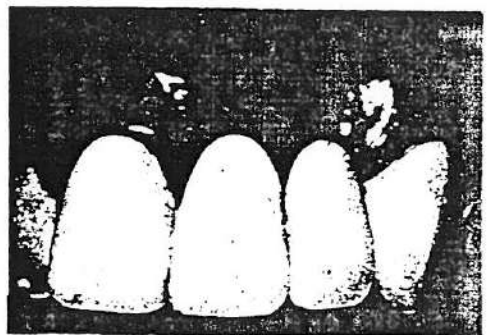
The general practitioner or prosthodontist often encounters difficult clinical problems which cannot be solved by restorative procedures alone, but can be successfully managed utilizing periodontal procedures

in conjunction with restorative treatment.

The clinical cases described in this article focused on recent surgical techniques performed by the periodontist to reconstruct the ridge/pontic area and achieve maximal cosmetic result. The cases presented are not isolated examples of favorable cosmetic and functional results. Others¹⁹ have also reported successful results in the reconstruction of deformed partially edentulous ridge using one of the techniques described on a predictable basis by adhering to sound surgical and prosthetic principles and a combined prosthetic and periodontal approach.

No complication has been encountered with the vital submerged roots, in slight contact with pontics. It seems however that the complications reported in the literature¹⁴⁻¹⁶ are due to the excessive pressure transmitted by the removable partial or complete dentures because of ill-fitted pros-

Figure 18. Six weeks postoperative view, with a provisional bridge.



thesis or incorrect occlusion.

Some loss of tissue contour will occur postoperatively with the subepithelial connective graft through contraction and shrinkage of the grafted tissue which occurs during the first four weeks.³⁰ Therefore, the second stage gingivoplasty to correct any deformities and blend the surface contours of the ridge should not be performed before four weeks following the ridge augmentation.

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Conclusion

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Esthetic reconstruction of residual deformed ridges for restorative purposes

*by Andre P. Saadoun, DDS, MS
and
Ali Farnoush, DDS, MSD, PhD

It is well known that the alveolar ridges resorb after the teeth are extracted. The resorption of the alveolar bone is a physiological process which has been extensively described in the literature. In general a 0.1mm bone loss per year for the maxillary bone ridge has been noted as opposed to a 0.4mm bone loss per year for the mandibular ridge.¹ However, the usual amount of bone resorption could be more dramatic and result in ridge deformities or depressions, when the teeth are extracted because of advanced periodontal disease or apical pathosis, developmental defects, or when the accidental fracture of the root(s) require(s) the removal of the labial cortical plate, or as a result of periodontal surgery.²

The subsequent alteration in ridge contour requires cosmetic compromise in the prosthetic restoration by modifying the thickness and/or the height of the pontic to compensate for the tissue depression and to achieve harmonious contour. The result is an overcontoured surface, which is difficult to clean and alveolar tissue above the pontic which appears darker than the adjacent gingival tissue. This will also result in an uneven gingival margin and a poor esthetic appearance.^{2,3}

Therefore, the restoration of the deformed residual ridge after dental extractions remains a challenging

problem for the restorative dentist to achieve the requirements of form, function, oral physiotherapy and esthetics especially for a patient with a high lip line who needs an anterior bridge.⁴

The purpose of this article is to present recent techniques which can be utilized to resolve the problems associated with the residual edentulous ridge deformed by tissue loss (vertical and/or horizontal) and to minimize the difficulties encountered in fixed prosthodontics for the esthetic replacement of the lost teeth. The rationale and indications of various treatment modalities available such as the preservation of the alveolar ridge by root retention, and the reconstruction of deformed ridges using connective tissue graft or ceramic grafting materials will be discussed. Several cases have been successfully treated utilizing the above periodontal procedures in conjunction with restorative treatment. To illustrate the technique and clinical application of these procedures three clinical examples will be presented.

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Preservation of the alveolar ridge by vital root retention

Forced eruption and submerging of either endodontically treated or vital roots have been used to preserve and maintain the alveolar bone.^{5,6}

No apparent bone loss was found by Howell⁷ in submerged endodontically treated teeth and it was suggested that the procedure could be utilized by maintenance of the residual ridge height supporting a complete denture.

Comparative histologic studies have indicated that vital submerged roots were free of inflammatory infiltrate and have a greater potential for repair than endodontically treated teeth.⁸ Bone regeneration was found over submerged vital roots and was enhanced when the roots were sectioned 2mm below the crestal bone with primary surgical closure.⁹ It has been shown that such roots remain vital and asymptomatic, minimize alveolar bone resorption, preserve the stability of the osseous tissues and maintain the ridge contour.^{6,10,11} In fact, alveolar rate measurement done 6 months later at the reentry procedure indicated a relative overall loss of alveolar crest height of 0.44mm.¹²

Follow-up of vital root retention in humans during a 20 to 36 month period showed that the height and contour of alveolar ridge were better

maintained as compared with edentulous areas.^{13,14}

It seems that the retention of vital submerged roots offers a successful modality for alveolar bone preservation and maintenance, specially on patients with fixed restorations with pontics in slight contact with the ridge.

The following case report presents the submergence of lower anterior teeth as a pre-prosthetic procedure to avoid subsequent resorption of the ridge both in an apical direction and loss of the vestibular depth. Pontics will be fabricated to be in contact with the ridge.

Case No. 1

A healthy 70-year-old woman was evaluated for elective retention of her mandibular anterior teeth #23, 24, 25, 26 to preserve the ridge prior to the construction of a metal ceramic bridge from canine to canine. The teeth met the following criteria for vital root burial as outlined by Garver and Fester¹⁵ (Fig. 1).

1. No more than 1mm horizontal mobility.
2. Reducible refractory defects at the time of surgery.
3. Sufficient healthy mucogingival tissue for final closure.
4. Root length/bone ratio 1/3.
5. Asymptomatic vital teeth.

After local anesthesia, an internal beveled marginal subcrestal incision was used to remove the crevicular epithelium around the necks of the teeth and to provide clean wound edges for adequate healing by primary intention. Full thickness mucoperiosteal flaps were raised on the buccal and lingual aspects of the involved teeth (Fig. 2).

Two labial releasing incisions extending beyond the mucogingival line were made on the mesial aspect of teeth #22 and #27; a partial thickness dissection was used to provide sufficient relaxation for reflection of the flap and good coaptation of the flap edges without tension for suturing. All calculus and granulation

tissue were removed and the roots were planed with sharp curettes. The crown of the teeth were sectioned at the level of the alveolar process with a diamond fissure bur with high speed under water spray. The vital root stumps were then reduced 1mm below the alveolar crest, and the bony crest was contoured to provide a round bony surface. The buccal and lingual flap were coapted without tension to achieve primary closure. A continuous suture, as well as a few interrupted sutures were used to close the wound over the submerged vital roots (Fig. 3). No periodontal dressing was placed over the surgical site. Tetracycline 250 mg. QID for five days was prescribed to prevent infection and Tylenol #3 was recommended for discomfort. The sutures were removed after one week and the healing was uneventful. One week later a gingivoplasty of the ridge was performed to correct residual tissue deformities. A periodontal pack was then placed to cover the wound.

Six weeks later the area was re-evaluated (Figs. 4 and 5) and a metal ceramic fixed partial denture was fabricated with convex pontics in a slight contact with the residual ridge. The patient was followed post-operatively every three months for a period of 12 months following the surgery without any complication (Fig. 6).

There have been however some reports of problems, such as exposure of submerged vital roots through the gingiva, cyst formation and alveolar bone loss, on patients with removable partial or complete dentures.^{14,16}

Reconstruction of alveolar ridges using connective tissue graft

Recently several articles,^{24,17,18} have described different mucogingival procedures to manage and resolve the esthetic restoration of a deficient partially edentulous maxillary anterior ridge (mutilated pontic area) or so-called collapsed or deformed

ridges. Abrams in 1980¹⁷ described the roll technique or the de-epithelialized connective tissue pedicle graft. Basically this is a form of contiguous pedicle graft which utilizes only the connective tissue of palate adjacent to the ridge as the donor site.

The autogenous combined epithelial and connective tissue free graft (full thickness onlay grafts as described by Seibert 1983),¹⁸ has also been used to treat moderate to severe ridge defects. This technique requires the utilization of a donor site distant from the ridge to be augmented.

The subepithelial connective tissue graft procedure reported by Langer and Calagna²³ and Garber and Rosenberg,⁴ has also been shown to be successful in reconstructing, enhancing the anterior cosmetic, and restoring normal bucco-lingual dimension for ridges with adequate height. Two surgical approaches have been described, the flap procedure and the double pouch procedure. The basis of 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 following case report describes the reconstruction of an anterior deformed ridge with a bucco-lingual loss of tissue by means of the flap and the use of the subepithelial connective tissue graft procedure.

Case No. 2

A healthy 35-year-old woman was not satisfied with her anterior bridge fabricated to replace teeth #9, 10 which were lost with the buccal alveolar plate during a bicycle accident. She was referred to our office by her prosthodontist in order to correct the depression in the bucco-lingual width of the residual partial ridge (Fig. 7), to minimize the cosmetic problem of the planned fixed restoration and to provide the upper lip with a normal bulk and contour. The subepithelial connective tissue graft procedure was used to achieve this goal.

Recipient site

Two vertical incisions were made in a divergent fashion beyond the mucogingival junction in the labial fold to facilitate elevation and mobility of the flap. The interproximal papilla adjacent to the abutment teeth were not included in the flap design. A horizontal incision was made on the palatal aspect of the ridge and connected the two vertical incisions (Fig. 8). A partial thickness flap was elevated on the buccal aspect of the deformed ridge to leave periosteum and connective tissue covering the alveolar bone intact. This was to provide an adequate source of nutrient and vascular supply for the connective tissue graft.

Donor site

Secondary flap removed during palatal flap procedure for pocket elimination could be used as a connective tissue graft for ridge augmentation.

In this patient, no periodontal surgery for pocket elimination was indicated, therefore two horizontal incisions were made on the palate as seen in Figure 9. The first one was placed 4-5mm apical to the free gingival margin, and primary partial thickness was elevated, leaving a layer of connective tissue on the palatal bone. The second incision was placed 1-2mm more coronal from the first one, beveled toward the bone, at a safe distance from the free gingival margin to avoid recession at the donor site (Fig. 9). Two vertical releasing incisions reaching the palatal bone connected the previous incisions. The connective and adipose tissues over the bone were carefully removed, trimmed to the desired size

and then stored on a moistened gauze with saline solution. The beveled portion of the palatal primary flap was sutured to the beveled coronal edge of the donor site to facilitate flap coaption, prevent bone exposure, and ensure good healing.

The subepithelial connective tissue was then placed on the recipient bed to augment the alveolar ridge (Fig. 10). The elevated split thickness flap was then sutured down over the graft to immobilize it (Fig. 11).

The pontic of the provisional bridge was reshaped in the gingival portion to prevent any pressure on the grafted site. The sutures were removed seven days later. Three weeks later, a gingivoplasty was performed using a round diamond bur under water spray to create proper gingival concavities in the augmented ridge (Fig. 12). The gingival portion of the provisional pontic was relined with acrylic to create ovate pontic fitting these concavities. The final ceramic bridge was started eight weeks later (Fig. 13).

Ridge augmentation via ceramic grafting materials

Recently dense hydroxylapatite particles such as Alveograft* (brand of

durapatite 18-40 mesh — Cook-Waite) and Calcitite** (hydroxylapatite 2040-12-Calcitek) and Synthograft*** are now available to the dental profession.

There are two basic types of synthetic bone grafting materials: basic tricalcium phosphate (hydroxylapatite) such as periograft (durapatite) and calcitite which are considered permanent and nonresorbable material, and beta tricalcium phosphate such as synthograft which has been shown to resorb in an unpredictable way when implanted.²⁰ The hydroxylapatite has dense, microcrystalline structure, and the particles are rounded (calcitite) or sharp (Periograft).

These new ceramic grafting materials which are radiopaque, biocompatible, have been evaluated in a number of animals²¹ and human studies for "filling" of infrabony defects²² and alveolar ridge augmentation.^{10, 23-25} The grafting materials have been shown to be extremely biocompatible when implanted in hard or soft tissue, eliciting no inflammatory, toxic or foreign body responses. The grafting materials have demonstrated the ability to become chemically bonded to bone via natu-



Figure 10. Subepithelial connective tissue graft placed on the recipient bed.

ral appearing bone cementing mechanisms and have been used as bone graft substitutes.²⁶

The synthetic materials do not stimulate bone growth, they are not osteogenic or osteoinductive, and they do not induce new attachment which is the major goal in treatment of periodontal osseous defects.²⁷ However, they are very useful as alveolar ridge maintainer and space filler to help "plump out" an area for esthetic purpose.²⁸

There is no contraindication regarding the use of the ceramic materials to reconstruct a collapsed or deformed ridge. On the contrary, several advantages are apparent; an adequate supply of synthetic material is always available, there is no need for a second surgical site and time required for the grafting procedure is reduced.²⁹

The following case presents the use of a new dense, nonresorbable

form of hydroxylapatite material (Calciite) as a means to correct a deficient alveolar ridge and create a cosmetic result for an anterior prosthetic restoration.

Case No. 3

A 24-year-old man, in good health, was referred for treatment. Teeth #9, 10, with a fractured segment of the buccal conical plate, were removed following a car accident (Fig. 14). A metal ceramic bridge was planned. As the pontic area was depressed in a bucco-lingual direction and deformed in the apico-occlusal direction, it was decided to augment the ridge height and to fill out the labial depression with hydroxylapatite (Calciite 2040).

Following local anesthesia with a vaso constrictor (1/50,000 epinephrine), a single vertical incision of 10-15mm from the alveolar crest to the vestibule was done (Fig. 15). The vertical incision was extended through the periosteum and a subperiosteal

tunneling was performed with a thin periosteal elevator to obtain an adequate tunnel size and create a pouch in the facial vestibule above the ridge to allow insertion of the syringe containing grafting material (Fig. 16).

The hydroxylapatite particles were prepared to proper consistency by adding sterile physiologic saline solution. The loaded plastic syringe was then inserted in the pouch and the hydroxylapatite particles were injected in to build the ridge contour in a labial and occlusal direction. The pouch was then closed with interrupted sutures (Fig. 17). Antibiotic coverage and analgesics were prescribed. During suture removal, the incision line was incompletely sealed causing extrusion of some of the grafting particles; it was decided to place new interrupted sutures for an additional week. A radiograph taken postoperatively showed a dense ac-

Continued on page 44

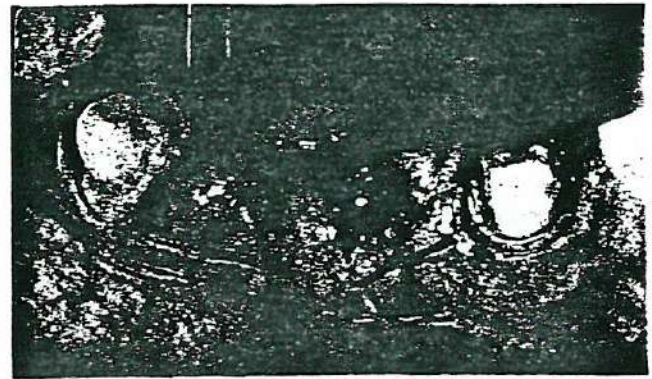


Figure 11. Occlusal view of the residual ridge following the reconstruction of the buccolingual dimension.

Figure 12. Gingivoplasty of the augmented ridge, creating the proper concavities for the ovate pontics.



Figure 13. Metal ceramic bridge (before staining) with even gingival margins and correct physiologic cosmetic contours.

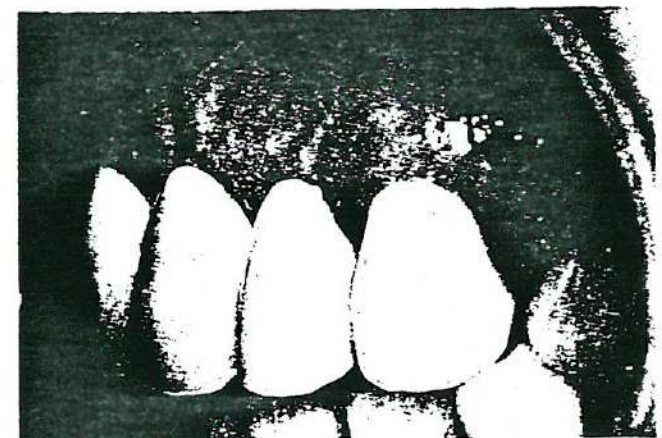




Figure 14. Buccal view of a deformed residual ridge.



Figure 16. Insertion of the syringe and injection of the synthetic ceramic particles.

Figure 17. Closure of the pouch with interrupted sutures.

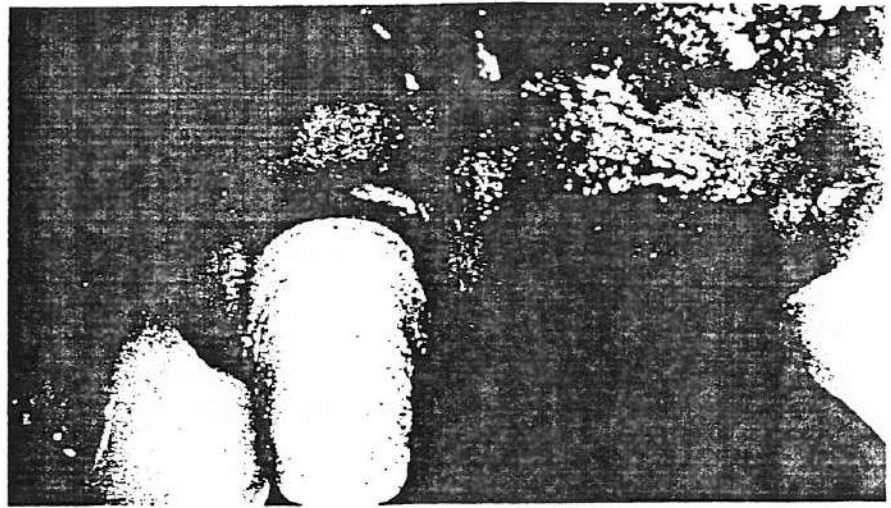
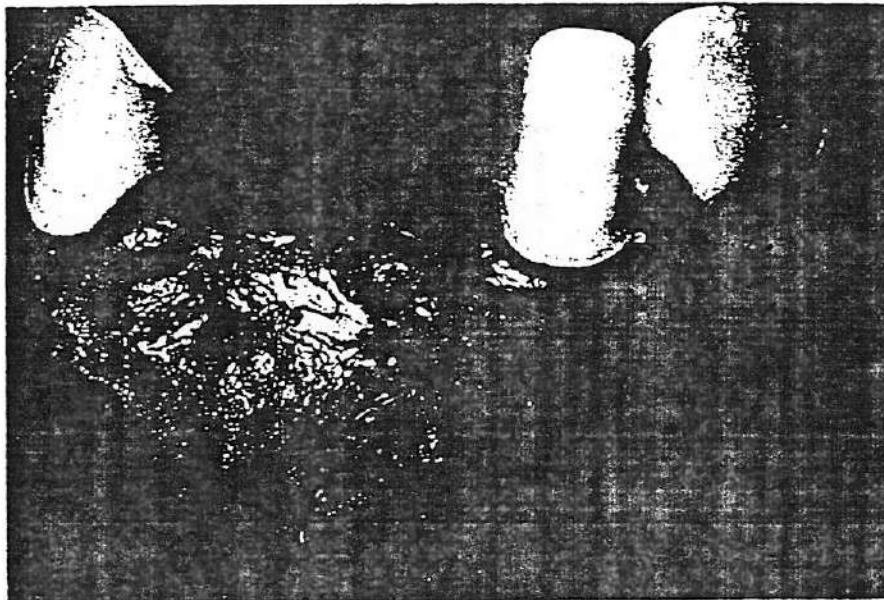


Figure 15. Vertical line of incision extending beyond the mucogingival line.

Residual deformed ridges

(continued from page 43)

cumulation of hydroxylapatite on the augmented ridge.

A slight gingivoplasty was performed to correct the tissue deformities and create concavities on the ridge for the pontic. The temporary bridge was relined, modified and inserted.

Two months following the surgical procedure, the gingiva and alveolar ridge appeared healthy and normal (Fig. 18).

Discussion

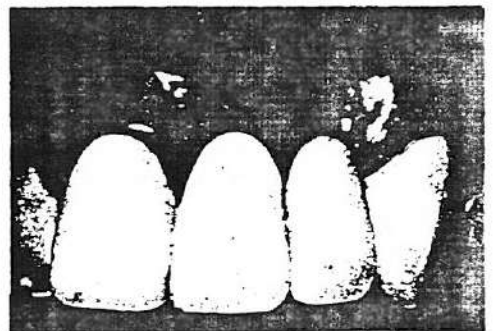
The general practitioner or prosthodontist often encounters difficult clinical problems which cannot be solved by restorative procedures alone, but can be successfully managed utilizing periodontal procedures

in conjunction with restorative treatment.

The clinical cases described in this article focused on recent surgical techniques performed by the periodontist to reconstruct the ridge/pontic area and achieve maximal cosmetic result. The cases presented are not isolated examples of favorable cosmetic and functional results. Others¹⁹ have also reported successful results in the reconstruction of deformed partially edentulous ridge using one of the techniques described on a predictable basis by adhering to sound surgical and prosthetic principles and a combined prosthetic and periodontal approach.

No complication has been encountered with the vital submerged roots, in slight contact with pontics. It seems however that the complications reported in the literature^{14,16} are due to the excessive pressure transmitted by the removable partial or complete dentures because of ill-fitted pros-

Figure 18. Six weeks postoperative view, with a provisional bridge.



thesis or incorrect occlusion.

Some loss of tissue contour will occur postoperatively with the subepithelial connective graft through contraction and shrinkage of the grafted tissue which occurs during the first four weeks.³⁰ Therefore, the second stage gingivoplasty to correct any deformities and blend the surface contours of the ridge should not be performed before four weeks following the ridge augmentation.

No further changes were noted in the tissue height and contour using the new nonresorbable ceramic grafting material, the bulk and cosmetic appearance remained constant following the ridge augmentation up to five years.^{23,24} However, one has to mention the possibility of particles extrusion from the lines of the incisions during the first week. A good flap design with long beveled incision and flap closure with several continuous locked sutures can prevent loss of grafting materials.

As previously mentioned, it is necessary to modify and reline the provisional pontic immediately after the augmentation, following gingivoplasty, and a few weeks later until no further change is observed in the tissue contour. The final restoration can then be started at the convenience of the restorative dentist.

Research is in progress to further evaluate the long term results of these procedures.

Conclusion

Restoration of the deformed residual ridge remains a challenging problem for the restorative dentist to achieve the requirements of form, function, oral physiotherapy and esthetics. Esthetic appearance of the prosthetic replacement of such ridges is often compromised due to the bulk and/or the height of the pontic necessary to compensate for the tissue depression.

The purpose of this paper was to present recent periodontal procedures which can be utilized to resolve the problems associated with the residual edentulous ridge deformity

(vertical and/or horizontal) and to minimize the difficulties encountered in fixed prosthodontics for the esthetic replacement of the missing teeth. The rationale and indications of various treatment modalities available such as the preservation of the alveolar ridge by root retention, and the reconstruction of deformed ridges using connective tissue graft or ceramic grafting materials were demonstrated and discussed.

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The Edentulous Ridge in Fixed Prosthodontics

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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

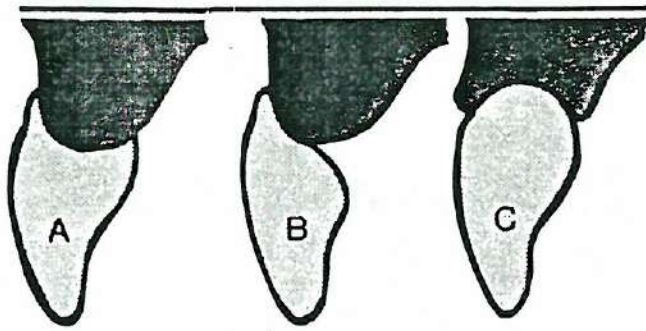


Fig 1—Pontic designs. A. Total ridge lap. B. Modified ridge lap. C. Ovate.

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 sequestered 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 interden-

tal 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 cemento-enamel junction (CEJ) normally would have been (Radiograph 1).

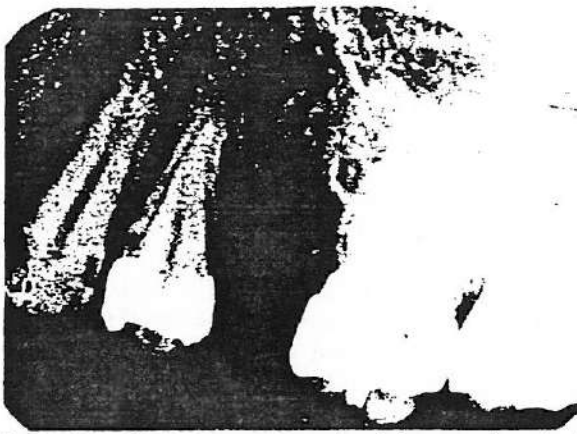
The rise and fall of the CEJ of any particular tooth form can be characterized as being highly scalloped or flat, corresponding to the underlying osseous topography and gingival form. The dimension of the additional healing bone fill will equal the distance between the tip of the interdental papilla 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).



Radiograph 1—Flat osseous topography of the extraction site; i.e., healing across the tips of the two interdental osseous crests.

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).

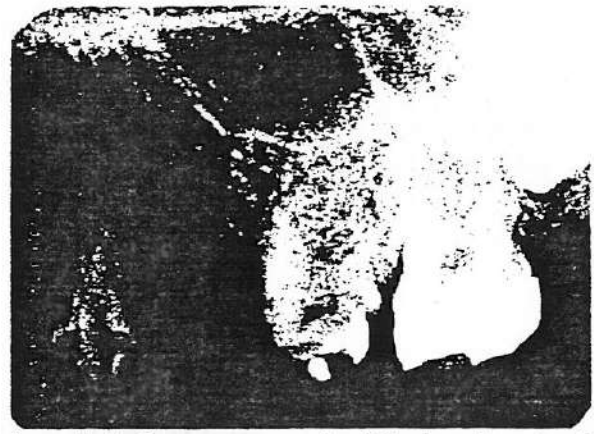
Modified Ridge Lap Pontic—The flat ridge is decreased in width from the lingual aspect only, allowing the pontic to make contact predominantly on the buccal aspect, thereby facilitating oral physiotherapy. For esthetic reasons, an indentation is then created on the buccal aspect which permits the placement 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 osteotomy 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



Radiograph 2—Osseous topography following the osteoplasty procedure. (Compare with Radiograph 1.)

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.² Recently, an interesting concept of surgical ridge augmentation was described in the literature,¹ 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 literature¹ (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

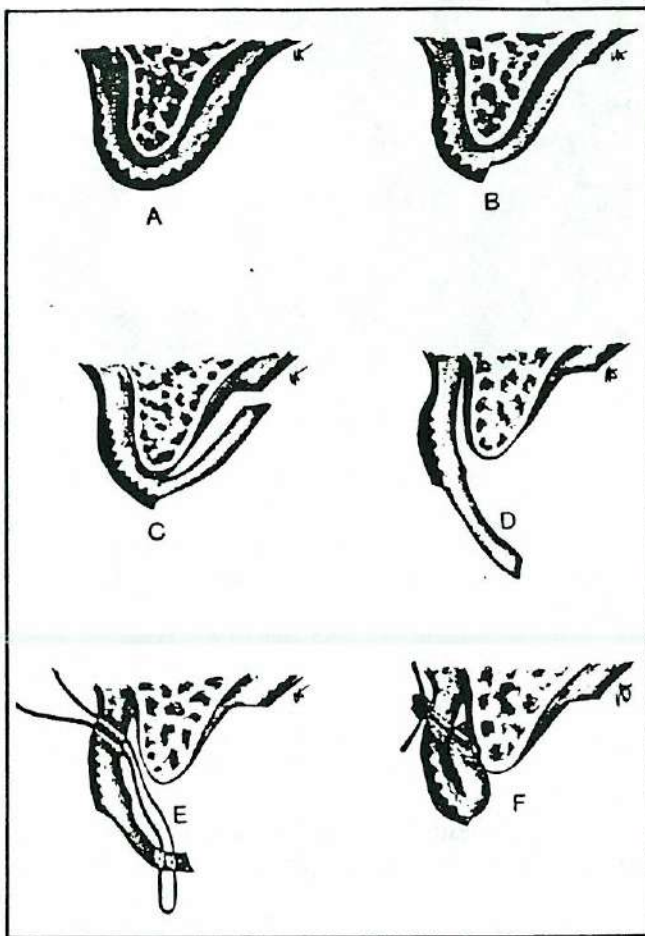


Fig 5A—Diagrammatic representation of the complete *roll* procedure. (Courtesy of Dr. Leonard Abrams, University of Pennsylvania.)

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.

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).

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 *distal* 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, resulting in a free bleeding surface. The amount of required tissue is then outlined on the tuberosity area according to the measurements taken from the recipient site, and a large wedge of *both epithelium and connective tissue* is removed. This wedge, the undersurface of which is shaped to conform to the ridge to be augmented, is sutured in position (Fig 6B). It is essential to expedite this stage of the procedure, allowing for rapid coaptation of the free graft and the development of adequate nutrient circulation.

Sutures are removed at 12 days (Fig 6C). At this stage, the resulting tissue may not blend in perfectly with the tissues above and lateral to it. A gingivectomy or gingivoplasty invariably is required to blend in the donor tissue and to develop the concave form of the pontic recipient site. It should be emphasized that these plasty procedures should not be done at the time of

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.

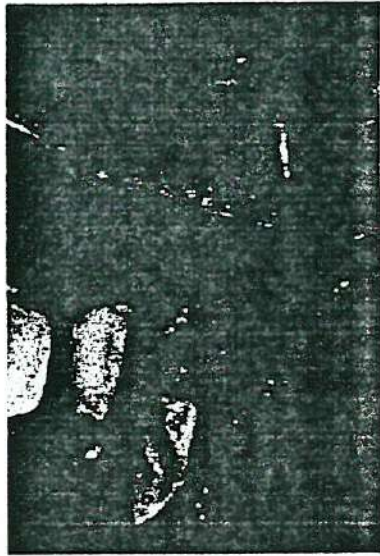
A split thickness flap is first elevated on the buccal aspect of the deformed ridge, leaving the periosteum and a portion of the connective tissue overlying the alveolar ridge (Fig 8A). The vertical incisions extend in an oblique fashion on either side of the deformed ridge and into the labial fold as 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 10C—Split thickness dissection of tissue over the entire deformity to develop a pouch into which connective tissue grafts may be placed.



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

Fig 10D—Connective tissue graft being slipped into the pouch and tried in position prior to suturing.



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 re-lined and recemented, and 13 weeks is allowed to elapse before the augmented ridge (Fig 10H) is ready for the final prosthesis.

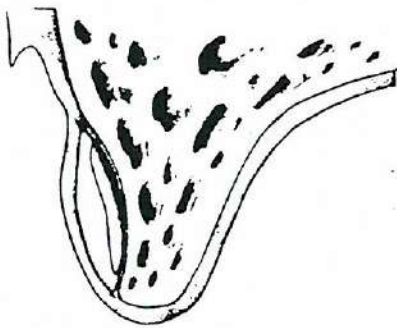


Fig 10E—Cross-sectional diagrammatic representation of connective tissue graft in position, subepithelially.

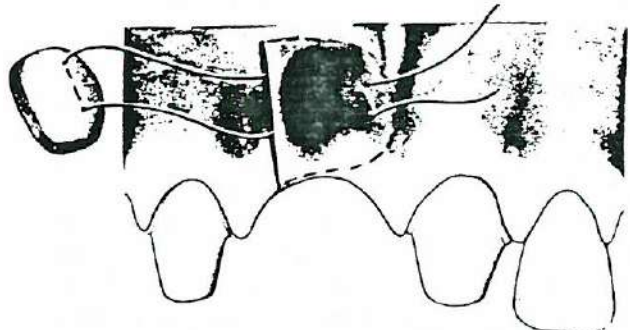


Fig 10F—Diagrammatic representation of suturing technique. Note that the connective tissue graft is not yet in position within the pouch. It will be pulled into the pouch utilizing the two loose ends of the suture and will be stabilized in a position which depends upon the initial entry of the "bite" of the first suture.

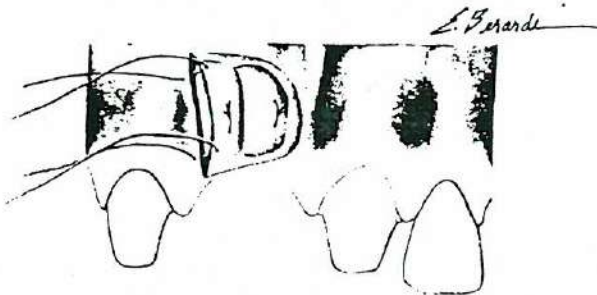


Fig 10G—Diagrammatic representation of pouch closure with interrupted sutures, following insertion of connective tissue grafts.

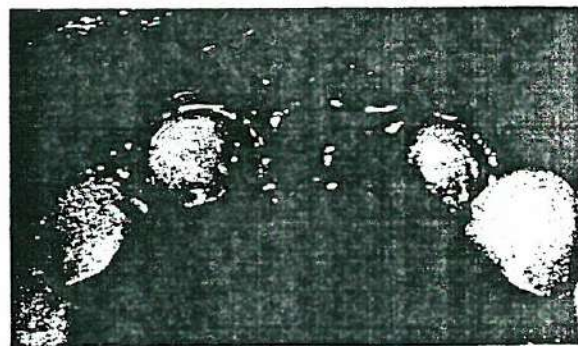


Fig 10H—Augmented ridge with depression created for ovate pontic. (Compare with Fig 10A.)

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

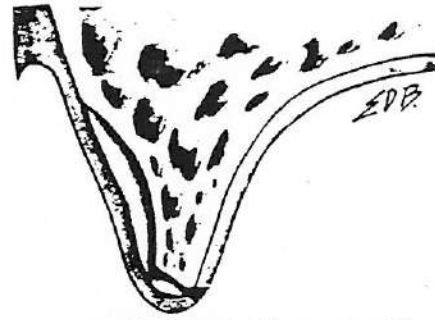


Fig 12A—Cross-sectional diagrammatic representation of placement of horizontal incision on the palatal aspect of the ridge at a more apical level. This facilitates a certain amount of drape to the pouch, which is created by extending this incision horizontally toward the buccal aspect and then apically around the osseous crest. Following placement of connective tissue within this pouch, the augmentation will be in both a horizontal and a vertical dimension.

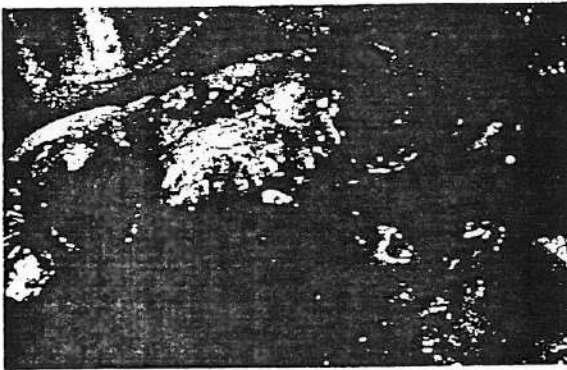


Fig 12B—Clinical view of incision similar to that shown in Fig 12A.



Fig 12C—Clinical view showing connective tissue 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.

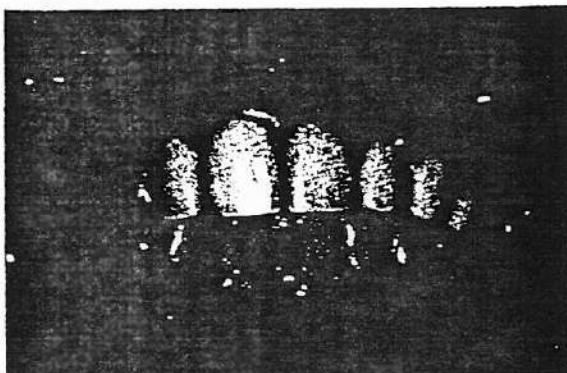


Fig 12D—Preoperative view with provisional restoration in place and pink acrylic on the apical end of the provisional restoration.

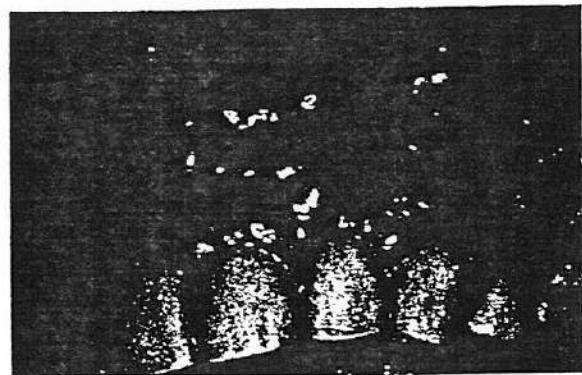


Fig 12E—Postoperative view of the same site following ridge augmentation. Note the dramatic amount of vertical as well as horizontal ridge augmentation. Note, too, that the provisional restoration has been cut back on its apical end to allow for the increase in ridge dimension.

must be changed. It should now be made on the palatal side of the edentulous ridge, at a more apical level, corresponding to the crest of the underlying alveolus (Fig 12A).

The dissection is made horizontally from the palate towards the buccal surface and then onward, around the alveolus in an apical direction (Fig 12B). The tissue coronal to the primary incision will now drape somewhat incisally, which will add vertical dimension to the ridge. The dissection is completed by extending it laterally over the complete area of the deformity. The donor graft is slid in through the incision around the alveolus and onto the buccal surface (Fig 12C). The base of the graft will remain on the crest of the alveolus, augmenting it in both a vertical and horizontal dimension. The initial incision should not be sutured back into close apposition or the net gain in a vertical dimension will be lost. It should be allowed to heal by secondary intention or by placing a connective tissue graft with a small base of epithelium, which will fill the void created by the drape of the pouch (Figs 12D and E).

Ridge deformities may be bizarre, requiring augmentation in varying dimensions and planes; consequently, several separate incisions may be necessary, depending 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 next passed through the donor 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.

The author would like to acknowledge Elissa Berardi for her work on the drawings in this article.

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Augmentation of the Deformed Residual Edentulous Ridge for Fixed Prosthesis

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This article is directed towards resolving the problem caused by residual edentulous ridges that are deformed by tissue loss or collapse, thereby creating difficulty in fixed prosthodontics with esthetic pontic replacement.

Introduction

The so-called collapsed ridge is generally caused by severe bony loss prior to or during tooth removal. The loss can be due to advanced periodontal disease, surgical trauma during tooth removal, or accidental traumatic injury, or can be a result of periodontal surgery. Up until now, three basic solutions have been offered. The first is to try to carve a pontic that blends with the edentulous area but may require placing it in poor axial angulation in order to achieve this end (Fig 3C). The second is to add pink colored plastic or porcelain to the apical end of the pontic in order to simulate normal gingiva. The third solution is to make the pontic portion of the fixed prosthesis removable, such as that seen in Andrew's Bridge.^{1,2}

Solutions offered in this paper are surgically plastic in nature, in that a connective tissue pedicle graft is placed labial to the edentulous area in order to create a desired esthetic effect. A by-product of the procedure is the formation of a subtly concave edentulous ridge. When there is a concave tissue area, a convex pontic can be prepared for tissue contact (Fig 1). Under these circumstances, when dental floss is used, it scrapes the pontic and not the tissue. A concave ridge with proper close convex pontic adaptation ensures good cleansing.^{3,4} The concave pontic receptor ridge tissue also simplifies laboratory procedures because it precisely locates pontic placement on the laboratory cast for the technician. As a result of utilizing pontics in the manner to be described, the author has found it beneficial to try to form concave soft tissue pontic receptor ridges surgically, whenever possible.

The proposed ridge augmentation procedure is recommended only if the residual ridge defect interferes with the esthetic appearance of the restoration, as determined by experimentation with the provisional restoration. The author has found it difficult to try to predict, in advance, the contours of the soft tissue edentulous areas prior to provisional restoration. The temporary prosthesis is the ideal testing mechanism to determine precisely what the soft tissue needs will be.

⁴Presented at the 25th Anniversary of the founding of the Postdoctoral Program in Periodontics, University of Pennsylvania, May 17, 1980.

Variations in pontic design and soft tissue conformations

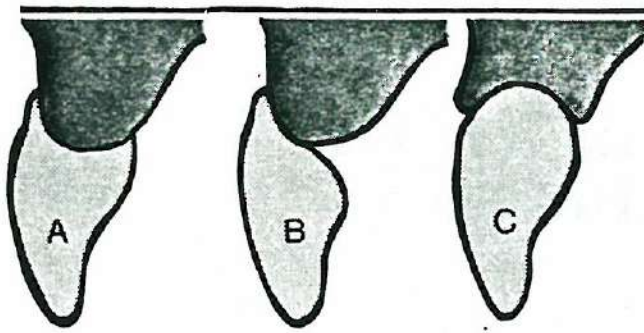


Fig 1—A—Total ridge lap. This is the least desirable of pontic configurations. Any attempt to cleanse the undersurface of the pontic with dental floss causes the convex tissue, rather than the concave pontic, to be scraped by the floss. B—Modified ridge lap. This is more desirable since it provides a convex pontic for flossing. Its major disadvantage is that there are areas where debris can lodge easily. C—Ridge lap with concave edentulous ridge. This is the most desirable of pontic shapes as it provides a convex pontic with concave tissue and allows for a minimum of food and debris retention. This pontic design also permits the pontic surface to be cleansed by dental floss. Close pontic-tissue configuration is desirable since it minimizes plaque retention.

Technique for Ridge Augmentation (Figs 2, 3, 4, 5, and 6)

The procedure begins with a nonepinephrine-bearing local anesthetic to ensure generous bleeding at the tissue site. The first step is to remove the surface epithelium, by scalpel or by rotary diamond instrument, utilizing the free bleeding as a guide; the presence of bleeding in the entire area indicates complete epithelium removal. It is important to note that the proximal marginal periodontium of adjacent teeth must be preserved intact.

At this time, an epinephrine-containing local anesthetic is introduced for hemostatic control. A triangular flap is elevated from the palate within the de-epithelialized zone. It can be either a full- or partial-thickness flap, as determined by surgical convenience. A pouch is created by blunt dissection labial to the alveolar bone, and the flap is inverted and guided into place by a retaining suture in the area of the mucogingival junction. Sufficient distance between the entrance and exit of the retaining suture, based on the friability of the soft tissue, will ensure a strong tissue base with which the inverted flap can be pulled into place and secured.

The area from which the flap has been removed will appear as a depression with angular sides which will heal as a rounded, depressed, subtly concave area. Prolonged bleeding can be controlled, if necessary, by additional suturing. The area is then packed with periodontal dressing. Suture and dressing removal are performed approximately 8 to 10 days postoperatively. At that time, the pontic can be relined with self-curing resin to fit the defect and polished to a high gloss.

Whenever possible, the collapse of the edentulous ridge should be prevented. Precautions can be taken during tooth extraction or during periodontal surgery. During tooth removal procedures, an immediate re-

placement should be fabricated and placed approximately 5 mm into the edentulous socket. As the edentulous socket heals, the immediate pontic replacement can be gradually shortened. In many instances, a concave pontic zone can be created which will present a contour on the labial that resembles the alveolar process and gingiva of the adjacent teeth.

During periodontal surgery, too often, the entire edentulous area is thinned out as part of pocket elimination. It is strongly urged that the soft tissue overlying the edentulous areas be preserved during periodontal surgery and left for final surgical trimming until after the provisional restoration is made. This will ensure adequate thickness of edentulous area soft tissue and will allow the restorative practitioner to exercise those options necessary to create an esthetic pontic-soft tissue relation. Often, this precaution will require retreatment of the proximal surfaces of the teeth of the edentulous area for final pocket elimination. However, the esthetic benefits greatly outweigh the problems of multiple reentry.

Diagrammatic representation of the de-epithelialized connective tissue pedicle graft for residual ridge augmentation

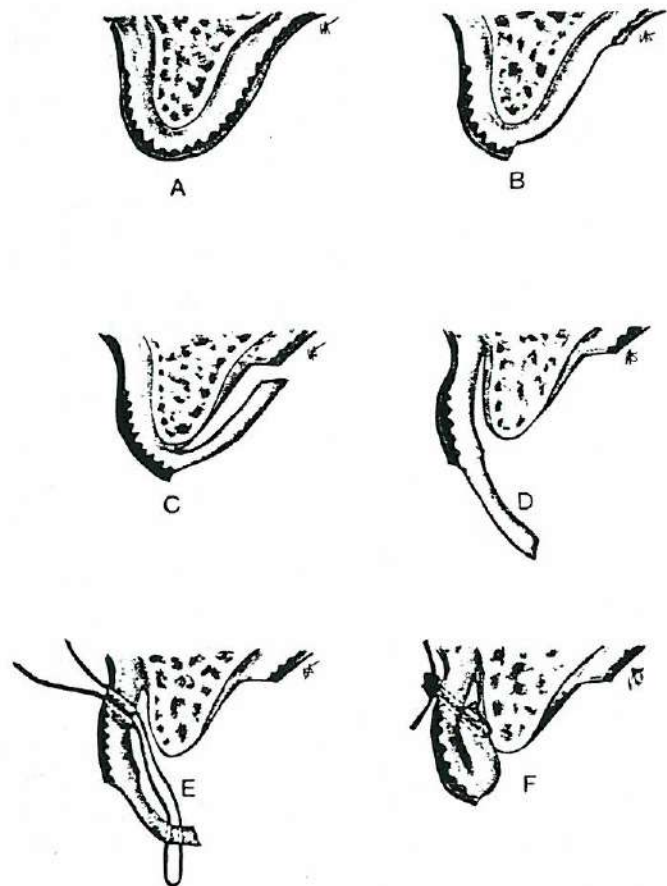


Fig 2—A—Cross section of the residual edentulous ridge prior to the procedure. B—The first step is to remove the epithelium. C—The elevation of the triangular flap takes place in the area of de-epithelialization. D—The pouch is created anterior to the alveolar ridge. E—The sutures are placed in the mucogingival junction to catch the tip of the flap and pull it into place. F—The flap is secured and the concavity created.

Pedicle connective tissue augmentation is contraindicated when there is a knife-like edentulous ridge with very scant bone and underlying soft tissue. In this case, there will be insufficient flap thickness for adequate *plumping* of the area. If the procedure should be attempted under these circumstances, a great deal of postoperative shrinkage can be anticipated, with counterproductive esthetic results. A solution to the latter problem is to take free connective tissue grafts from elsewhere in the posterior portion of the palate. Several possibilities for the free connective tissue grafts will soon be described in the literature; they include free wedges of soft tissue that are completely embedded in a surgical pouch and other grafts that allow the epithelium to be used at the exposed incision site. Discussion of these procedures is beyond the scope of the present paper.

Whenever gingivoplasties are to be performed in the edentulous ridge to create a concave pontic receptor area, consideration should be given to the thickness of the soft tissue overlying the osseous crest. To determine whether sufficient tissue exists over the osseous crest (a minimum of 1½ to 2 mm following surgery), a radiograph or periodontal probe with anesthesia can be used. If insufficient soft tissue is anticipated, the surgical procedure will require some osseous reduction. Again, discussion of this procedure is beyond the scope of this

paper; it is mentioned only to give the reader some idea of the complexities that can be encountered.

Summary

The previous discussion presented a simplified technique for ridge augmentation in deformed residual edentulous areas in fixed prosthodontics. The technique is recommended only when the soft tissue defect interferes with esthetics, function, comfort, or ability to be cleansed. The proposed technique is simple to perform, requires very little time, and causes few or no complications. The resulting soft tissue area closely mimics the contours of the gingiva overlying the roots that are present in the adjacent teeth and creates a concave soft tissue pontic receptor area which allows for close approximation of a desirable convex pontic. The technique is contraindicated in areas where there is insufficient soft tissue, or where the residual ridge defect does not interfere with the lip line esthetic pattern.

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The Edentulous Ridge in Fixed Prosthodontics

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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

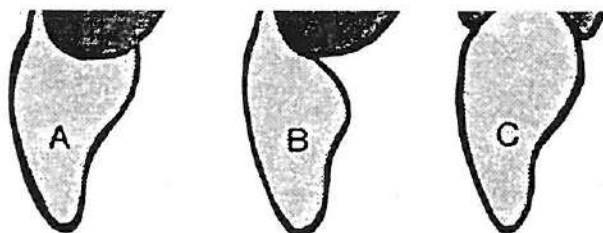


Fig 1—Pontic designs. A. Total ridge lap. B. Modified ridge lap. C. Ovate.

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 sequestered 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 interden-

point at which the maximal curvature of the cemento-enamel junction (CEJ) normally would have been (Radiograph 1).

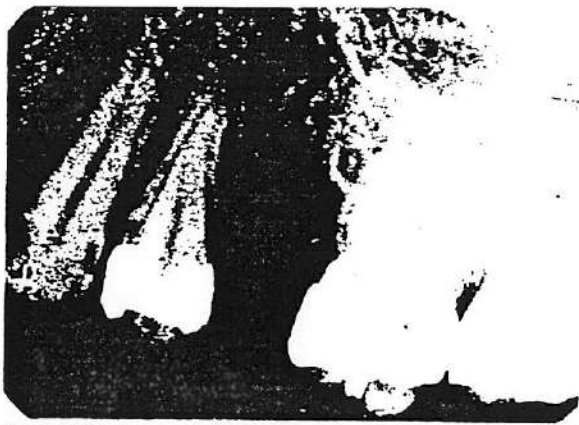
The rise and fall of the CEJ of any particular tooth form can be characterized as being highly scalloped or flat, corresponding to the underlying osseous topography and gingival form. The dimension of the additional healing bone fill will equal the distance between the tip of the interdental papilla 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).



Radiograph 1—Flat osseous topography of the extraction site; i.e., healing across the tips of the two interdenal osseous crests.

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).

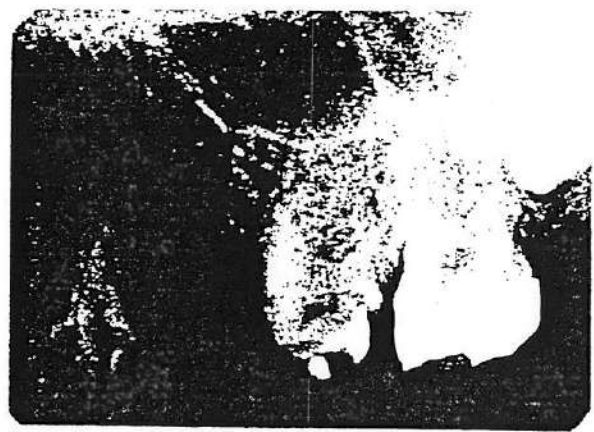
Modified Ridge Lap Pontic—The flat ridge is decreased in width from the lingual aspect only, allowing the pontic to make contact predominantly on the buccal aspect, thereby facilitating oral physiotherapy. For esthetic reasons, an indentation is then created on the buccal aspect which permits the placement 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 osteotomy 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



Radiograph 2—Osseous topography following the osteoplasty procedure. (Compare with Radiograph 1.)

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.² Recently, an interesting concept of surgical ridge augmentation was described in the literature,¹ 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 literature¹ (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

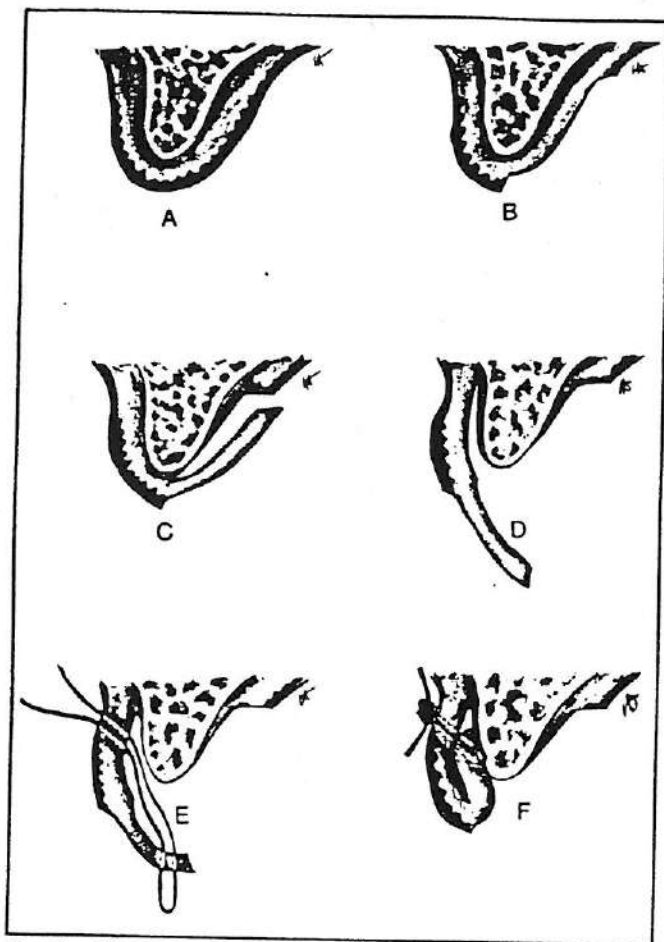


Fig 5A—Diagrammatic representation of the complete *roll* procedure. (Courtesy of Dr. Leonard Abrams, University of Pennsylvania.)

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.

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).

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, resulting in a free bleeding surface. The amount of required tissue is then outlined on the tuberosity area according to the measurements taken from the recipient site, and a large wedge of *both epithelium and connective tissue* is removed. This wedge, the undersurface of which is shaped to conform to the ridge to be augmented, is sutured in position (Fig 6B). It is essential to expedite this stage of the procedure, allowing for rapid coaptation of the free graft and the development of adequate nutrient circulation.

Sutures are removed at 12 days (Fig 6C). At this stage, the resulting tissue may not blend in perfectly with the tissues above and lateral to it. A gingivectomy or gingivoplasty invariably is required to blend in the donor tissue and to develop the concave form of the pontic recipient site. It should be emphasized that these plasty procedures should not be done at the time of

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 10C—Split thickness dissection of tissue over the entire deformity to develop a pouch into which connective tissue grafts may be placed.



Fig 10D—Connective tissue graft being slipped into the pouch and tried in position prior to suturing.

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 re-lined and recemented, and 13 weeks is allowed to elapse before the augmented ridge (Fig 10H) is ready for the final prosthesis.

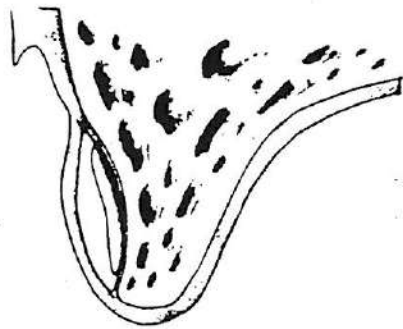


Fig 10E—Cross-sectional diagrammatic representation of connective tissue graft in position, subepithelially.

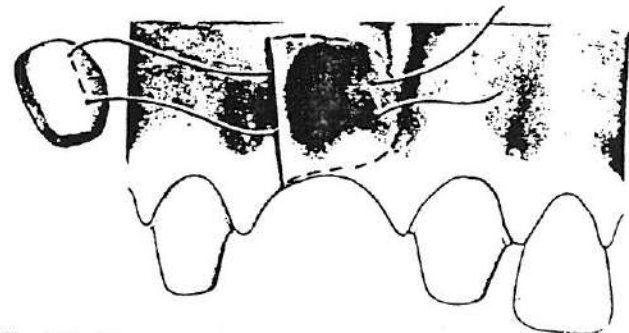


Fig 10F—Diagrammatic representation of suturing technique. Note that the connective tissue graft is not yet in position within the pouch. It will be pulled into the pouch utilizing the two loose ends of the suture and will be stabilized in a position which depends upon the initial entry of the "bite" of the first suture.

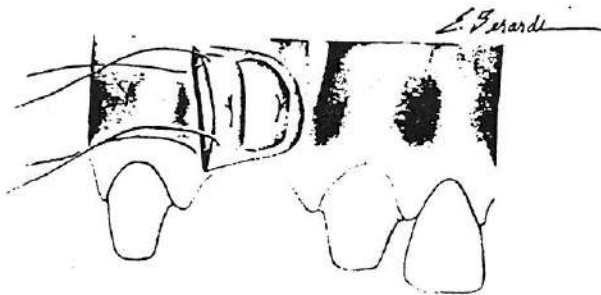


Fig 10G—Diagrammatic representation of pouch closure with interrupted sutures, following insertion of connective tissue grafts.

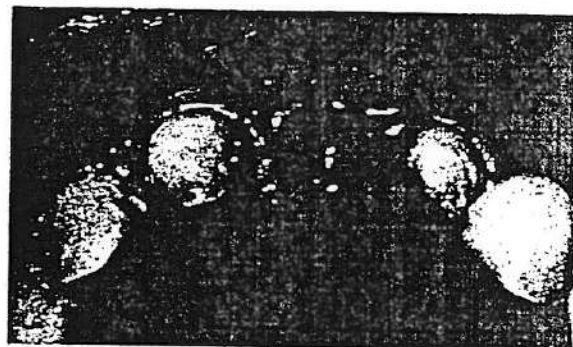


Fig 10H—Augmented ridge with depression created for ovate pontic. (Compare with Fig 10A.)

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

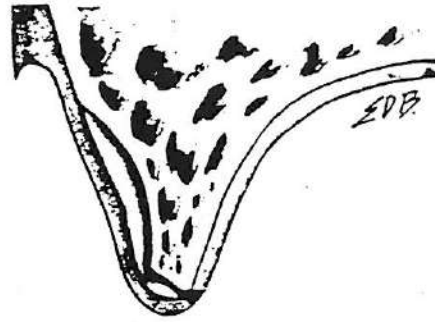


Fig 12A—Cross-sectional diagrammatic representation of placement of horizontal incision on the palatal aspect of the ridge at a more apical level. This facilitates a certain amount of drape to the pouch, which is created by extending this incision horizontally toward the buccal aspect and then apically around the osseous crest. Following placement of connective tissue within this pouch, the augmentation will be in both a horizontal and a vertical dimension.

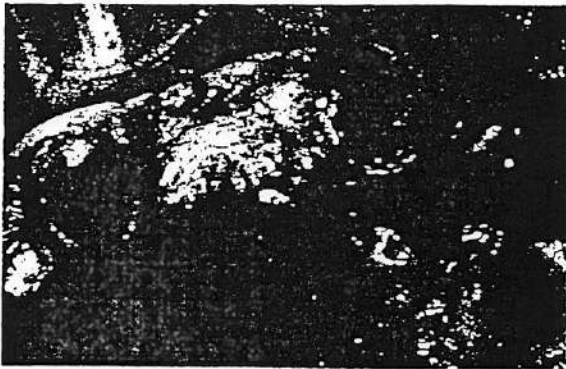


Fig 12B—Clinical view of incision similar to that shown in Fig 12A.



Fig 12C—Clinical view showing connective tissue 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.

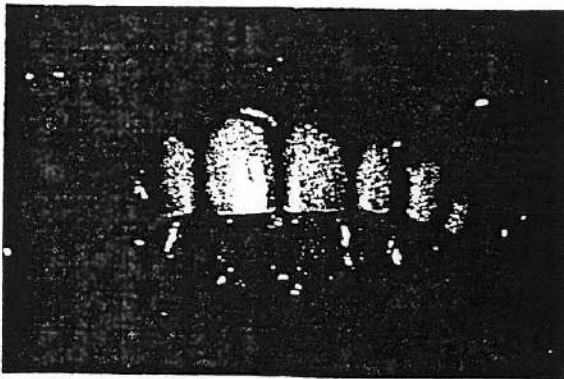


Fig 12D—Preoperative view with provisional restoration in place and pink acrylic on the apical end of the provisional restoration.

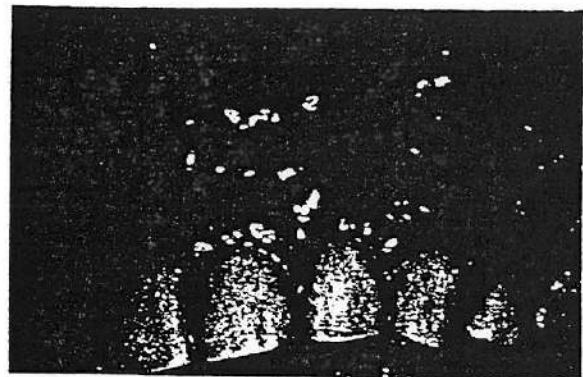


Fig 12E—Postoperative view of the same site following ridge augmentation. Note the dramatic amount of vertical as well as horizontal ridge augmentation. Note, too, that the provisional restoration has been cut back on its apical end to allow for the increase in ridge dimension.

must be changed. It should now be made on the palatal side of the edentulous ridge, at a more apical level, corresponding to the crest of the underlying alveolus (Fig 12A).

The dissection is made horizontally from the palate towards the buccal surface and then onward, around the alveolus in an apical direction (Fig 12B). The tissue coronal to the primary incision will now drape somewhat incisally, which will add vertical dimension to the ridge. The dissection is completed by extending it laterally over the complete area of the deformity. The donor graft is slid in through the incision around the alveolus and onto the buccal surface (Fig 12C). The base of the graft will remain on the crest of the alveolus, augmenting it in both a vertical and horizontal dimension. The initial incision should not be sutured back into close apposition or the net gain in a vertical dimension will be lost. It should be allowed to heal by secondary intention or by placing a connective tissue graft with a small base of epithelium, which will fill the void created by the drape of the pouch (Figs 12D and E).

Ridge deformities may be bizarre, requiring augmentation in varying dimensions and planes; consequently, several separate incisions may be necessary, depending 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 next passed through the donor 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.

The author would like to acknowledge Elissa Berardi for her work on the drawings in this article.

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Dear Friends

William James reportedly said "I am done with great things and big plans, great institutions and big success. And I am for those tiny invisible loving human forces that work from individual to individual, creeping through the crannies of the world like so many rootlets, or like the capillary oozing of water, yet which, if given time, will rend the hardest monuments of human pride."

So let's ramble through a "ballad". . . ode, if you please, of
Collateralization and It's Role in Treatment Counseling.

CASE PRESENTATION. . . ANYONE?

The comment, "the newsletter occasionally approaches Avromian absurdity," when indeed the purpose is to poke at basics and leave the energy with the reader and provide an apparent exercise of value for subscribers. The intent of this blurb is not abstraction, but to lay down some basic premises from our old friend, Carl Rogers, that have been rattled off, over the years, in the form of check lists without much background accompanying the suggested checklist.

An exploration of "industrially" scarred dentists in the "management of staff" and "case presentation" will establish, as we compare it to Carl Rogers' work, two perceptive and well-intentioned views of the same situation from totally different perspectives with the result that each will formulate a course of action based on his/her perspective.

Carl Rogers' view is grounded in trust and long-range goals and objectives. Traditionally, in dentistry, our perspectives accept the human being as s/he is and acknowledge his/her strengths as well as his/her weaknesses, but basically focus on short-term goals and objectives. We seek to get a "staff" member and/or a "patient" to make that decision as quickly as possible in the unawareness that to argue exhaustively may postpone the change to the needed policy or procedure.

Rogers sees solutions to problems in terms of healthy relationships. Dentists solve problems with sharp arguments. Given the inherent ecumenical character of man's reasonable mind, an effective approach in any given situation is probably somewhere in between these two camps.

The Rogerian approach is to minimize both argument and strategy. To portray Rogers' method as a form of argument is to seriously misunderstand what he intended. While Rogers and today's dental mindset are superficially similar, the differences are profound.



REED'S
INTERNATIONAL
LETTER

The differences between Carl Rogers and our usual approach tells something about our motivation and purpose. . . our attitude toward the listener and how motivation and attitude shapes our discussion. In examining the differences between dentistry and Rogers, we need not choose up sides, but simply listen to both and take from either that which is appropriate in a given situation.

The first step in using Rogerian skills is to convey to the other person that s/he's understood. The purpose of this task is not to induce in the listener the speaker's position and create him/her open to change so that the speaker may win an argument. In Rogers' work, On Becoming a Person, he says that empathic understanding is possible providing one avoids making evaluative statements or judgements. This avoidance allows the other person to accept responsibility to work out his/her own solutions.

Communication along these lines must convey that the speaker trusts the listener to make the right decision and he recognizes that the listener is capable of making choices that make sense.

Rogers asks, "Can I permit the other person to be what s/he is? or do I feel that s/he must follow my advice?" Rogers' answer is definitely "yes" to the first question because his objective is not to argue with the other person, but to maintain a continuing relationship through what he calls "unconditional acceptance" of the other which will bilaterally promote growth, development, maturation,

improved function, and will improve the coping mechanisms for life in each person.

Rogers is not describing argument. He does not speak of opponents or victory. The change is not some predetermined position for which he seeks assent. It is the removal of threat so the other may grow and become capable of autonomously accepting responsibility in working out his/her own solutions.

This is indeed the ground substance of collateralization that was being discussed with the Russians, by Carl Rogers, just prior to his death and so aptly forms the philosophy of administrative procedure in the informationally driven societal structure.

When one de-pyramidalizes, one alters one's entire view of position in favor of outcome. Carl Rogers' objective in conveying to the other person that s/he is understood is related closely to dentistry's insistence that the speaker must be able to argue both sides of the question. In dentistry, our mastering either side of the question does not seem aimed at understanding. In forensic and debate, it is clear that the other side is "evil" so that the primary reason for mastering the other side is to know how to refute it. We must be able to master either side of the question, not in order that we may in practice employ it in both ways, but in order that we may see clearly the facts for our own purpose.

Our usual approach to "understanding" is that of a lawyer anxious to achieve victory. The persuader

It's easy to get others to do what you want them to do if you will see things through their eyes.

OMER K. REED, DDS

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characteristically seeks to influence the listener or to have the listener adopt a specific course of action. Thence cometh the "prattle" we use in our usual case presentation.

The speaker is to master the nature of competition, to focus on victory. Forensic and debate contestants provide pleasure for those accustomed to their actions and who have the capacity for argument.

In dentistry, the person who is to be unconditionally accepted is the speaker, not the listener and this unconditional acceptance must come about by the speaker destroying any criticism as quickly as possible to achieve this end. The argumentative speaker will make use of an audience's attitude or prejudice, their beliefs, values or premises.

Carl Rogers clearly rejected this strategy and this misuse of understanding. He deplored confirming the other in order to reinforce certain behaviors in others. Quoting Carl Rogers, "If I do this, I tend to confirm him as an object. . . a basically, mechanical, manipulatable object."

Rogers chose to understand with a person, and empathy enables the speaker to see the other person's point of view, but also places emphasis on solving a problem, rather than attacking a person. Understanding with a person avoids thoughts of competition and victory, of manipulating the other, whereas understanding about, as Rogers said, implies an attempt by the speaker to control the other person, to bring the other

person to approve of what the speaker advocates.

"I become less and less inclined to hurry in to fix things, to set goals, to mold people. . . I am much more content simply to be myself and let the other person be himself," said Carl Rogers.

His approach is tentative, cooperative and non-argumentative. By contrast, we usually proclaim that we "know the truth" and struggle against anyone who advocates the opposition of our truth. As a tool, we usually delineate an area within the listener's position which is valid. Rogers advised against any kind of evaluation. . . positive or negative. The purpose of listening is to understand and remove the threat of judgement. Rogers said that a positive evaluation is as threatening as a negative since to inform someone that he is good implies that you also have the right to tell him that he is bad. (Praise Re-appraised) His position precludes the delineation within the listener's position of validity because such delineation implies judgement.

Listening without judgement creates within others the willingness and ability to change. The more I move in to change things or people, the less they seem to change, and the more I leave them as they are, the more I stir up change.

Rogers contended that if the speaker genuinely relates to the other's position, if the speaker can get within the listener's frame of reference, the speaker's "own comments" will have to be drastically revised. It is as though the speaker

All meaningful and lasting change starts in the imagination and works its way out.

Self-examination is nearly always the first step towards change.

Put two people with a common goal together and suddenly, one plus one is more than two.

tries on someone else's shoes and discovers they fit better than his own. In contrast, we usually seek ways of invalidating the listener's conclusions and do so by employing premises acceptable to the listener that lead to opposite conclusions. Our interest is not in outlining the area within which the listener's position is valid, but rather in choosing premises acceptable to the listener that make the speaker's conclusion valid.

Unlike the Rogerian approach, the usual dental strategy is to understand what the listener is willing to accept rather than the measure of validity of the listener's position. This is antithetical of Rogers' position.

In a traditional communication, the speaker sees the person to whom he speaks as a judge and it's true that anyone is your judge whom you have to persuade. Persuasion demands that the listener assume two roles, that of listener and that of judge. This imposes on both the speaker and the listener the necessity of maintaining distance between them. On the part of the speaker, the distance is maintained by means of concealment. The speaker cannot be what Rogers called "transparently real." We must control the situation, which means that we must keep sufficient psychological distance between ourselves and the listener so that the listener does not divert himself in the position we advocate. The distance the listener maintains from the speaker is based on the listener's resistance to what the speaker is saying, both because the

listener serves as an opponent and as a judge of the speaker.

For a listener to judge a speaker's argument properly, s/he must not be "taken in" by the speaker lest a judgement be grounded in a non-relevant consideration. To the extent that the listener stands apart from the speaker, there is a leverage for the listener's evaluation or judgement of the speaker's position.

Power is seen in opposite camps between Carl Rogers and our usual social dental positioning. We ask our "opponent" to listen to position, to understand it and to see the truth in it by demonstrating that we have done the same thing with his/her position. In our argument, we paraphrase the other's point of view for the purpose of inducing the listener to modify his/her position. We do not ourselves intend such modification and we must conceal this from the listener.

Rogers objected to maintaining a distance between the speaker and the listener as was indicated on his comment on the relationship between therapist and "patient." We are afraid that if we let ourselves really experience. . . positive feelings toward another, we may be trapped by them. This may lead to demands on us where we may be disappointed in our trust, and these outcomes we fear. So as a reaction, we tend to build up distance between ourselves and others. A "professional" attitude, an impersonal relationship.

Rogers saw no justification for distance between speaker and listener because judgement regarding what one or the other is doing is not conducive to the

You are completely responsible for all your responses to other persons and events.

understanding both should be seeking from each other. Rogers' emphasis is on cooperation, understanding and truth-seeking and is intended to strengthen and maintain ongoing relationships . . . relationships that are subject to the danger of misunderstanding. Rogers believed that misunderstanding was eliminated by minimizing threats, by avoiding opposition and controversy.

We use opposition as the ground for stimulating judges to make decisions. We believe understanding implies agreement. In our case presentations, our attitude in closing is "I have said it. You have heard it. The facts are before you. I ask for your judgement." This entire concept would not "make it" with Carl Rogers.

If you must speak, ask questions. Speak to the other person's obvious, with empathy. Listen without judgement to create within self and others the willingness and ability to change. Ask questions, the answers to which are the messages you want to send.

The power of the Rogerian question is that it transfers the position of power to the question answerer. The answerer is indeed the generative one who creates the message for him/herself. The answers are dependent upon the question, and the energy is generated and owned by the question answerer.

It seems that our experiential banks are loaded with the antithesis of Rogers' discovery in human interrelationship. Do you dare do a 180 degree turn in your application of energy with your fellow team people in the

practice? Do you have the "risk-ability" in sufficient quantity to "understand with" a person at the treatment consultation?

Not to take this turn or risk is a greater risk. The ease of outcome "win-win" with self and others is Carl Rogers' gift to those who feel understood.

Voluntary vulnerability? Sure!

Are you exposed in position to be taken advantage of by persons in your environment? Are you too non-directive, soft, or less assertive than is socially effective? Perhaps in the view of some. . . power rests in the hands of the person assigning the role to be played. Assign yourself the role. Empower yourself. Muse as you see the uniqueness, inter-connectedness and servitude of the winner's game.

We recently heard Charles Plumb, Commander, USN Retired, speak of his 5-1/2 years in the Hanoi Hilton. . . 14,000 miles he "hiked" in an 8 X 8 foot cell. The games he designed for each day he played well. His independent discovery of "understanding with" was felt even by his captors.

Design your game to place the Rogers' "dichotomy" in motion in your team interface and in the opportunity called treatment consultation.

Take a course and learn to listen so others will speak, not a course learning to speak so others will listen.

Omer

Life is like playing the violin in public . . . and learning the instrument as you go along.

Napili News

There are three major responses to life:
YES! NO! and WOW!

YES! The NAPILI SILVER was a wonderful experience in every way.

NO! You weren't forgotten. . . we missed you if you weren't with us.

WOW! Let's do it again in 25 more years! We gained two new investors in the Pentegra, and three new clients. . . we're grateful for, and looking forward to your continued support and referral.

You've received by now the special offer for the September 28 workshop, Napili 1/Pentegra Symposium. . . Napili will host the traditional Mexican dinner on Thursday evening, lunch and dinner on Saturday. . . space available, come, join us!

First announcement for Napili 8, the Anatomy of the Accelerated Practice: November 9 - 12, Phoenix. Guest speakers will be Cal Evans, Scott Ford, Bruce Pettersen and George Winn. This will be a challenging session exhibiting the wellness, interpersonal skills that lead to a consistent production of \$400,000 to \$1,000,000 per year. (Another WOW format.)

Omer will speak for the American Dental Association Political Action Committee (AdPac) meeting in Salt Lake City on October 3. . . call Gary Matthews (801-373-3933) for information.

We enjoy hearing from you. . . in person, or by 'calls and letters.'

Marci Reed

President
Napili Seminars

NAPILI PARTICIPATION

REGARDING THE NAPILI SILVER. . .

“. . .sorry that a trip to Hawaii for NAPILI's 25th Anniversary was not in the cards for this summer.

“However, we do want to pass along a few thoughts to you as you are beginning the countdown to the big celebration.

“And celebration it should be! When I think back to the time we first came to Phoenix for Napili 7 (implantology) back in 1981 on the advice of friends, we had ideas, but lacked direction.

“We spent our few dollars on tuition and airfare and stayed at the Biltmore.

“The first evening's orientation session was followed by you and others going to the Gold Room for dinner, which did not fit into our very zero-based budget. . . and thankfully you provided lunches during the seminar!

“I had brought a patient to do the implant surgery for and you 'suggested' we do both arches instead of the one we had planned.

“My wife, five months pregnant, by my side assisting, and four hours later. . . I was spent, but the dentistry was not done. You sensed I was in trouble, sat down next to us and got us through. Good people skills, because I was a total stranger to you at that time.

“Times have changed. . . and so have implants. I have never forgotten how you handled me and that implant situation. . . .you helped me, and then my team, to learn, creating a service team that not only does things well, but also enjoys the game.

“. . . Love to Marci and Happy Anniversary!”

MRD

(Thanks for the very kind words!)

“Napili Participation Column is a communications vehicle dedicated to networking among Napili seminar attendees and REED'S INTERNATIONAL LETTER subscribers. Submit your dialogue for consideration to: Napili Participation Column, Napili International, 4515 North 32nd Street, Phoenix, AZ 85018.”

PROFESSIONAL PRIVATE PRACTICE

Spotlight on: *Dentists*

An Old Adage Revolutionizes Dental Practice

Today, many dental practices are in trouble. With the same ever-rising overhead costs that plague all private practices, dentists are also contending with capitation, more private practice competition and less decay to treat. Now, the competition for patients is bound to grow even more intense because a breakthrough concept—embodied in an effective, preventive home care program—is about to steal more patients away from practices that are slow to “see the light.”

This revolutionary concept is based on an old adage that many health care professionals typically overlook: Give 'em what they want.

The results of giving patients what *they* want—not just what professionals *assume* they want—has had some results that have even amazed the developers of the program—the professional staff of Drexam, Inc., headquartered in Denver, Colorado.

Several years ago, Drexam took a good look at recent studies being done on patient satisfaction. Findings, reflecting those in a 1984 Procter & Gamble study, showed that:

98% of patients wanted their dental professionals to take the time to explain procedures.

95% wanted to be shown that professionals took a personal interest in them—acknowledging the individual as “special.”

97% wanted specific instructions on oral health care.

85% wanted professionals to make specific brand name recommendations for oral health aids.

Over the following years, Drexam gathered research data from studies, focus groups, interviews, surveys and input from hundreds of dental professionals throughout the nation. What they came up with is an ethical, effective win-win situation that benefits the patient and the practice. They “give the patients what they want.” They call it the Extended Dental Care Program (EDC).

EDC meets all the patient “wants” defined by the research studies. Oral health aids aren't just recommended—they can actually be supplied then and there, in the office. Dentists using the EDC Program are provided with a full line of home care aids—from toothbrushes to remineralizing gel. Not available through retail outlets, these aids are *only* dispensed from the office. Drexam's clinical staff developed their products by combining all the best features of leading brands (impressive quality).

“Only from the office” is key. Because the program emphasizes *education* on the hows and whys of using home care aids—another identified patient “want”—Drexam provides patient educational brochures. They also supply support materials for the clinical and the office staff.

Best of all, in terms of the competitive edge, EDC does seem to

make patients feel special. That may be due to the extra attention, the educational hand-outs and, especially, the very medicinal, therapeutic “look” of the Drexam line. EDC programs seem to boast some very happy patients—patients who *aren't* likely to stray.

EDC also meets the needs of the practice—and here's where the EDC Program shines.

- increased patient compliance (Just what the doctor ordered.)
- reduced office overhead (Gone are the giveaways.)
- increased revenues (1. Some EDC dentists dispense Drexam aids at a cost; others add revenue by charging a fee for providing the aids as part of the total preventive program. 2. Recalls are coming in more consistently.)
- increased professional satisfaction (1. Hygienists are enjoying the chance to teach—and they like seeing compliance. 2. The preventive program is more complete than ever before.)
- reduced threat of malpractice (This is a significant extra bonus from the way the program helps the staff keep a record of treatment and instruction.)

This is one program that definitely merits attention from dentists.

The concept merits attention from *all* health care practitioners. Give the patients what *they* want—and we'll all win. □

I LOVE MY LAWYER. HE TAUGHT ME HOW TO CHARGE

While poring over his attorney's bill, this physician saw a bright light. It flashed how a proctoscopy could be worth \$1,249.17.

By Hugh F. Hill III, M.D.

My attorney rushed into my office, waving a piece of paper.

"What is this *thing*?" he ried.

"Counselor," I said, leaning back in my chair, "always good to see you. How's my favorite legal eagle? Sit down. Can I have the receptionist bring you coffee?"

"Look at this!" he insisted, thrusting the offending document across my desk. "It came n today's mail."

"I recognize it," I said, smil-

ing. "Isn't it great? I knew you'd be excited when you got it. This will revolutionize medical billing—and I got the idea from you!"

"But it doesn't look anything like a doctor's bill," he protested.

"Of course not," I replied. "Remember that little legal matter you handled for me recently?" A hint of suspicion crossed his features. "After examining your statement for services rendered," I continued, "I

went out and bought some legal billing software and adapted it to my practice."

He slowly sank into the chair opposite my desk. "But I've been your patient for years, and I've never gotten anything like this before."

"That's the beauty of it!" I exclaimed. "I'm not practicing any differently, I'm just billing for it properly now."

As my enthusiasm waxed, his waned. "But \$1,249.17 for a proctoscopy?" he asked incredulously.

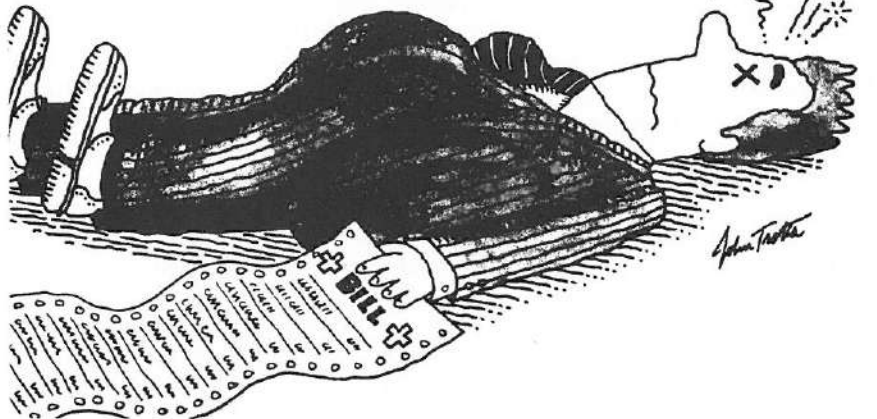
"Yes, isn't that terrific?" I marveled along with him. "And the software lays out everything in such detail! I never realized how hard I was working until I started billing this way."

He reached across my desk and reclaimed the statement. "I guess this is the breakdown of the time I spent in your office."

"Couldn't be clearer, could it?" I acknowledged. "There's the entire visit—divided according to the time it took to do the initial examination, explain the proctoscopy, perform the procedure, and discuss it with you afterward—with each segment rounded to the nearest tenth of an hour. Also, now that I'm billing for it as a distinct service, I don't feel so bad about having to spend 20 minutes recording my observations on your chart."

"What's this item labeled 'research'?" he asked peevish-

THE AUTHOR is an emergency physician and attorney practicing in Bethesda, Md.



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"You went to law school for three years and bill at \$150 an hour. I went to medical school for four years, so I bill at \$200 an hour."

ly, jabbing his finger at the statement.

"Another excellent idea I got from you," I chuckled. "I used to spend hours every week reading journals. Now I do it like you lawyers do: I research each patient's problem as it comes up. That way I can bill for the research time."

"All itemized," he murmured, gazing at the statement. "Travel time to the library, mileage expense, research time, call to university colleague, review of literature suggested by colleague. . . ." His voice faded.

"The next item is my favorite," I said. "Remember that little problem you recently worked on for me? There was an item for conference time on your bill. When I asked about it, you said you'd discussed my case with two lawyers in your firm. Well, until I started keeping track with this billing program, I had no idea how often I was conferring with my own associate. As a convenience to you, I've listed his time on my statement, too."

He looked stunned for a moment, then managed another question: "This out-of-state meeting—what does that have to do with my proctoscopy?"

"I can't tell you how grateful I am to you for getting me started on this," I said. "Since Uncle Sam won't let me deduct the entire cost of these expensive seminars anymore, it's especially nice to be able to bill for them. You want me to be up on the very latest aspects of your problem, don't you?"

"Well, of course," he mumbled. "but. . . ."

"You're wondering how I arrived at those figures, aren't you? Well, you see, there are 50 patients in my practice who have your particular condition. So I just took all my expenses from the three-day meeting and allocated them equally among the 50 of you. With the software, it's really a piece of cake."

"Great," he sighed. "I suppose this section here was suggested by my calling a tax specialist about your trouble with the Internal Revenue Service?"

"Exactly!" I grinned. "After my research, and after attending that meeting, I decided to get you a second opinion on that lesion I thought was benign. And with this new billing system, I can afford to call around until I find the subspecialist who's absolutely the best qualified to consult on each patient's problem."

Still staring at the bill, he seemed to stiffen a bit. "Here's something I hadn't noticed before. What's this 'phone call from spouse'?"

"I had to spend a long time reassuring your wife on the phone," I said.

"Okay," he said grudgingly, "but how did you get this total? You multiplied the time by \$200 an hour?"

"Right," I answered, gesturing at the framed degrees on my wall. "You and I are about the same age. You went to law school for three years and bill \$150 an hour. I went to medical school for four years, so I bill at \$200 an hour. Come to think of it," I mused, "maybe I should factor in the years I spent in residency."

"Oh, no, no," he babbled, pushing himself up from the chair. "That's fine. Thanks for taking the time to explain."

"Not at all," I said. "Whenever you need me, just call. Always glad to talk with my lawyer, my patient, and the man responsible for this wonderful new billing strategy. You've showed me how to make conversations such as this quite profitable, actually."

His face fell. "You don't mean. . . ."

"Of course!" I answered, giving him a firm clasp on the shoulder. I glanced at my new desktop timer. "We've enjoyed 17.35 minutes together. That's 0.3 hour. Would you like to be billed today or wait until the end of the month?"

"The end of the month is fine," he said weakly. As I guided him to the door, I noticed that his breathing was shallow and labored, his skin pale, his forehead sweating.

"Listen," I said, pausing in the doorway. "I've got some thoughts about marketing this new billing system, and I'm going to need legal advice."

His respiration steadied. He eyed me evenly.

"Maybe I can stop by your office sometime and we can talk," I suggested.

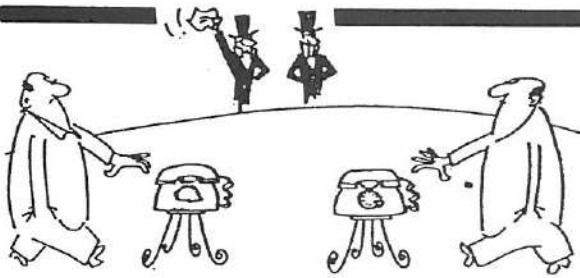
The light began to return to his eyes. His shoulders straightened. "Yes. Marketing. Maybe a syndicate. Closely held corporations. Contracts." He quickened. "Deals."

The color was returning to his cheeks.

By the time he stepped into the waiting room, he looked almost normal again.

As he left, I turned to the receptionist.

"Send in the next client . . . er, patient." ■



**AN EQUAL RIGHT TO
INEQUALITY:**

*The Sociology of the Answering
Machine*

JAY ROSEN*

*Office Calls?
Anyone?*

THE ANSWERING MACHINE reverses the whole history of the telephone by restoring the rights of the receiver to initiate communication. A dimension of privacy that had virtually disappeared from daily life has been put back: to be interrupted by the anonymous ring of the telephone is no longer the price one must pay for membership in a communication network. The extraordinary ability to call any number at any time from almost anywhere still exists, but it has lost much of its meaning. For the answering machine gives everyone the protective status once reserved for the executive by his secretary. In this sense the new device is a democratizing instrument, but the kind of democracy that results is a rather odd one—a democracy in which everyone has an equal right not to participate.

The executive secretary screening calls for the busy professional helps to administer a communications inequality—the fact that in any hierarchical arrangement there will be some people whose time and attention are more in demand than others. The sort of inequalities that create a need for a screener of calls are those of a competitive society: differences in power and status at every level within an organization and across social groupings. In American society as a whole, the President represents the extreme case of communication inequality. He certainly gets more calls than anyone else and his own call is the least likely to be refused, whether he is phoning the chairman of Exxon or the winning pitcher in the World Series. As long as there are differences in the desire to communicate, some receivers of calls will need a way to avoid communication with those whose time and attention are least in demand.

But what happens when everyone obtains the means to avoid communication? This is the problem raised by the telephone answering machine. It gives all members of the hierarchy the status of the busy executive, but that status is logically dependent on the great majority of potential callers who do not enjoy it. Just as a speaker requires an audience of listeners, a refuser of speech requires a potential audience greater than his time, attention or patience will allow. A kind of communication chaos is therefore created by the answering machine: everyone is able to refuse everyone else's call, but there is no guarantee that everyone will get the calls to refuse. Thus, the sad discovery some people make when they plug in their new machines: they weren't missing any calls anyway.

When many obtain the communication status once held by a few, there is in effect a new demand for differences which would recreate the inequalities upon which the logic of the answering machine depends. But where are these inequalities to come from? The answer is: "From equals, of course." That is, more subtle and personal differences between people of the same class will be brought out from the background of social ritual to be given blunt form by the unreturned message or the unanswered call. A whole new world of snobs will be created among friends, families, co-workers and the loose acquaintances typical of a mobile, urban existence.

Just as in any formal organization there are those whose time and attention are more in demand than others, in any social grouping there are those whose company is more interesting, whose presence is more requested, whose personality is more "in demand" than others. Though it sounds crude to say so, there are of course those people who are less "in demand" than others: the office bore, for example. The rituals of politeness are the means by which any social group manages to include those who would probably be excluded were a ruthless honesty to prevail. These rituals naturally have an element of hypocrisy about them: they communicate a different status to the troublesome member than that member actually enjoys. This hypocrisy is a precious thing in any culture. It prevents the rough edges of the human personality from appearing too often, and buries beneath convention the least generous impulses people feel toward one another. Fully expressed, the inequalities and personal differences which always exist between people would tear apart even a circle of intimates. One of the most accurate features of the film *The Big Chill* is the way in which Michael, the least popular member of the group, tries the patience of everyone else and in the process brings the group closer together. That he

is aware of his own obnoxiousness makes his character the funniest and in many ways the most popular one in the film, not only because his jokes are good but because he calls forth the most tolerant and human impulses in everyone. The audience feels good liking Michael, and this feeling is the very bond of sociability whose strength keeps a precious hypocrisy intact.

Facts of this sort have long been obvious to social psychologists, or indeed to any intelligent people-watcher. What the answering machine adds is a convenient way of avoiding tests of the social bond in one's self; it is easier to rely on the machine than to answer the phone blindly, knowing that any call might represent another demand to "be social." The casual acquaintance or depressed friend whose call is not desired once had to be tolerated or even indulged, until some plausible way of getting off the phone arose in conversation. Now, the impulses that one would call forth to cope with such a situation can remain unexercised through the magic of the answering machine, and the ethics of the machine are that they *should* remain that way in favor of "convenience." Convenience is not all a neutral value. It turns the duty to be social—a system of rules and rewards for following the rules—into a "demand" made unfairly on the sovereign self, a demand people are increasingly encouraged to resist. It is a short step from the inconvenient call to the inconvenient person. By enabling both to be avoided, (without causing a confrontation that would also be inconvenient) the answering machine makes itself an indispensable part of a culture of contacts, a loose network of semi-relationships in which people only meet to pursue a mutual self-interest. The model for such a network is obviously the business world, for the answering machine is helping to translate the principles of market exchange into social values to which everyone can guiltlessly subscribe. These values are essentially antisocial: shared ways of refusing to share a social duty. They are therefore difficult to counter, since there is an odd feeling of community in discovering that others are weary of communing, as well.

Almost everyone has been an unwanted caller at some time or another, and frequently we are permitted to remain ignorant of our status. It is fortunate for us and for all our relationships that we are granted this ignorance, the gift of hypocrisy that people generously bestow on one another. Indeed, it is fortunate for the entire society that people are not constantly reminded of their actual status, and are left free to communicate with those who may have no real reason to communicate with them. The way in which a doorman or elevator operator maintains his dignity is by engaging in essentially trivial communication with those who pass through his environment, demanding only a moment of his time and the smallest part of his humanity. There is no reason for the talk that passes between people in such situations, other than to keep the social bond intact and to permit everyone a place in the human community. The good humor one is expected to show to the doorman is an act of generosity, not only to the doorman but also to the self. Thanks to the answering machine, it is now a little more convenient to avoid such an act.

Scottsdale Fly-in with Omer Reed
Oct 20th to 23rd

Omer has organized a spectacular
Fly-in -- no doubt about it!

1) Thunderbird Inn - While not a luxury resort, it is only a few hundred feet from the runway at Scottsdale Airport, and all rooms are two-room suites with wet bar, refrigerator, and two TV's-choose two doubles or a king size bed, and non-smoking rooms are available. It also has a pool, spa, lounge and restaurant. Finally, if you are flying commercially, ask the front desk about special transportation from Sky Harbor Airport to the Thunderbird Inn. The suites are \$65.00 a night, and you can make reservations by calling 800/334-1977 -- Tell them you are part of the Flying Dentist Association group. If you want a car, a snappy rental car can be reserved by calling 602/990-2990.

2) Omer has our CE meeting planed for 8:00 AM to noon on Friday and Saturday. We will be discussing asset accumulation, crisis management, practice enhancement, personal growth and practice conversion, as well as the People Without Perio program. Omer is also offering a tour of his "front deskless dental office"

3) The Goodies

-On Thursday evening at 7:00, the whole group is invited to Omer and Marci's home for a reception. Transportation will be provided if you don't have a car.

-For Friday and Saturday afternoons no definite schedules have been set but these are what we have to choose from - and we can fly to all the sites.

--Soaring at Estrella Airport

--Visit the Champlin Fighter Plane Museum at Chandler Airport

--Carefree resort

--Visit the aircraft boneyard and the B-17 Museum at Davis-Monthan AFB at Tucson

--Grand Canyon

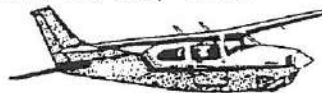
--Saturday night, we will have a barbecue at Carefree Resort.

--And of course, endless shopping for those with the inclination.

So make your reservation at the Thunderbird Inn, and mail the registration form in this newsletter to me. Add a note if you prefer a particular activity, or activities. More information will be in next month's newsletter, and details will be mailed to all who register. Final note: Omer says the weather is fantastic in October -- CAVU and 85 degrees. I looks like a good one for other Districts to join in !!

REGISTRATION FORM FOR SCOTTSDALE FLY-IN, OCTOBER 20-23, 1988

Mail to: David Gladden
3030 Beard Road
Napa, CA 94558



Remember to make your reservations at Thunderbird Inn

NAME _____

NAME OF SPOUSE, CHILDREN AND GUESTS _____

ADDRESS _____

TELEPHONE _____ ETA _____

TYPE AIRPLANE AND N-NUMBER _____

Number for Saturday night barbecue (cheap, maybe free!) _____

There is no registration fee for this fly-in.

Flying Dentist Association
Application For Membership From

=====
Last Name _____ First Name _____
Specialty _____ Spouse Name _____
Children's name & ages _____
Office street address _____
Office city, State _____ Zips _____
Office Phone ____/____-____ FDA Officer _____
Home street address _____
Home City, State _____ Zip _____
Home Phone ____/____-____ Mail to Off or Home _____
A/C Number N-_____ A/C Make _____ Model _____
Date of Birth __/__/__ Medical Date __/__/__ BFR Date __/__/__
Ratings Yours _____ Spouse _____
How many annual meetings have you attended ____ Year Joined ____
District ____ In what way would you like to be active in FDA ?
Do you use your Aircraft in your Profession ? How? _____

I hereby make application for membership in the Flying Dentist Association. I agree to abide by the bylaws and to pay dues as required. I have enclosed a initiation fee of \$15.00 and my dues (note rate below). I am aware that annual dues of \$60.00 include \$3.50 for a subscription to Flight Watch.

Initiation Fee -----	\$15.00	\$15.00	
Dues -----	\$60.00	\$ _____	
(after July 30th dues \$30.00)		Total \$ _____	Enclosed
Dues due Jan 1st each year			

Signature _____ Date _____

Make Check to: Flying Dentist Association
Mail To: Ernest Fritcher DDS
334 So Brea Blvd.
Brea, Calif. 92621

Give a Membership Application to a Friend