The Palatal Approach to Osseous Surgery

II. CLINICAL APPLICATION

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The palatal approach is a refinement of osseous surgery designed primarily to obviate certain problems associated with therapy of the maxillary molar area. A greater understanding of the implications of the anatomy peculiar to this region, coupled with an increased knowledge of the healing process and a critical evaluation of long term postoperative results, has led to the development of the surgical procedure described in this article.

It must be understood from the outset, that practically all cases necessitating osseous intervention, require some attention to the buccal surface, and, for this reason, the palatal approach is not to be construed as a substitute for buccal bone surgery. However, when existing osseous aberrations afford the therapist a choice, definite advantages can be seen for performing a great reduction of the aberration from the palatal aspect. The rational selection and successful utilization of this surgical innovation calls for a thorough understanding of all basic principles of osseous surgery in addition to increased diagnostic acumen and careful case selection.

TRADITIONAL THERAPY

MAXILLARY MOLAR AREA

Habit and ease of access have conspired to make the buccal approach to osseous surgery the "standard" method. The basic problem encountered when the standard buccal procedure is applied for the correction of multiple interproximal cratering in the maxillary molar area is shown in Figure 1. Figure 1A illustrates the typical pattern of posterior pocket development with the recording of increased interproximal depth and little, if any, alteration over radicular surfaces. Elimination of the interproximal depth without reduction of radicular, marginal, bone height would place the interdental bone at a level apical to that of the marginal bone, resulting in a reversed architectural pattern. Although pocket depth would be eliminated immediately following the surgical procedure, clinical observation has demonstrated repeatedly that such a postoperative result can seldom be maintained for an extended period of time.

The standard therapeutic procedure for this situation, and the one most widely employed today, is illustrated in Figure 1B. Removal of marginal, buccal bone over the roots of the premolar teeth has eliminated the reversed architectural pattern and restored a normal anatomical configuration to that area. The molar area, on the other hand, illustrates the presence of reverse architecture. The acceptance of reverse architecture in this area, as an acknowledged compromise, has been advocated as more desirable than risking a therapeutic bifurcation involvement by sacrificing buccal bone over the radicular surfaces of the maxillary molar teeth. While, admittedly, a few of the cases treated in this manner have been maintained without further breakdown, the vast majority have been found deficient in terms of periodontal health.

FACTORS INFLUENCING BUCCAL BONE REMOVAL

A previous paper presented the rationale for the palatal approach, as well as the advantages of extensive buccal bone removal. Additional discussion is indicated, however, to further clarify the actual operative technique employed in given situations.
The chief characteristic distinguishing the palatal approach from the standard procedure described above is that the greater reduction of the interdental deformity is performed from the palatal aspect than from the buccal surface. Thus, the crater is formed toward the palate allowing for maintenance of maximum buccal bone height. The retention of buccal bone is a factor of singular importance in the development of the interdental deformity, as well as other problems seen to develop as a result of buccal bone removal. However, since it is understood that the palatal approach cannot eliminate the necessity for buccal bone surgery and that most cases will require some buccal contouring, it would be logical to inquire into the factors influencing the extent of acceptable buccal bone removal.

The question might well be asked, “When buccal interval is indicated, what factors will guide the operator in his efforts to maintain buccal bone height?” A more specific question would be, “When the palatal approach is utilized, what determines the amount of buccal interdental bone that can be reduced?”

The answers to these questions depend largely on two factors: (1) The type of interproximal crater present, and (2) the anatomical relationship of the point of bifurcation of the buccal roots of the maxillary first molar (and to a lesser degree, the bifurcation point of the second molar) with the position of the marginal bone.

In order that these important considerations may be fully understood, each will be presented separately and in some detail.
The four general types of craters are shown in Figure 2. It should be obvious that all are the result of the resorptive process and, in reality, represent different stages, in degree and in time, of the progression of periodontal disease. Although variations of each type may occur, the majority may be categorized as follows:

Class I Crater: The normal interdental bony architecture of the molar area is relatively flat as compared with the more pyramidal shaped anterior interdental form. The Class I crater represents a 2 to 3 mm osseous concavity with relatively thick buccal and lingual walls. The gradual slope of the concavity from the margin of the buccal and lingual alveolar crest to the centralized base of the shallow defect is responsible for the heavy walls associated with this type of crater. Minimal interproximal bone destruction in most posterior areas can easily produce a deformity of this configuration.

Class II Crater: The Class II crater refers to a 4 to 5 mm osseous concavity, usually with a wide orifice, thinner walls, and a more abrupt slope to its base. This is the type most commonly encountered during therapy.

Class III Crater: The Class III crater is a more advanced lesion and consequently, a deeper osseous deformity. Generally, this type will be in the 6 to 7 mm range with a sharp drop of the crater wall from the margin to a broad, flat base. Contrary to what might be expected, this type of osseous ablation is frequently found without concomitant pocket depth on the buccal or palatal surfaces.

Class IV Crater: The Class IV crater is the least common type encountered and represents an osseous concavity of variable depth characterized by extremely thin buccal and palatal walls. The base of the crater is often wider buccolingually than the orifice. On occasion, either the buccal or palatal wall may be completely absent, leaving a single thin wall of bone remaining on one side.

ANATOMICAL RELATIONSHIPS

The full implication of variations in anatomical relationships peculiar to the maxillary molar area has been recognized to exert a profound influence on the success of therapy in this region. Tooth to marginal bone relationships, comparative molar morphology, the alignment of approximating teeth, and a variation in thickness of bone covering buccal root surfaces have all become important considerations.

When interproximal craters are present in an otherwise normal anatomical pattern in the maxillary molar area, the first molar generally presents greater complications in therapy than does the second molar. One of the most important factors contributing to this situation is the difference in the relative relationship of the marginal bone with the buccal bifurcations of the two teeth in question.

Wheeler states that normally the point of buccal bifurcation of the maxillary first molar is approximately 4 mm apical to the cervical line. It follows then, that if in health, the osseous margin is 1 to 2 mm apical to the cervical line, an average of only 2 to 3 mm of buccal bone lies coronal to the bifurcation area (Figure 3). Because of a slight difference in the basic morphology of the second molar, the distance between the bifurcation and the cervical line on this tooth is ordinarily greater than that on the first molar. This variation in tooth morphology, combined with the curvature of the arch which places the second molar
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IV crater is centered and of variable thin buccal margin of bone (Figure 4). The buccal roots project palatally. This usually results in a heavier buccal plate, and consequently a thicker osseous covering over the buccal roots of the second molar.

With these anatomical relationships in mind, an effort will be made to explain the authors' rationale in stressing the importance of crater form and bifurcation position relative to marginal bone, as factors supporting the palatal approach, and dictating improved management of the buccal aspect of maxillary molar osseous surgery. In order that these points can be clarified, it will be necessary to review the standard procedure for each crater type.

Crater Therapy—Traditional Approach

A diagrammatic representation of Class I, II and III craters is shown in Figure 5. All three types illustrated are typical with increased interproximal depth and little or no pocket depth over the palatal or buccal radicular surfaces.

Class I Crater: If the buccal walls of the Class I craters, mesial and distal to the first molar (Figure 5A), were reduced 2 to 3 mm, the interdental areas would be apical to the buccal marginal bone of the first molar, creating reversed architecture. Since it is likely that 2 to 3 mm of buccal marginal bone lies coronal to the point of buccal bifurcation of the first molar, the therapist could remove marginal bone to the point of the bifurcation. Similar levels of interdental and marginal bone would then be created and a satisfactory architectural form achieved. The buccal bifurcation would not be invaded and the situation could be managed as though the first molar were a single rooted tooth. Many such cases have been so treated in the past and this group constitutes the vast majority of the "successes" recorded by the traditional buccal approach.

Class II Crater: The 4 to 5 mm depth of the Class II crater creates an entirely different and more complex problem (Figure 5B). Removal of the buccal walls of these
defects would place the interdental bone apical to the point of bifurcation of the first molar tooth. Buccal marginal bone can be safely reduced only to the bifurcation point, or normally 2 to 3 mm. Therefore, since marginal bone cannot be reduced to create similar levels between marginal and interdental areas (as was done with the Class I crater), the reversed architectural pattern, created by the surgical technique, remains. Dependent upon the degree of this architectural disharmony, failures, as indicated by a return of interproximal pocket depth, are a frequent sequelae of this operative procedure.

Class III Craters: If the therapist were to manage the Class III crater by removing 6 mm or more of interdental buccal bone height, mesial and distal to the first molar, a severe buccal reversed architecture would result (Figure SC). The interdental bone levels would be considerably apical to the average point of buccal bifurcation, resulting in almost certain failure.

When one views a composite of Class I, II, and III craters, managed from the buccal aspect, it becomes obvious that the relationship between the point of bifurcation of the first molar and the marginal bone becomes critical in determining the amount of interdental osseous correction possible, if the therapist is concerned with
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Bone from adjacent palatal root surfaces to reestablish normal osseous topography in the area. Since the Class II crater is relatively shallow, the removal of the palatal wall establishes a gradual buccolingual slope in the interdental area. The minimal discrepancy created between the heights of the buccal and lingual alveolar crests allows the new interproximal tissue to assume physiologic form and adapt closely to the underlying osseous scarring. With buccal contouring limited to osteoplasty procedures for creating interdental slitscways, maximum height of buccal bone throughout the segment is maintained. Thus, the postoperative effects of this procedure reveal only subtle palatal recession and no obvious alteration in buccal topography.

A case presenting multiple Class I craters is shown in Figure 7. Pockets of 5 mm depth existed interproximally between the premolar and molar teeth (Figure 7A). There was no pocket depth on the buccal and palatal marginal surfaces. An internal beveled incision was made near the margin of the buccal gingiva.10 This incision allowed for the removal of the gingival papillae and a marginal wedge of tissue as well as adequately thinning the gingival margin. In most cases, the elevation of a modified mucoperiosteal flap, i.e., draping the marginal tissue 3 to 4 mm apically without vertical releasing incisions, provides sufficient access for osseous contouring. In this case, however, the modified flap was not effective, necessitating a vertical incision at the disto-buccal of the second molar to provide adequate access (Figure 7B). It is desirable to have interdental slitscways for food passage over and beyond the marginal tissue. Since the buccal bone was thick throughout the operated segment, an osteoplasty or "festooning" procedure was performed to create interdental grooves. During this part of the procedure, care was exercised to avoid reduction in the height of the interdental bone (Figure 7C).

Figure 7D shows the results of a palatal gingivectomy performed at a 90° angle to

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The various types of interproximal craters and their management utilizing the palatal approach:

- Class I crater: Unfortunately, the Class I crater is frequently overlooked, or its presence, if detected, is ignored. Immediately following soft tissue surgery, every operated area should be examined closely for residual pocket depth. This aspect of therapy is often neglected. Detection of depth at this time may indicate the presence of the Class I crater. Therapy for this type of deformity, like that for other early periodontal lesions, calls for a minimal sacrifice, enjoys the greatest degree of success, and precludes advancement of the disease process. Too often, osseous surgery is utilized only when overt, severe deformities are present, or when more conservative procedures have failed.

The treatment advocated for the Class I crater is the removal of the interdental bone comprising the palatal wall of the deformity. This is then followed by the sacrifice of a sufficiently amount of supporting bone from adjacent palatal root surfaces to reestablish normal osseous topography in the area.
removal of the palatal wall, other disturbing problems would arise. Without concomitant removal of some buccal bone height, palatal surgery would produce a marked discrepancy between buccal and palatal crestal bone levels. The new interproximal tissues, unable to conform to the exaggerated osseous topography, would "bridge" the interdental area resulting in a return of pocket depth. Thus, satisfactory management of the Class II crater necessitates attention to both buccal and palatal surfaces. In keeping with the limitations imposed by the anatomic relationships previously discussed, the buccal crater wall and adjacent marginal bone can ordinarily be reduced 2 to 3 mm. This removal retains a buccal physiologic architectural pattern while reducing the buccolingual crestal-height discrepancy. It also creates a more favorable interdental inclination compatible with physiologic gingival architecture. The gross resection of the crater, however, is performed from the palatal aspect.

A word of caution should be interjected at this point concerning the sequence of buccal bone removal. It should be strongly emphasized that the complete reduction of buccal crater walls as an initial procedure is definitely contraindicated. When the buccal crater wall is completely eliminated, without regard for the amount of marginal bone that can be removed coronal to the bifurcation point, the therapist has committed himself and must accept the consequences. Marginal and interdental bone should be removed with care—gradually and simultaneously. When the point of buccal bifurcation is reached on the first molar, the interdental bone should not be apical to this level.

A clinical example of the treatment of...
the Class II crater is shown in Figure 8A. Interproximal craters were present between the second premolar, first molar and second molar. Buccal interdental and marginal bone was reduced to the level of the buccal bifurcations (Figure 8B). Attention was then directed toward the palatal aspect of the craters. In this particular case, there had been some periodontal destruction of the palatal interdental bone between the molars (Figure 8C). Interdental corrections were made, followed by the necessary marginal reductions (Figure 8D). Acceptable and compatible bony architecture was established on both the buccal and palatal aspects; reversed architecture was avoided by the combined buccal and palatal reduction.

There are occasions when the anatomy of the first molar is such that the point of buccal bifurcation varies from normal and may be situated some 5 to 6 mm apical to the cervical line. Under these circumstances, it may be possible to perform more extensive osseous surgery from the buccal aspect. One disadvantage to this procedure, however, has been severe buccal recession and the post-healing development of thick, rolled gingival margins. Extensive buccal recession is not well tolerated by the gingival tissues. Palatal tissue, on the other hand, adapts readily to a more apical level.

Class III Craters: The Class III crater is a severe deformity whose successful management demands careful consideration and considerable resourcefulness on the part of the therapist. First, one must realize that this defect represents an advanced lesion and that osseous surgery does have limitations. Hence, the deep lesion must be approached with the understanding that certain compromises are often necessary. It
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may not be possible to recreate favorable
architecture and the solution may lie in
minimizing the necessary compromise.

If the Class III crater is approached
purely with the objective of complete
elimination, the removal of excessive
amounts of buccal and palatal bone will be
required. Severe reverse architecture or the
extensive sacrifice of supporting bone,
which may actually hasten the loss of the
involved teeth, may be the end result.

In the management of Class III craters,
it is suggested that the buccal aspect be
handled in a fashion similar to that advo-
cated for the Class II deformity. Buccal
ossesous surgery should be terminated when
the buccal interdental and marginal bone
reach the level of the bifurcation of the
first molar. Palatal osseseous surgery, how-
ever, can be carried as far as the area can
tolerate and still remain within the limits
of acceptable architecture. This will re-
quire experience and a thorough under-
standing of the principles and procedures
of osseseous surgery. A clinical case with a
Class III crater involving the first and sec-
ond molars is shown in Figure 9. The peri-
odontal probe is inserted into the deep lesion
in Figure 9A, revealing 9 to 10 mm of
total pocket depth. A gingivectomy was
done at the level of the crest of the bone.
and the craters are evident (Figure 9B). A Class III crater is present between the first and second molars and a Class II crater exists between the second premolar and the first molar. The buccal interdental and marginal bone was reduced to the level of the point of bifurcation of the first molar (Figure 9C). The buccal surgery was then terminated and the remaining crater depth was handled from the palatal aspect. A two year postoperative result is seen in Figure 9D.

In many cases the described procedure will prove adequate. However, since the Class III crater represents a complex clinical problem frequently requiring compromise, situations may arise where the buccal interdental areas are reduced apical to the point of the buccal bifurcation. The subsequent acceptance of slight or minimal reverse architecture is recognized as an undesirable but necessary compromise. (Slight or minimal reverse architecture would be that associated with no more than a 2 mm discrepancy between the level of the interdental bone and the point of buccal bifurcation.) The anatomical environment lends itself most readily to this type of solution in one in which the buccal interdental bone mesial and distal to the first molar is broad and unconstriicted by adjacent root proximity; the roots should also have considerable mesio-distal convexity in contrast to flat proximal surfaces.

It should be emphasized that it is considered better judgment to maintain some semblance of acceptable buccal architecture following osseous surgery, create comparable bucco-lingual crestal heights by limiting total palatal wall reduction, and thus accept some residual pocket depth, rather than to completely eliminate the crater and, in so doing, create a severe architectural deformity. Although the elimination
of pocket depth is one of the primary goals of periodontal therapy. The clinician must know when to terminate osseous surgery in the presence of advanced deformities. This philosophy of intelligent compromise exists throughout the medical sciences.

Class IV Crater: Schwartz has emphasized the importance of this issue. The Class IV crater should be focused upon only after consideration of the thickness of the crater walls. The walls can be exceedingly thin, offering little resistance to rotary abrasives or hand instruments. One can inadvertently reduce more height than indicated.

The wound healing studies have also led to a greater understanding of the dangers associated with exposing thin osseous tissue. Particular care should be exercised to preserve adequate soft tissue to cover thin bone following flap elevation for access to osseous deformities. Not only should one minimize the reflection of tissue when there is evidence of thin bone but, in some cases, osseous exposure is completely contraindicated. Here the repositioned flap has proved to be of great advantage.

Since palatal bone is usually thicker than buccal bone, and palatal recession is better tolerated, the palatal approach has contributed greatly to the successful management of the thin-walled lesion. The procedure advocated simulates that utilized for the Class II and III craters with additional care exercised during osseous removal. Although the shallow Class IV crater is not particularly difficult to treat, the deeper deformity presents an exacting problem complicated to a great degree by postoperative osseous resorption and the complexities of the wound healing phenomenon.

SPECIAL CONSIDERATIONS IN THERAPY

The previous clinical cases are representative of typical periodontal deformities encountered daily during therapy. There are, however, many variations of these maxillary molar problems calling for individualized attention. The following three cases represent variations successfully managed utilizing the principles elucidated for the typical case.

Case I: The majority of maxillary molar areas involved with interproximal craters will fail to demonstrate concurrent depth on the buccal and palatal surfaces. Some cases, however, will show frank or incipient buccal bifurcation involvement of the molar teeth. Such a case is presented in Figure 10A.

The first molar has an early bifurcation involvement in conjunction with a heavy buccal plate. The second molar has a more extensive lesion in the area of the bifurcation, and the thickness of the buccal ledge is accentuated by the anatomical inclination of the tooth. An interproximal crater is present between the molars, Figure 10B. The buccal plate was leveled and thinned by osteoplasty. Osteoplasty was performed over the mesio-buccal and disto-buccal roots of the second molar in order to create a gradual rise and fall of marginal bone to the area of buccal bifurcation (Figure 10C). Since it was possible to eliminate the cratering and establish an acceptable interdental slope by removal of the palatal wall of the crater, maximum buccal interradicular height was maintained. The postoperative result is shown in Figure 10D.

Obviously, buccal osseous deformities must be treated from the buccal surface. The extent of buccal bone removal, however, can often be minimized by blending it with palatal surgery for the elimination of gross interproximal aberrations.

Case II: At times, treatment of seemingly simple defects becomes more complicated because of variations in anatomical form or as a result of unusual restorative patterns.

In the case shown in Figure 11 a shallow Class I crater was present between the molar teeth. Although very little bone loss had occurred, the height of the buccal marginal bone, as well as the buccal crater wall, was on a level with the point of bifurcation of both molar teeth. Here the molar mor-
Such a clinical case is illustrated in Figure 12B.

Following a gingivectomy, a modified mucoperiosteal flap disclosed an incipient buccal bifurcation involvement, as well as interproximal cracks of 3 to 4 mm mesial and distal to the first molar. The marginal bone on the mesio-buccal root of the first molar and the distal interdental crest were both apical to the point of buccal bifurcation. Any reduction of buccal interdental bone height could only accentuate the existing architectural deformity. In treatment, the palatal approach was utilized with no alteration of buccal bone height. The postoperative result revealed a thickened interradicular papilla at the bifurcation of the first molar (Figure 12C). Buccal reduction of the interproximal crater mesial to the molar, and particularly that distal to the molar, would have accentuated the poor architecture and produced an even greater gingival abnormality. Because of the distal root proximity, buccal crater reduction would have also resulted in a constricted interdental papilla not conducive to the maintenance of gingival health.

One additional consideration deserves attention in this discussion of the treatment of the extensive periodontal lesion involving the maxillary molar area. In dealing with advanced periodontal disease, the question inevitably arises as to whether to perform rather extensive and difficult osseous surgery, or to extract the tooth in question. Although the choice made will depend largely upon the critical importance of the tooth, the success achieved ultimately rests with the resourcefulness of the operator. In this regard, the palatal approach has contributed significantly to the successful management of the advanced lesion. Yet, all advanced lesions do not represent good surgical material, regardless of the operative technique employed. It may prove beneficial to remove the most involved tooth in order to enhance the prognosis of those remaining. If individual roots are hopelessly involved, root amputa-
The palatal approach

resulted in compromised objectives and questionable success. Anatomical relationships peculiar to the area and variations in crater form are shown to play an important role in the intelligent selection of the therapeutic procedure utilized. A classification of craters, based on the depth and topography of the deformity, is introduced. Standard therapeutic methods and their deficiencies are reviewed for each crater type. This is followed by an explanation of the therapeutic procedures now advanced based on the advantages of gross crater reduction from the palatal surface. Clinical cases are presented in support of palatal therapy for each crater type, as well as some of the more common variations encountered.

The palatal approach is offered, not as a panacea for universal utilization, but as another important technique which, when indicated, can be used to advantage in the treatment of advanced periodontal disease.

The palatal approach is not a departure from basic principles of osseous surgery but an affirmaiton of them. It reveals, moreover, in good fashion the essential nature of periodontal surgery—that of plastic repair of a defect. With this objective in mind, the treatment union involved. In dealing with the tightening of the interproximal papillae, it is not difficult to envision, in the molar area especially, the advanced situations where the treatment unions will be indicated. Regardless of the type of treatment union employed, it seems now more important to enhance the health of the individual teeth. The result is a greater emphasis on the need for accurate periodontal treatment. This means not only maintaining existing conditions and preventing further damage, but also restoring to a greater degree the original condition of the periodontal tissues. The success of the treatment union can therefore only be judged by the degree to which this objective is achieved. The treatment union must be planned and executed in such a way that the final result is a harmonious blend of the gingival and osseous tissues.
mind all approaches which are rational fall into their logical places.

BIBLIOGRAPHY


15. Amsterdam, M. Periodontal Prosthesis, First Graduate Lecture Presented at Temple University, School of Dentistry, Feb. 1961.

UNIVERSITY OF PENNSYLVANIA

Dr. Morton Amsterdam, D. Walter Cohen and Associates will present a five day course on Periodontal Prosthesis—February 16th to 14th, 1964. This course is designed to acquaint advanced graduate students in the treatment of periodontal conditions of the teeth and their supporting structures. This course includes instruction in the care and clinical demonstration of the procedures employed, using laboratory slides and simulations.

R. Roberts Theane, R.D.H., D.S., and Associates will present a four day Refresher Course in Oral Hygiene—March 9th to 12th, 1964. This course is aimed at giving the practicing dental hygienist a review of the current concepts in techniques used in the practice of oral hygiene.

Dr. Arthur Edward Kahn will present a five day course on Complete Dentistry—March 9th to 16th, 1964. This course will consist of lectures, demonstrations and student participation. Included will be: tooth preparation; crown retention; teeth for use of reversible hydrocolloid; quadrant and full mouth dentistry; hinge axis; method for centric and eccentric registrations; method for development of the occlusal pattern; role of the cuspid in occlusion; remount procedures; precision attachments; functional diagnosis and case presentation.

For further information please write Continuing Courses, School of Dentistry, University of Pennsylvania, 4001 Spruce Street, Philadelphia, Pennsylvania 19104.

WESTERN SOCIETY OF PERIODONTOLOGY

The 11th Annual Spring Meeting of the Western Society of Periodontology will be held in Los Angeles, Nevada, on March 21, 22, 23, 1964 at the Hotel Sahara. Dr. Walter Cohen will be the speaker.

For additional information write Steve A. Phillips, D.D.S., Business Manager, 7274 Wilshire Boulevard, Los Angeles, California 90005.