Rationale for the Lingual Approach to Mandibular Osseous Surgery

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The elimination of the deep gingival sulcus is a fundamental objective in the management of periodontal disease to reestablish periodontal morphology that patients can effectively maintain. Although research for possible systemic mechanisms in the etiology and control of periodontal disease continues, treatment on a local basis persists as the prime method of disease regulation. More than 30 years ago periodontal surgery consisted of flap and curettage type procedures, gingivectomies, and other techniques that carried a surgical label. Many techniques dating back to this time were essentially "clean out" procedures performed in hopes of an occasional dramatic result consisting of an epithelial or connective tissue attachment which would eliminate the pocket. Most such results were limited to isolated areas, and infrequently dramatic bone repair could be seen radiographically. While these case report successes were indeed interesting, these procedures were abandoned by many periodontists due to their failure to achieve more consistent treatment objective results.

It was in the late 1940's that periodontal graduate programs were instituted, which were very influential in producing a more sophisticated type of therapist with more definitive therapeutic goals. The principles of modern osseous surgery in periodontics were popularized

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by Schlager in 1949, although in 1924 Arthur Black described the elimination of the interdental crater and the beveling buccal and lingual interproximal bone margins. Carranza presented a discussion of osseous surgery in 1935, which was overlooked for many years. The terms osteoplasty and osteotomy were introduced by Friedman in 1955 as an integral part of osseous surgery. Although osseous surgery has undergone extensive refinement since its conception, the therapeutic techniques in the aforementioned papers served as a basis for the various currently used techniques devised for the management of osseous defects.

Therapeutic surgical methodology is a popular subject of discussion, but failure of the techniques in the hands of an individual clinician to achieve pocket elimination is rarely an open topic of critical analysis. Residual pocket depth is a subject that normally receives only superficial attention when discussed, but close observation of the surgically treated periodontal pocket indicates that residual or recurrent pocket depth is a fairly common finding. What often appears to be a successful 4 to 6 week surgical result ultimately fails because of interproximal gingival proliferation and bridging with concomitant pocket formation when bony aberrations are not resolved.

Evidently many clinicians have had numerous surgical failures after using osseous surgery techniques. They have often reverted to conservative or “clean out” procedures even though they have probably never subscribed to proper osteectomy-osteoplasty techniques with strong emphasis on the minute details, which are vital for successful results. Most such mentioned clinicians will invariably arrive at one of two conclusions. First, he may decide that the most cases will develop pockets following surgery regardless of the type of surgery performed. This conclusion may indeed seem very logical to a clinician since it is common to his practice and he considers himself to be as competent and efficient as the majority of clinicians in the area of surgical skills. Once convinced that he has accurately analyzed his situation, the logical course of action in treatment is to resort to simpler “clean out” types of surgery, which are less time consuming, and in the final analysis yield a comparably compromised result. On the other hand, a clinician may react to failure with a distinctly different conclusion and attitude—he may consider his failure to eliminate pockets as a personal challenge. Such a conclusion in this type of individual will probably result in the exertion of a tremendous mental and physical effort to analyze and refine his surgical techniques and procedures for insight into his dilemma. This effort will necessitate good documentation of the surgical procedures utilized and a critical analysis of his technical skills by one or more people whose clinical abilities and judgments he respects. By utilizing the constructive criticism and ideas obtained from his colleagues and his own self-evaluation, he can then reapproach his problem with a new determination.

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Obviously, these different reactions to the problem of pocket re-
currence are totally opposed. One approach indicates that the stan-
dards for success are unrealistic and that in order to survive one must
ower the standards. The opposite approach would imply that the stan-
dards for success are not unrealistic, but that the technical skills neces-
sary to achieve them are inadequate. This latter concept does not mean
that all pockets can be eliminated on all patients or that failure never
results. It simply indicates that the therapist expects and attempts to
achieve a high level of performance from himself.

Responsible periodontists must continue to judge their therapeutic
results upon local findings obtained with the probe and visual acuity.
This presumes considerable knowledge of the normal anatomy and
topography of the maxilla, the mandible, and the overlying alveolar
bone. Normal gingival form, gingival behavior, axial root inclinations,
and tooth morphology.

This paper discusses the anatomical patterns of the mandible and
alveolar bone as well as tooth inclinations, suggests how periodontists
and the elimination of its effects relate to this basic information, and
introduces the rationale for the lingual approach to mandibular osseous
surgery as a further refinement in achieving and maintaining pocket
elimination in the mandibular posterior segments.

Descriptive Anatomy of the Mandible

The anatomical features of the mandible are an important consid-
eration in periodontal surgery. For limits may be imposed on the scope
of anticipated surgery by local and individual anatomical structures.
Definitive planning and management of surgical therapy are predicated
upon a vivid knowledge of the anatomy of the structures encountered
during surgical intervention. Primary emphasis is placed on an aware-
ness and an understanding of the entire mandible rather than just the
alveolar bone and the teeth since the cross-sectional anatomy of the
body of the mandible significantly influences the progression of the
disease and the types of bony defects that are encountered.

In various parts of the mandible are considered, it is helpful to
have a dry mandible for study. The mandible can show considerable
variations in overall size and in anatomical thickness, as well as in
depressions and prominences that are present in specific regions. While
considering the anatomy of the mandible, there is great value to be
obtained in examining as many mandibles as possible over a light, which
makes the difference in bone thickness very apparent.2 Localized ana-
tomical variations in bone structure are common and frequently of de-
velopmental origin.

General Considerations

The mandible is usually described as a horsehoe shaped bone sup-
porting the lower dental arch, and is comprised of a horizontal portion
(body) with bilateral vertical rami joining the body at obtuse angles. The inferior border of the mandible is plump, smooth, and rounded.
The alveolar process is joined to the upper portion of the body of the mandible and forms its superior border. Occlusally the alveolar process does not, however, possess the same curvature as the body of the mandible. The plane of the posterior mandibular alveolar process gives it the appearance of protruding sagittally into the arch formed by the body of the mandible, while the plane of the rami is continuous with the plane of the body of the mandible, and is therefore positioned laterally to the plane of the alveolar process in the molar region (Fig. 1).

Anatomical considerations pertinent to osseous surgery will be divided into those of the external surface of the mandible and those of the internal surface of the mandible. A number of textbooks are available which describe in detail the surface characteristics of the mandible, and they should be reviewed by the reader.

External Surface of the Mandible

The most prominent lateral posterior landmark is the external oblique ridge, particularly in the molar region (Fig. 2). It extends obliquely from the mental tubercle, below the mental foramen, to the anterior border of the ramus, and ends at the tip of the coronoid process. The thickness of the radicular bone in the molar and bicuspid region is often dependent upon the external oblique ridge. The height of the mandible, the proximity and prominence of the mylohyoid ridge to the crest of the alveolar process, and the position of the anterior border of the ramus molar region. A shallower depression which even minor or areas frequently have not lend themselves positioned split thick.

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Internal Surface of the Mandible

On the internal mylohyoid ridge passes the third molar area. The shape considerably variation, slightly elevated to bei
The shape of the mandible illustrating variations in orientation. Note the lingual inclination of the difference between the plane of the mandible

At the body of obtuse angles

A shallow buccal vestibule in the molar region, combined with a heavy external oblique ridge, will severely limit the extent to which even minor osseous defects can be modified or corrected. Such areas frequently have zones of minimal to no attached gingiva and do not lend themselves to readily correctable solutions such as apically positioned split thickness flaps, pedicle flaps, or free gingival grafts.

With adequate height of the alveolar process and sufficient width between the second molar and the anterior border of the ramus, a shallow depression called the retromolar fossa will be positioned between the internal lateral border of the retromolar triangle and the external oblique ridge. This depression is frequently neglected because of the difficulty encountered in making the necessary incisions, and reflecting optimally thinned flaps far enough distally for good access to the area with minimal bleeding in this very vascular area.

Internal Surface of the Mandible

On the internal aspect of the body of the mandible, the prominent mylohyoid ridge passes downward and forward from the ramus distal to the third molar and gradually ends by fading into the inferior portion of the alveolar process in the premolar region. The mylohyoid ridge is the origin of the mylohyoid muscle, which forms the floor of the mouth. The shape and position of the mylohyoid ridge can show considerable variation, and may range from being somewhat blunt and slightly elevated to being markedly elevated and spiked (Figs. 3 and 4).
Figure 3. The mylohyoid ridge and generalized horizontal bone resorption have resulted in a fairly broad ledge of bone on the lingual of the molars and to a lesser degree on the premolars. This is a very common finding in periodontal cases.

Viewed occlusally, the mylohyoid ridge seems to result in a thickened table-like bony ledge of varying dimensions in the molar and second premolar region before thinning to a sloping marginal contour in the first premolar region if no tori are present. The overlying soft tissue reflects the bony contours and a shelf-like gingival contour creates a difficult area for effective oral hygiene. Inadequate oral hygiene, under these conditions, can result in lingual infrabony defects immediately adjacent to the teeth rather than generalized horizontal absorption because of the thickened ledge of bone. As discussed later in this paper, these lingual ledges are rarely reduced sufficiently from a surgical standpoint at either the marginal area or in an apical direction. In most cases incomplete osseous reduction in either area is conducive to residual pocket depth. Lingual infrabony defects can often extend into the bifurcations of the molars.

Inferior to the mylohyoid lies the submandibular fossa, a slightly concave area which forms the lingual wall of the submandibular space (Fig. 5). Many dentists are reluctant to adequately reflect a lingual flap as far apically as is necessary for definitive osteoplasty procedures because of the potential of the area for greater post-surgical edema, and cellulitis from bacterial contamination of the anatomical spaces.

Bony prominences, or exostoses, are often found in various locations along the body of the mandible. Mandibular tori are most commonly found in the region of the canines and premolars on the lingual aspect of the mandible superior to the mylohyoid muscle. Buccal exostoses are most frequent in the molar regions.

Figure 4. The upper bone with the lingual view upon the angle of view, the lingual view being seen in the image of the occlusal plane infrabony lingual defect of second molar, the m.
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Figure 4. The appearance of the mylohyoid ridge and the junction of the alveolar bone with the lingual of the mandibular molars and premolars are frequently dependent upon the angle of view. Three views of the same area from different angulations and vantage points are seen here. A. Horizontal view exhibiting thickened marginal bone, interproximal craters, and a depression in the retrognathic triangle. B. From 45° angulation to occlusal plane, the mylohyoid ridge forms a marked rounded bony ledge and infrabony lingual defects which join the interproximal craters. C. Viewed from distolinguo of second molar, the magnitude of the rounded, thickened ledge is even more evident. This type of bony ledge will contribute significantly to residual and/or recurrent problems if untreated. Also note the fenestration of the distal root of the second molar and the lingual tilt of both molars.
Axial Root Inclinations

The degree of axial root inclination, in both a mesiodistal and buccolinguinal direction, is varied for each tooth and class of teeth when measured from a vertical line perpendicular to the occlusal table of each arch. In studying 22 specimens of each tooth in 11 mandibles, the incisors and canines showed the greatest deviation in root angulation, whereas the premolars and molars exhibited the most stable axial slopes.

Krause, Jordan, and Abrams developed a table of axial inclinations (Table I) and accompanying illustrations which should be considered for effects on alveoli and root form, and alignment in both a healthy and periodontally involved mouth. Although definitive parameters were not established, the investigators conformed as closely as possible to the measurements suggested by Dempster et al., as well as to their own statistically insignificant subjective clinical averages.

The root of the canine and the first premolar range from an almost perpendicular mesiodistal alignment to a slight distal inclination of approximately 6°. Toward the posterior teeth, there is an increased distal
tilting of the clinical crown approximately highly variant countered.

The mandibles, whereas the ranging from first and second molar after study of the alignment, results in the and the buccal enamel on a natural occlusally high.

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LINGUAL APPROACH TO MANDIBULAR OSSICULAR SURGERY

Table 1. Suggested Mandibular Asial Tooth Inclination for Study Purposes.

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<thead>
<tr>
<th>Angle at Mesiodistal Inclination of the Tooth Central Axis with a Vertical Line</th>
<th>Angle at Buccolingual Inclination of the Tooth Central Axis with a Vertical Line</th>
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<tr>
<td>Canine</td>
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<tr>
<td>First premolar</td>
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<td>First molar (mesial root only)</td>
<td>10°***</td>
</tr>
<tr>
<td>Second molar (mesial root only)</td>
<td>14°***</td>
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**Root apex inclined distally.
***Root apex inclined lingually.

By holding extracted teeth to conform to the above measurements the teeth are in a favorable position to be examined for effects of tooth form and alignment.

ulting of the root surfaces and a corresponding mesial inclination of the clinical crowns. The mesial root of the second molar is inclined distally approximately 14°. The third molar was not considered because of the highly variable form, position, and eruption pattern commonly encountered.

The mandibular first premolar has a lingual tilt to the root apex, whereas the remaining posterior teeth have a buccal root inclination ranging from approximately 9° on the second premolar to 20° on the first and second molars. While the only published study states the mandibular molars have a 20° axial inclination to the lingual, the authors after studying numerous dry mandibles think that the lingual inclination of the molars is often greater than 20°. Regardless of whether the angulation exceeds 20°, the positioning of the axial center of a molar results in the lingual height of crown contour being reduced apically and the buccal height of crown contour being elevated occlusally. The enamel on the lingual surfaces of the molars and premolars consequently tends to extend further apically than on the buccal, resulting in a natural sloping of the interproximal alveolar bone from an occlusally higher buccal plate to more apically positioned lingual plate.

Normal Relationship of Marginal Alveolar Bone to Gingiva

A conceptual idea of the various forms, within normal limits, that periodontal architecture can assume is a therapeutic necessity if deviations from normal are to be recognized. In health, the marginal alveolar bone normally parallels the cementoenamel junction of the teeth throughout the mouth. The interproximal bone configuration is predominantly convex from the mesial of the second premolar to the
midline, whereas the interproximal septa of the molar regions is
flat. The mesiodistal width of the interdental crests are governed
by the proximal relationships of the crown forms, the cementoenamel
junctions, and the contact relationships of the teeth.

Although in health the gingival contour is often said to reflect un-
derlying bone form, different periodontiums within normal limits will
invariably present with several configurations of gingival and bone
thicknesses. For instance, the gingiva and the bone may be thin, the
gingiva may be thick and the bone thin, the gingiva may be thin and the
bone thick, or both the gingiva and bone may be thick. A thickened
periodontium does not necessarily predispose a patient to periodontal
disease, but most therapists will select a thin, scalloped periodontium as
a representation of the ideal normal, rather than a thick periodontium.
Within the range of normal limits a thin periodontium with 2 to 3 mm
sulci is no more healthy than a thick periodontium with the same
sulcular depths. However, when pocket depth develops in the presence
of thick bone, a ledge or shell-like defect invariably results. The man-
agement of periodontal pockets in the presence of thick bone is gener-
ally more complex than when bone is thin.

Locations and Types of Bony Defects

A few studies on the distribution of the various types of bone
defects seen in dry skull material have been carried out, and even fewer studies have been carried out on live patients during surgical intervention. Of the types of bone resorption described, the inescapable conclusion is that the most common lesion is the interden-
tal crater. Manson and Nicholson reported that two thirds of all man-
dibular defects were represented by interdental craters and that they
were twice as common posteriorly as they were anteriorly. They consid-
ered function involvement as being a stage in the progression of tis-
ue destruction rather than a form of bony lesion. The next most com-
mon form of bony alteration was to the alveolar margin in the form of
thickened margins, resorption of radicular bone causing buccal or
lingual defects, and reverse architecture.

After studying the anatomy of the lower arch, the authors have
concluded that the location and form that bone defects assume is di-
rectly related to the topography of the alveolar bone, tooth forms and
inclusions, and the anatomy of the mandible. The incidence of bone
defects involving the interproximal and the lingual of the mandibular
premolar and molar region is probably the highest of any area within
the mouth.

Many clinicians are very much aware of bony aberrations involving
the posterior maxilla but fail to recognize the frequency and extent of
bony defects related to the posterior mandibular segments, particularly
the lingual aspect. Perhaps this oversight relates to the fact that direct

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vision of this area during surgery can be most difficult for even the most experienced periodontist. Quite simply, what cannot be seen in the minds of many clinicians does not seem to exist, and this makes it extremely difficult for them to relate to the problem. In this regard, it is fairly difficult to document the posterior aspect of the mandibular lingual with adequate photographs, and good photographs are an excellent means of critcally evaluating the quality of the periodontal surgery performed. Obviously the surgical management of a visually difficult area will receive less attention than an area that can be readily observed by direct vision. Perhaps a good test of any clinician's skills would be how well he manages the lingual aspect of the mandibular posterior. In past years, many teaching institutions have endorsed osseous surgery for the management of most bony defects, but have advocated the gingivectomy procedure on the lingual of the lower arch. It seems ironic that the greatest surgical compromise be made in an area where plaque removal is probably the most difficult for the patient. Compromise involving the bony defects by gingivectomy in the presence of a plaque problem is certainly inviting disaster.

The subject of reverse architecture is not a common topic of conversation among clinicians, and many are not aware that this aberration usually leads to failure from the reestablishment of the periodontal pocket. Normal gingival architecture would have interdental gingival height that is coronal to the marginal gingiva and gives it the appearance of being scalloped in form. Reversed architecture would indicate that the interdental gingival height following surgery is apical to the marginal gingival height. Even the operator who is ordinarily alert to reversed architecture in most areas will frequently terminate the osseous surgery with reversed architecture on the lingual of the posterior mandible. Any reduction of the crater on the lingual will ordinarily precipitate reversed architecture. However, sacrifice of the supporting lingual bone in order to correct the reversed architecture will not usually cause an invasion of the lingual furca if proper skill is exercised.

The buccal furca of a molar is usually in closer proximity to the cementoenamel junction than the lingual counterpart. The removal of the radicular bone on the lingual of premolar and molar areas to avoid reversed architecture is time consuming and difficult. Access and visibility contribute to increased operating time and difficulty in general. Too frequently, flaps are inadequately thinned with the initial incision and thick lingual bone is handled with abrupt, short bevels. Furthermore, the lingual is ordinarily avoided because of the possibility of hemorrhagic complications. Finally, there seems to be a wide variety of reasons for the unpopularity of definitive osseous surgery in the management of mandibular lingual bony defects.
Rationale for Management of Mandibular Defects

Ochsnerain and Ros® stated that preoperative gingival architecture gives valuable assistance to the clinician in that gingiva will seek an architectural form that it prefers whether or not it is supported by bone. Scaled and flat architectural patterns of gingiva cannot be divorced from the underlying alveolar bone pattern in the absence of disease. The architectural patterns of gingiva are dependent upon root form and axial inclination as well as the cementoenamel junction outlines and contact and proximal surface relationships of the clinical crowns.

Figure 6 demonstrates a common observation seen in the clinical soft tissue management of a gingival pocket. Figure 6A illustrates an incision made at right angles to the root surface, which eliminates the soft tissue wall of the pocket. Figure 6B depicts an early postoperative result from such an incision. A shelf-like or ledge-like gingival topography is present, but the inherent quality of gingiva to return to a certain architectural form will cause it to proliferate coronally with almost certainty. Goldman® was very much aware of this behavioral pattern in gingiva when he focused attention on the principles of gingivoplasty. Because of the memory of gingiva, it will gradually shift in a coronal direction and approach the original preoperative position near the cementoenamel junction within a few months. Figure 6B will ultimately resemble Figure 6A with the reestablishment of the periodontal pocket.

After completion of healing, the preoperative goal of the surgical procedure has obviously been negatated, and a similar result could have been accomplished with curettage. It is hoped that there are few therapists who would execute an incision as seen in Figure 6A. However, when a thick ledge of bone exists in the presence of a periodontal pocket, as seen in Figure 6C, there are many clinicians who would attempt to treat the problem with an external bevel incision, and thereby compromise their postoperative result due to the thickness of the bone. Under the circumstances seen in Figure 6C, it would be impossible to create a longer beveled incision and the shelf-like defect will remain postoperatively. The behavior of gingiva is fairly consistent and it will proliferate coronally as illustrated in Figure 6A, with the reestablishment of the periodontal pocket.

Figure 6D demonstrates a common situation where the pocket has created an intrabony defect instead of a shelf in the bone, as is often seen on the lingual of the mandibular molars. The base of the periodontal pocket is apical to the crest of bone, and an external bevel incision in the gingiva would have to be perpendicular, or even have a negative or inverse bevel to the tooth due to the bone profile. Under these circumstances, the gingiva will proliferate coronally at a rapid rate and cancel the primary objective of periodontal surgery, i.e., pocket elimination.

Perhaps many exists in only a mix of thick bone is an absolute thin. The lingual is mentioned earlier, how anatomical relation of the bone to be thin is a prime target for action.

As previously stained molars to the bone, problems. More specification of the tool deserve emphasis. First molar is approach axis. A cross section molar is seen in Figu cementoenamel junction mesiodistally.
Defects

at preoperative gingival architecture in that gingiva will seek an either or not it is supported by the bone pattern in the absence of gingiva are dependent upon root as the cementoenamel junction surface relationships of the clinical observation seen in the clinical pocket. Figure 6.4 illustrates an interface, which eliminates the soft epitcts an early postoperative result a ledge-like gingival topography is gingiva to return to a certain archite coronally with almost certainty, this behavioral pattern in gingiva principles of gingivoplasty. Because the buccal shift in a coronal directionative position near the cemento-

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![Figure 6.8: Behavior of gingiva. A. Right angle incision to the tooth at the base of pocket. B. Final healing of the gingiva after the right angle incision. The periodontal pocket has been eliminated, but a ledge persists from which the gingival tissue will prolifere coronally consistent with a return of the original periodontal pockets. C. When an incision is made in the presence of a thick buccal bone plate, the degree of angulation would be dictated by the bone thickness. The early postoperative result of this situation will be a thick ledge similar to that seen in B. Pocket elimination will be short-termed and the gingival tissue will assume its original height and pathological condition. D. This pouch executed incision aimed at pocket elimination is limited to the bone topography. Such an incision would result in rapid gingival proliferation and recurrent pocket depth.]

Perhaps many clinicians consider thick bone to be a problem which exists in only a minority of clinical cases. They may also suspect that thick bone is an aberration of a normal situation where the bone is relatively thin. The lingual of the mandibular premolar-molar area as mentioned earlier, however, is normally thick, and the thickness is due to anatomical relationships between the tooth and bone. It is abnormal for the bone to be thin in this area. The lingual of the premolar-molar area is a prime target for ledging of the bone as a result of a pocket formation.

As previously discussed, the relationship of the premolars and molars to the bone, both buccally and lingually, presents certain basic problems. More specifically and in the same trend of thought, the inclination of the tooth and bone presents additional problems which deserve emphasis. In Figure 7.4 the buccolingual inclination of the first molar is approximately 29° or greater in relation to the vertical axis. A cross section through the interdental bony septum of the first molar is seen in Figure 7.8. The normal contour of the bone follows the cementoenamel junction and is relatively flat buccolingually as well as mesiodistally.
Figure 7. Mandibular first molar relationships. A. The vertical axis of the first molar is tilted lingually approximately 20° to the horizontal axis. B. Normal relationship of the first molar to supporting bone. Note the thickness of the lingual bone and the position of the mylohyoid ridge (MR). C. Position of the bony crater to the molar. The greatest depth of the crater bucclolingually is beneath the contact area and since the molar is tipped linguually some 20°, the contact area is positioned lingually. Observe the long slope from the base of the crater to the buccal crest and the closer proximity of the crater base to the lingual aspect of the root.

The most common bony defect is the interdental crater. It is also in this area that pocket depth occurs with greater frequency than in the radicular area. It is not uncommon for the interdental crater to extend to and include the line angle of the lingual aspect of the molars and premolars. Furthermore, the crater may extend beyond lingual line angles and actually meet on the lingual of a premolar or molar and create a cuplike defect in the presence of thick bone. The concentration of blood vessels in the interdental area associated with the inflammatory process gives a ready explanation for the cratering effect seen in the bone. Due to the tooth inclination and the fact that the deepest aspect of the crater is beneath the contact area, it is logical that the base of the crater is located lingually as depicted in Figure 7C. Reduction of the crater from the buccal will result in sacrificing excessive interdental bone height. Reduction of the interdental bone will also mean that buccal radicular bone must be removed from the tooth in order to create an acceptable architecture.

Most therapists treat the crater with a mental image of tooth and bone as depicted in Figure 8A. This erroneous concept suggests that the molars are in a fairly vertical position with the crater being situated approximately midway bucclolingually, concomitant with relatively thin lingual bone. Actually, as previously discussed, the molars are tilted
The interdental crater. It is also with greater frequency than in the interdental crater to extend lingual aspect of the molars and may extend beyond lingual lineal of premolar or molar and of thick bone. The concentration area associated with the inflammation for the cratering effect seen and the fact that the deepest part area, it is logical that the base used in Figure 7C. Reduction of sacrificing excessive interdental bone will also mean that buccal bone in order to create lingually some 20° or more to a vertical axis and the crater is located beneath the contact area, positioning it toward the lingual. Figure 8B represents the usual management of the bony crater which removes considerable interdental bone height. In this regard, the authors have made this error for a number of years and we suspect that others are currently making the same error in surgical judgment. The thickened lingual bone receives a short level which seldom extends apical to the mylohyoid line and is totally inadequate. To state the situation more succinctly, the average clinician overtreats the buccal aspect of the mandibular arch and undertreats the lingual.

Proper management of the crater associated with the mandibular molar can be seen in Figure 9. Due consideration must be given to the relationships of the crater to the bone as well as to the inclination to insure maximal preservation of interdental bone height. It should be added that the bone being preserved on the buccal is supporting bone. Regarding the lingual aspect, it is obvious that considerable ramping of the lingual bone has taken place. Note that it extends far more apically than that seen in Figure 8B and is considerably apical to the mylohyoid line. Furthermore, it should be realized that most of the reduction of the lingual bone is osteoplasty and does not involve sacrificing supporting bone. This approach is definitely more conservative than that discussed in Figure 8B. Obviously, this type of therapy will also require more attention to detail.
Conclusions

The definitive treatment of periodontitis for pocket elimination and the establishment of periodontal architecture that can be effectively maintained with daily personal oral hygiene techniques is sometimes an elusive goal. Performing osseous reduction, primarily from the lingual aspect of the posterior mandible, definitely helps in accomplishing such a goal. This paper should not be interpreted to mean that osseous correction of bony defects should be approached strictly from the lingual, since almost all cases require some buccal recontouring if a satisfactory soft and hard tissue architectural form is to be achieved. Clinical observation and experience have shown that the anatomical patterns, seen in relation to the mandible, have a powerful effect on normal periodontal architecture as well as the types and locations of bony defects encountered.

Tooth to bone relationships deserve attention. The buccal housing of the alveolar bone is frequently thin in the premolar region and occasionally on the first molar, while the external oblique ridge causes thickened bone over the second molar. The vestibular depth on the buccal of the molars is often quite shallow, meaning that only a very
A limited amount of osteoplasty-osteotomy can be performed from the buccal. The lingual position of the alveolar bone is normally thickened and shelf-like from the distal of the third molars to the mesial aspect of the premolar region. Because the posterior teeth are inclined lingually from the second premolar distally, the buccal marginal bone height is higher occlusally than the lingual bone margins, with the interproximal bone therefore sloping somewhat apically and lingually.

Interdental craters are the most common defect seen with the onset of periodontitis. Such defects in the lower arch tend to occur beneath the contact areas of the teeth, which are much further to the lingual than in the maxilla. The highest percentage of interproximal craters are shallow and not amenable to grafting techniques in the hands of most clinicians. These shallow craters are prime candidates for osseous reduction techniques.

With the progression of periodontitis, the interproximal defects frequently extend to include infrabony lingual defects. Although obtaining lingual access for osseous reduction techniques is often difficult, osteotomy-osteoplasty techniques performed primarily from the buccal of the posterior mandible frequently result in compromise of the lingual and over treating the buccal in terms of osteotomy procedures. The lingual embrasure spaces are usually wider than on the buccal, and with adequate reduction of the mylohyoid ridge, greater access for oral hygiene procedures is provided.

Although the authors have had no problems involving the lingual nerve or artery, both are worthy of mention in planning incisions for access on the distolingual of the second molar. Complications could arise as both course anteriorly, but if the alert therapist operates with a reasonable degree of caution, it is unlikely that he will encounter problems.

An analogy can be drawn between the treatment of periodontitis and that of a malignancy, except of course that periodontitis is not life-threatening. A favorable long-term prognosis in both cases is dependent upon the disease being diagnosed early, and then upon the ultimate in patient cooperation and the institution having the most productive treatment sequence possible. Effective treatment is then contingent upon the therapist's knowledge of anatomy and pathology. He must be able to picture the local anatomy in relation to the disease process and what can be done surgically for the best postoperative result. The more advanced the problem is when finally diagnosed and treated, the more radical the extent of treatment techniques that must be used and the less predictable the results.

Theory of treatment is basic and interesting, but must be applicable to clinical use. It is with these objectives in mind that surgical techniques for the lingual approach to mandibular osseous surgery will be discussed in a subsequent paper published elsewhere.
REFERENCES


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