Osseous Surgery – How Much Need We Compromise?

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With advances in knowledge and technique, the horizons of periodontal therapy have been extended. From an historical position of underexpectancy on the part of both the public and the dental profession, the periodontist of today is called upon to treat cases of ever-increasing complexity. The obviously inoperable case and the obviously fully correctable case present little problem in treatment planning given the modalities of therapy available today (Figs. 1 and 2). The areas of uncertainty lie between these two contingencies.

Areas of Uncertainty

The most difficult patients to treat definitively are those suffering from moderate to advanced periodontal disease. The most vexing problems in treatment planning occur in the same patients. The following questions constantly intrude: (1) are some extractions needed? (Fig. 3); (2) would the patient be best treated by maintenance curettage only? (Fig. 4); or (3) are the deformities correctable by surgery? (Fig. 5). Arising from this last question is another: How much bone can be removed, and may this result in secondary occlusal trauma with permanently increased mobility, with the implications of a commitment to periodontal prosthetic? Is surgery justified in these instances? There are virtually no data at present and no information on how much bone support is sacrificed to re-create physiological form (Figs. 1 and 6). There are merely untested opinions.

Research Implications

This “state of the art” may commit many patients to restorative solutions which might have been avoided, or may withhold the advantages of definitive modern periodontal therapy. There is now some in-
Figure 1. A and B. Buccal and lingual preoperative views. Note craters and bony ledging. C and D. After osseous recontouring. E and F. After healing. Ready for restorative dentistry.

Figure 2. The first molar should be extracted as bone grafting is unlikely to give a satisfactory result, and osseous recontouring is contraindicated.
Figure 3. Complete osseous correction is impossible. Judicious extractions would allow surgical attainment of acceptable bone form after thorough initial therapy. This would be followed by a periodontal prosthesis.

Figure 4. Complete osseous correction is impossible. Maintenance curettage, or flap curettage at most, is indicated.
Figure 3. An attempt to create positive bone architecture would destroy remaining support, and selective extraction will not help. This should be obvious from the radiographs alone (A). If the teeth are to be maintained, either curettage, flap coverage or selective bone grafting is indicated (B).

Figure 4. Concept of creating physiologic bone form, or "positive" architecture. Note that the architecture becomes flatter posteriorly, but the infradental bone is never more apical than the infradental bone. Depending on the height of the furca, a molar is treated as either one root or two.

OSSEOUS SURGERY—How to Utilize Radiology

Further information to suggest rational choice of patients need for permanent care performed.

Uncertainty will remain to resolve, as in light of recent findings usually be gauged by therapy. The importance data and sound judgment suggests for a given case is suggested at the initial.

The general helpfulness and extensive restorative procedures modifying factors in and oral hygiene periodontal elimination of pockets and maintenance procedures can

OSSEOUS

There is no attempt a suitable "ideal" or desirable to attain symposium. Areas tempting to create also some unfavorable unnecessarily is discussed. To quote mariners, not by dangerous reefs important questions removed if defined moderate to advanced recent study is of

Research Findings

Multiple bone architecture (physiologic and lingual apical) moderate to severe corrected ranged over were some defects of considerable importance.
formation to suggest that (a) very little bone support is sacrificed if a rational choice of patients for osseous correction is made; and (b) the need for permanent splinting can be predicted before osseous surgery is performed.

Uncertainty will always exist and will require experience and judgment to resolve, as it does in all the healing arts. Nevertheless, in the light of recent findings, the results of proposed surgical therapy can usually be gauged by adhering to sound basic principles of periodontal therapy. The importance of this is that, with a combination of scientific data and sound judgment, we should be able to establish a post-surgical prognosis for a given patient which may well differ from that originally suggested at the initial examination.

The general health of the patient, his age, and his ability to accept extensive restorative dentistry or orthodontic procedures are important modifying factors in the treatment plan and therapy. Occlusal status and oral hygiene performance are critical factors. It is assumed that the elimination of pockets is a desirable goal so that the patient’s maintenance procedures can be more effective.

**OSSEOUS SURGERY AND BONE SUPPORT**

There is no attempt in this article to discuss situations classically suited to “ideal” osseous recontouring and its attainment. This form is desirable to attain if possible, but will be dealt with elsewhere in this symposium. Areas of uncertainty with favorable results (achieved by attempting to create the best form possible in a difficult situation) and also some unfavorable results (stemming from wrong decisions leading to unnecessarily incomplete or overzealous osseous correction) are discussed. To quote Dr. Alfred Worcester: “Harbors are made safe for mariners, not by records of propitious voyages, but by knowing the dangerous reefs and sunken ledges that have caused disasters.” The important question to be asked is: How much bone support must be removed if definitive osseous correction is attempted in patients with moderate to advanced bone deformities? Some information from a recent study is of interest in this regard.

**Research Findings**

Multiple bone defects were completely corrected to attain positive architecture (physiological form) in a group of patients using buccal and lingual apically positioned flaps (Figs. 1 and 6). All patients showed moderate to severe periodontal breakdown, and the bone lesions corrected ranged over a broad spectrum of bone types and severity. There were some defects, though deemed correctable, that seemed in danger of considerable loss of supporting bone in the operated area. In many
The results were apparently reproducible with the use of cement for bone grafts, with the size of the bone graft being determined by the periodontal pocket.

Loss of interproximal bone following extraction of a single tooth with an angular crest, bone deposition in areas of gingival recession over adjacent teeth, and bone resorption in the area of extraction were observed. The height of the bone surface when measured was 2.5 mm.

Figure 7. A. Preoperative. Note severe hemiseptal defect between the molars. B. Postoperative correction. C. After healing.
instances secondary occlusal trauma was expected as a result, and the
patients were warned that permanent splitting might become necessary
after surgery. Multiple measurements of vertical bone height were
taken during surgery around the circumference of each tooth, both im-
mediately prior to and following osseous correction.

Bone Removed

The results of this part of the study showed that ostectomy ap-
parently removed little actual attachment. 0.6 mm of supporting bone
height per tooth on a circumferential average. This was far less bone
loss than was anticipated visually, or according to widely held clinical
beliefs.

Loss of interproximal bone support was negligible, except where
severe angular or hemiseptal defects were present, where 1 to 2 mm of
supporting bone was occasionally removed interproximally from the
tooth with the more coronal bone level (Fig. 7). With regard to os-
tectomy over individual tooth surfaces, the greatest amount of supporting
bone resected was over midbuccal, midlingual, or palatal surfaces ad-
jaent to interproximal defects. This is to be expected if positive archi-
tecture is to be attained (Fig. 6). Even on these surfaces, only about 1
mm of bone support was usually removed. Occasionally, up to 2 mm of
supporting bone was removed over an adjacent buccal or lingual root
surface when a deep crater was eliminated or a severe hemiseptum cor-
rected (Fig. 8). The greatest amount of bone support removed from a
single root surface was 3 mm of vertical height. This was rare, occur-
ring over adjacent palatal or lingual root surfaces if very deep craters
were ramped out severely to the palatal or lingual to avoid surgical fur-
cal invasion on the buccal surface of molars (Fig. 9 and 13).4 Even in
this extreme situation, the greatest circumferential mean reduction of
supporting bone height measured for any tooth was 1.5 mm, and this
too was rare. When reducing deep bone craters, it may be possible to
ramp one wall of the crater (buccal or lingual as the case may be). Even
when the ramping involves considerable removal of supporting bone
on one side of the root, other supporting bone is usually conserved in a
circumferential assay of support. This would explain why there is so lit-
tle mean bone reduction while considerable support is removed from
one surface.

It is also important to note that removal of buccal or lingual bone
seems to be less important in terms of tooth support than is the
removal of interproximal bone because roots are generally irregular in
shape, and the buccal or lingual surfaces have a smaller surface area
than the flattened root form extending buccolingually. The result is
that interproximal bone gives more support in terms of surface area
than does buccal or lingual bone, especially posteriorly. This is obvious
from the fact that the most coronal part of the supporting bone on which
Figure 8. Example of radical ostectomy to achieve “positive” bone architecture where very severe defects are present. Note both the deep hemiseptum on the mesial and deep crater on the distal of the first molar (C).
A. Preosteosous buccal view. B and C. Preosteosus buccal and lingual views with readings of 3 mm from a fixed mark on the root to the height of supporting bone. D. Postosteosus buccal view. E and F. Postosteosus buccal and lingual views now showing 7 mm readings on the probe. Compare A with B, B with E, and C with F. This severe amount of ostectomy circumferentially is unusual.

Figure 9. Reduction of an interdental bone crater. A. Crater ramped lingually. B. Note preservation of buccal bone. C. Same crater reduced both buccally and lingually with no ramping.
Osteotomy is being performed usually has a thickness of 1 or 2 mm on the buccal or lingual aspect of the tooth, and a thickness more in the 10 mm range interproximally.

Visual Effect

We have seen that corrective osseous surgery in rationally selected patients apparently removes little bone support from the tooth involved. Yet visually it appears that great amounts of bone may sometimes be resected. An example of this paradox is illustrated in Figure 10. The preosseous picture shows a large funnel-shaped bone lesion present around the buccal surface of the maxillary second molar. After correction, a large amount of bone appears to have been removed, and yet measurements showed no loss of supporting bone on this surface. The reason is that only the side-wall of a space was removed down to the most coronal position of periodontal ligament attachment, which represents no loss of periodontal attachment. It is, in fact, osteoplasty and not osteotomy. There is minimal osteotomy only on the distobuccal root of the first molar. Reshaping and recounting thickened irregular bone to a more idealized form, has a rather startling visual effect. The difference in form alone seems to be visually misinterpreted as a large reduction in bone height.

It would therefore seem that if good clinical judgment is exercised in selecting patients for surgery, and complete osseous correction is not
attempted in obviously hopeless situations (Figs. 2, 4, and 5). positive bony architecture can be attained with little sacrifice of supporting bone.

Intrabony Lesions

When interdental cratering, the commonest form of osseous defect, is surgically treated, the last part of the defect is often left uncorrected in more severe cases in the belief that complete correction would cost too much bone support and would result in a “hopeless” tooth requiring extraction. Complete elimination of the residual crater, however, often makes only a small difference in terms of the amount of supporting bone removed (Fig. 11). Ochsenbein and Ross have discussed the importance of complete interdental crater removal. The often practiced compromise in osseous form commonly leads to equally compromised post-surgical results (Figs. 12 and 15). There are some patients treated with osseous surgery who are unsuited to this form of therapy (Figs. 4 and 5). Sometimes full osseous correction around anterior teeth is also inadvisable for esthetic reasons in a given patient. Another common error is performance of osseous surgery too early in treatment before full initial therapy has been completed and enough

Figure 11. A. Cast of preosseous bone lesions. B. Vertical grooving, thinning, and partial osteotomy. C. Osteotomy completed. D. Comparison of preosseous and postosseous bone levels. Note that complete correction (compare B) has cost very little more in bone support.
liss situations (Figs. 2, 4, and 5) provided with little sacrifice of supporting

Figure 12. Poor surgical form and results. A and B, Buccal and lingual pneumatic

tom. A, Thick, irregular bone left around the first molar, and reversed bone architecture.
B, Residual cratering left both mesial and distal to the first molar (palate). E and G. Pred

itible poor post-surgical results. Note soft tissue cratering and poor form which makes

pase control difficult. There is recurrent pocket depth.
time elapsed to realize the potential for natural repair. Time may eliminate the need for surgery or reduce its extent.

If we adhere to all the principles of sound basic periodontal therapy, more definitive osseous correction can be carried out than is commonly believed. We need not be so timid when we look, with direct vision, at the amount of bone we think should be removed in order to recreate physiological form. However, experience and judgment in osseous surgery are needed to make this decision. Bone correction could be taken to unfortunate lengths in inexperienced hands by removal of large amounts of bone in areas where other procedures (perhaps tooth extraction, root resection, or grafting) would make excessive removal of bone support over adjacent teeth unnecessary (Figs. 14 to 17).

Sound judgment is also required to determine what constitutes a hopeless tooth that one should not try to correct, and this judgment is derived only from adequate clinical experience and training. Conversely, there may be needless extraction of teeth that could be treated by well-conceived osseous surgery (Figs. 15 and 18), or salvaged by reattachment procedures which could result in the elimination of some defects in whole or in part by the growth of new bone (Fig. 16).

If the decision to extract the tooth is not obvious, then during surgery it is better to attend to the gross correction first, ignoring the tooth under question and its effect on the overall bone form created, and then to decide if the remaining lesion around the severely involved tooth can be corrected (Figs. 14 and 18). The same would apply to root amputation. This procedure will often result in a decision not to extract a tooth or amputate a root which would otherwise be done early in the surgery, with resulting osseous correction of defects that might have previously seemed incorrectable by osseous surgery. In some situations a compromise in osseous recontouring may be chosen that greatly reduces pocket depth by minimizing the aberrant bone form. Even though some recurrent pocket depth is likely in such situations, the tooth may now be far more amenable to maintenance curettage, and thus allow for tooth retention rather than extraction (Figs. 19 and 20).

Other techniques should be borne in mind for specific situations, such as attempting new attachment in deep, narrow, intrabony, three-walled pockets, bone swaging procedures, or bone grafts when indicated (Fig. 16).

Surgical Procedures where Ostectomy-Osteoplasty is Chosen

In order to make a more accurate decision as to whether complete osseous correction or compromise is advisable, and also to conserve supporting bone, a specific sequence in osseous correction is suggested (Fig. 21). It is helpful to perform vertical grooving between both teeth and roots first, where buccal or lingual bony ledges are present. This will usually result in some reduction of the lips of the interdental bone.

Text continued on page 98.
Figure 14. Tooth extraction and root amputation to preserve adjacent bone support. A. Presosseous buccal view. Correctable bone form. B. Presosseous palatal view. Note bone lesion around first premolar with external root resorption. Correction would compromise both adjacent teeth. C. Same as (B) Note full extent of the defect around the first molar. D. Gross bone recontouring. Full correction would destroy sound support around the second premolar, yet buccal support is good (4). Cut made for palatal root amputation. E. Palatal root amputated. Note fusion almost to apex. F. First premolar extracted. Note multiple areas of external root resorption. G. Buccal postosseous bone form. H. Palatal view. Bone architecture and conserved tooth support are now both acceptable.
Figure 15. Same patient as in Figure 14, opposite side. A. Premolar buccal view. B. Premolar palatal view. C. Note bone exposure. Correction would be to preserve the gingiva and create a new bone. D. Premolar palatal view. Bone defects are similar in location to those in Figure 14, but less severe and with no root resorption. E. Post-extraction bone form (buccal). F. First premolar extracted. Note posterior bone form. G. Palatal view. H. Palatal view. I. Bone graft with bone regenerate. J. Six days postoperatively, before suture removal. 

Note: The text describes a dental procedure involving bone grafting and tooth extraction. It highlights the importance of preserving bone and gingiva during treatment to achieve optimal results.
Figure 16. Bone graft. A. The gingivae are firm and fibrotic following initial therapy, but note area of inflammation at the distal of the first molar. B. Flap entry showing deep intrabony defect. Obvious recontouring would needlessly destroy bone support on adjacent teeth. Tooth extraction, root resection or grafting are the most viable alternatives. C. With no restorations needed and sound teeth, bone grafting is attempted. D. Before re-entry, 7½ months later. E. Surgical re-entry. F. Close-up view showing bone regeneration. (Such complete regeneration cannot be expected routinely.) G. Final bone recontouring. H. One year following re-entry.
Figure 17. Compare with Figure 16. More severe defect and restorative dentistry needed. A. Presurgical buccal view. B. Silver point shows the apical extent of the defect. Note good bone support around the mental root. C. Defect deemed not amenable to osseous recontouring or bone grafting. Cut for root amputation. D. Two and one-half weeks postsurgically. Note the recontoured crown form. Gingivoplasty and restorative dentistry are indicated.

Figure 18. Plaster casts of bone defects and their surgical correction. The initial judgment might be made that keeping the second molar would result in considerable more bone resection from adjacent teeth than if the second molar were extracted (4). If the tooth is extracted initially, the bone recontouring must still include some osteotomies to eliminate the defects both mesial and distal to the first molar (2). However, if the second molar is kept until the final bone form can be visualized more readily, bone correction with recession of all teeth may be possible (C). Compare (E) with (D) and note that retention of the second molar did not result in loss of further bone support from osteotomies on the other teeth.
Figure 19.  A. Initial visit.  B. After initial therapy, including tooth movement.  C. Buccal preventive view. Note craters and fenestration over mesiobuccal root of first molar.  D. Palatal preventive defects.  E. Palatal view of deep defect around second molar.
therapy, including tooth movement. C. section over mesiobuccal root of first molar, deep defect around second molar.

Figure 19 (Continued). F. Postoperative buccal view. Note complete correction on the second molar, but a compromised form more anteriorly due to the thin bone generally, the fenestration, and an attempt not to eliminate the narrow arch of bone across the mesiobuccal root of the first molar. G. Final palatal bone form. The defect around the second molar was too severe for complete correction orthopodically. But occlusion is good, no restorations are required and the lower second molar is sound. It is therefore advisable to keep the upper second molar if possible. Some "fill" may occur, but even if it does not, the residual defect endangers no tooth but itself. Compromise is therefore reasonable, although grafting could have been attempted. If the lesion had been around the first molar, endangering a sound second molar, extraction or bone grafting would be preferred. H and J. Sutured.

Figure 20. To create classical form, sound support would be unacceptably destroyed by osteotomy. The choice is therefore either distobuccal root amputation of the first molar, or a compromise in bone form with recurrent pocket depths.
craters. Buccal and lingual osteoplasty to thin the bone between the grooves should then be carried out, followed by the reduction of any remaining lips of the craters buccally, lingually, and interproximally. (Thinning by osteoplasty and vertical grooving is not always indicated, particularly where the bony housing is thin initially [Fig. 19, C and F].)

Osteotomy can then be performed on the buccal and lingual surfaces to the desired extent, attempting to achieve the best possible bone architecture. This approach, as opposed to beginning with the elimination of craters, will obviate the visual misinterpretation of how much supporting bone needs removing for full correction of the bone form. It will also save time in surgery and should prevent excessive bone resection. Grooving and ramping into areas of previously corrected craters will usually result in the creation of line-angled peaks of bone (so-called “widows’ peaks”). Correction of these for proper interprox-
OSSEOUS SURGERY AND TOOTH MOBILITY

This is a vital aspect of the problem since tooth mobility is widely used as an important parameter in evaluating the periodontal status, prognosis, treatment plan, and treatment of the patient. A commonly observed phenomenon following periodontal surgery is an immediate increase in tooth mobility. It has been a widely held view that osseous surgery removes valuable supporting bone, and thus may result in such a marked increase in tooth mobility that permanent splinting is required to reduce the often alarming increase in mobility levels. This view is concerned with the introduction and control of secondary occlusal trauma acting upon a weakened periodontium. Residual mobility that does not resolve after a period of initial therapy and temporary stabilization to allow healing, is also widely regarded as a sign of secondary occlusal trauma. Radiographic evidence of severe bone loss coupled with clinical mobility, or even hypermobility itself, is commonly regarded as secondary occlusal trauma. The inference in these definitions and thoughts is that if this mobility is allowed to continue, it will increase, with continuing breakdown of the periodontal structures, and result in the eventual loss of the tooth or teeth. Cross-arch splinting procedures are classically prescribed for these patients in order to reduce mobility and thus prevent further breakdown.

Clinically, there is no precise point at which primary occlusal trauma becomes secondary occlusal trauma. The histological lesion is the same in both. The diagnosis of secondary occlusal trauma at a given time is thus imprecise and is a clinical judgment based on a feeling for
the amount of bone loss and tooth mobility. This is hardly a scientifically acceptable position.

Recent Data

There is no documentation in the literature concerning the effect of periodontal osseous surgery on tooth mobility. Many of our practices in these situations are thus empirical and based upon unsubstantiated concepts. Further information from another aspect of the study mentioned earlier is of interest in this regard. Tooth mobility was measured in ten-thousandths of an inch in the same teeth and patients discussed earlier. Mobility was measured on all teeth at initial examination and throughout initial therapy until no further decrease in tooth mobility could be demonstrated. Six months after the initiation of thorough curettage, plaque control, and occlusal adjustment, presurgical baseline recordings were made. Following surgery, recordings were repeated at fixed time intervals up to one year postoperatively. Plaque control and occlusion were carefully monitored at all times, and curettage was repeated three and six months after surgery (Fig. 22).

It can be seen from the graph that sound initial therapy produced a significant reduction in tooth mobility in three to six months before surgery was performed. Adequate time is needed to derive the full benefit from the healing response. Teeth initially loosened markedly after osseous surgery but gradually returned to or below presurgical mobility levels by the end of one year. This response occurred without any form of splinting: all that was needed was time and a healthy environment. Given this healthy plaque-free and inflammation-free environment and properly directed occlusal forces, osseous correction

![Graph of Tooth Mobility Changes](image)

Figure 22. Tooth mobility in ten-thousandths of an inch is plotted against time.

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mobility. This is hardly a scientific approach. For the literature concerning the effects of tooth mobility. Many of our practices are based on unsuitable clinical evidence. A further aspect of the study mentioned is the need for splinting.

Tooth mobility was measured in the same teeth and patients during the same periods as the data on all teeth at initial examination. There was no further decrease in tooth mobility two months after the initiation of gingival, occlusal adjustment, presurgical recording, or any other treatment. Plaque was monitored at all times and checked after treatment. (Fig. 22)

Tooth mobility was measured in three to six months before surgery. A time is needed for tooth mobility to be altered by or below presurgical levels. This response occurred without need for tooth mobility and a healthy, undisturbed enamel structure, and immediately after osseous correction.

Need for Splinting

From these data, the requirements for permanent stabilization after periodontal surgery can usually be gauged before surgery. Within six months of curettage, plaque control, and occlusal adjustment, different patients will respond more quickly than others, reaching an acceptable level of tooth mobility sooner. In such cases, the patient and the therapist must be correspondingly early that permanent splinting will probably not be required. If tooth mobility at this stage is acceptable to the patient and the therapist, it is likely that no splinting will be required after surgery, as tooth mobility will most probably return unaided to this level or better if simply given time and a healthy environment. The biological status of the periodontium seems more important than the quantity of attachment in determining the extent of tooth mobility. The amount of bone loss does not necessarily correspond with the severity of tooth mobility (Figs. 23 and 24) and no relationship was found between post-surgical tooth mobility and the amount of bone resected.

But when patient discomfort or therapist's beliefs dictate a further reduction in tooth mobility after careful initial preparation, temporary splinting at least, and more probably permanent splinting, will be required. Determination of what degree of tooth mobility is "excessive" is an issue in itself, and cannot be fully addressed here. A decision to splint permanently should not, however, be based merely on the therapist's belief that the mobility levels will be permanently increased if no osseous correction, or because the teeth are still looser than before, some three or four months after surgery.

There is no evidence for believing that any form of stabilization is essential for even sharply increased postsurgical mobility to return to previous levels. The necessity for such stabilization has often been preached, but never proven. This view could commit the patient presurgically to unnecessary permanent splinting, or to unsoldered crowns at best, if a full-coverage provisional splint is made before surgery in the belief that the osseous correction will result in even greater long-term mobility.

The above comments should not be misinterpreted to mean that splinting is always unnecessary or even a harmful procedure; it is the misuse of splinting that is being discussed. On the contrary, there are indications for splinting in periodontal therapy where the proce-
Figure 23. Lower anterior eight years after flaps and osseous surgery. Clinical mobility is between 0 and 1/2 in spite of bone loss.

Figure 24. Patient presented as illustrated, with both buccal roots of the first molar completely out of bone. The palatal root showed excessive pocket depth and was not angled. Clinical mobility was 1/2.

Osteous Surgery

Procedure is helpful to prevent or correct problems created by malocclusion (or orthodontics in adults), preserve residual mobility, prevent parafunctions on other teeth, and improve the stability of loose teeth. It may also improve mobility and support that of teeth requiring treatment. The procedure is not without its problems, and the margin is as controversial as the surgery itself.

In short, osseous surgery is an effective and necessary procedure to correct or prevent problems created by malocclusion. It is a valuable tool in orthodontics, periodontics, and restorative dentistry.

If a recall is scheduled for a patient with an osseous surgery procedure, it is important to recognize its potential shortcomings. Even though the procedure is effective, it requires careful management and monitoring to achieve the best results.
dure is helpful or essential in spite of many actual or potential problems created. Such indications include replacement of missing teeth, patient discomfort from loose teeth, retention of teeth in new positions after orthodontic movement (permanent retention is often required for adults), prevention of extrusion of unopposed teeth, and extreme residual mobility after therapy, usually related to severe and continued parafunctional habits. Although the use of splinting is commonly based on other beliefs such as an aid in healing, it has never been shown to improve the prognosis in these situations. In fact, it has never been shown that loose teeth have a worse long-term prognosis than tighter teeth. It may be intellectually comforting for those who splint any mobile teeth routinely to believe this, but there is no evidence to support that position, particularly if the criteria of good plaque control, freedom from inflammation, and good functional occlusion are established. There is, in fact, some evidence to the contrary.

No margin is as good as no margin at all, and splinting makes plaque control arduous.

In short, splinting should be avoided if possible, but not evaded if necessary, and there are criteria available to determine when it is necessary. The frequent question, “Would you prefer, then, to have loose or tight teeth?” is specious and not the point. Obviously, anyone prefers the closest possible approximation to normal. The question is, rather, having obtained the maximal healing response and decrease in mobility possible through sound therapy with comfort, function, and stability (no demonstration of further bone loss or increasing mobility), is this state preferable to the problems of oral hygiene, discomfort during therapy, and mechanical upkeep of permanent stabilization? Is it worth the price, literally and figuratively, or is the cure worse than the “disease”? Tooth mobility per se is not a disease; it may be a sign or symptom of disease but can be a stable physiological adaptation to controlled past disease.

If a reconstruction is to be successful, it must be expertly done, and there are relatively few people trained for the high precision and knowledge necessary for periodontal prosthesis. Perhaps the greatest shortcoming that pervades the dental profession today is its inability to recognize its own limitations. Complex and advanced procedures, both restorative and surgical, are often undertaken with inadequate training for proper execution. Skill, judgment, and knowledge are obtained only with difficulty and patience.

Secondary Oclusal Trauma

In the study cited, irreversible or secondary occlusal trauma following bone resection was not a feature; no patient remained with generally weaker teeth in the long term (one year) because of the surgical procedure performed. Irreversible or secondary occlusal trauma does
not seem to result from rational osseous correction. The judgment that it will is commonly made on viewing the full-mouth radiographs. The radiographic picture should be taken into account but presurgical mobility levels are a surer guide.

It is another doubtful assumption that hypermobility from only functional forces means secondary occlusal trauma in the true sense of the word “trauma” (Fig. 25). One cannot equate the terms “mobility” and “trauma”; there is evidence that teeth can have an elevated mobility level with a widened periodontal ligament space but show no histological or clinical sign of tissue damage. Yet periodontal traumatism is a histological lesion. It is possible that the term “secondary occlusal trauma” carries an incorrect connotation, and that a term such as “reversible mobility” might be more appropriate. Trauma may or may not be associated with this. The term “secondary occlusal trauma” could then more correctly be reserved for those cases where signs and symptoms other than mobility can also be demonstrated when associated with only functional forces. These would include clinical and radiographic evidence of further loss of attachment, increasing width of periodontal ligament spaces, and increasing tooth mobility, but no parafunctional habits.

The change in tooth mobility is far more important than mobility at a given time, as this may not be increasing. The point to be made is that mobility may be reversible or irreversible (in the absence of splinting) and that occlusal trauma, or more correctly, periodontal traumatism, may or may not be present. The histological lesions in so-called primary

Discussion

It is essential that we thoroughly investigate the individual patient. If the periodontal procedure or surgery will always be to preserve the splint, it is wise to determine the patient who needs it. The goal is to preserve the splint, but not at the expense of the patient’s well-being.

In the light of the foregoing, further research is essential. The controversy about the influence of parafunctional habits on the periodontium is a complex issue. It is essential to establish the full extent of the influence of these habits before we can fully assess the role they play in the maintenance of tooth structure and function.
and secondary occlusal trauma are the same. A comparison between two points in time is therefore necessary in order to make a rational clinical diagnosis of secondary occlusal trauma. The subjective feeling commonly acted upon is unreliable. Control of bruxism and of clenching habits, if present, is probably the key factor other than inflammation in determining whether stability or further breakdown results. Nightguards (upper and lower) are often of great assistance in these situations; permanent stabilization may also be indicated.

**Discussion**

The best therapy is the minimal therapy that will adequately preserve the oral structures in health, in function acceptable to the individual patient's biology, and in comfort and form acceptable to the patient. If these criteria can be met without invoking the more spectacular procedures known to periodontics, such as full mouth reconstruction or surgery, then the more modest approach is indicated. There will always be an artistic side to periodontics, but this should not take precedence over the scientific. We must also consider the unfortunate patient who simply cannot aspire to the ritual and romance of his therapist's well-developed artistic sense. He may merely want to keep his teeth.

**SUMMARY**

It is essential that the execution and results of osseous surgery be carefully analyzed. Perhaps the two most compelling reasons are (1) that we should understand the effects on tooth mobility and their implications for complex restorative dentistry, and (2) to facilitate the accurate assessment of postoperative "success" bearing in mind not only improvement of the environment, but also increased chances of survival for the operated teeth.

We have discussed the effects of osseous surgery on tooth mobility. In the light of recent information, a more accurate assessment of the need for splinting can be made. There has always been some controversy about osseous recontouring. Of late, there has been a particular resurgence of skepticism as to the efficacy of osseous resective procedures compared with more conservative forms of therapy. Scientific investigation demands the doubting mind and the analytical approach in order to establish the truth or fallacy of current ideas. This approach is essential to the continued existence of periodontics as a clinical science. These investigations should be based on a full understanding of the therapeutic measures being investigated, as it is misleading to assess the results of a procedure when that procedure is either not used to its full advantage or inappropriately used.
It is hoped that these comments will be helpful in deciding whether
definitive osseous correction in a given case is desirable or possible,
in terms of both bone removal and permanent splinting. The author
also hopes that this article has served to enhance the possibilities
of more complete osseous correction when indicated, in order to achieve
minimal pocket depths, and to permit proper comparison with other
modes of periodontal therapy. It is, however, crucial to realize that
whatever modality of therapy utilized, it is merely one phase in the
treatment spectrum. Maintaining a stable state for the patient over
many years is the ultimate goal, beside which any given technical pro-
cedure pales in significance. Periodontal therapy is an ongoing process
in which patient recall plays a central role.

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