Periodontal surgery — resection, regeneration and reconstruction of osseous tissue

Periodontal surgery has been performed for many years in an effort to achieve various goals. This paper will discuss three of the end results that we attempt to achieve through surgery: resection, regeneration, and reconstruction. This paper does not include all periodontal bony surgical procedures, nor is its purpose to teach anyone how to perform any of the procedures mentioned. Omission of certain surgical techniques does not signify that they are less important than others. If a practitioner plans to treat periodontal disease, he should be well versed in all the treatment modalities, so that the patient’s disease, rather than the operator’s repertoire, dictates the treatment of choice.

We have learned from previous papers that we are effective at root planing and scaling only to about 5 mm subgingivally. We also know that furcation involvement begins at about the same depth, making access even more difficult. Surgery with a flap approach is, therefore, a natural extension of our desire to provide a more effective therapy for our patients. Resective osseous surgery has been performed for many years. G. V. Black mentioned the reshaping of a shallow interproximal crater in 1866, and resective osseous surgery has been evolving ever since. The purpose of this type of osseous surgery is to gain access for proper debridement of the osseous defect and root surface. At the same time, we attempt to reduce the post-surgical probing depth by bone resection which is performed in such a way as to make the bone and gingival architecture consistent with each other. The resulting shallower pockets make maintenance easier for both patient and practitioner. Resective osseous surgery is most useful in the treatment of shallow to moderate-depth osseous craters, early furcation invasion, and thick ledges or exostosis. In treating these defects, the operator can create a very favorable osseous architecture without removing a significant amount of support bone (Figure 1). Selipsky’s classic study demonstrated that only 0.6 mm of supporting bone was lost in properly performed resective surgery. This approach is most successful in pockets that are no deeper than 6 mm; therefore, we should diagnose and treat our patient’s periodontal disease early so that we can use very predictable modalities such as resective osseous surgery.

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Another often overlooked indication for resective osseous surgery is crown lengthening for restorative purposes. If there is insufficient clinical crown length for retention or if the margin of the restoration must be extended for whatever reason into the gingival attachment apparatus (biologic width), then a crown-lengthening procedure is required before the restoration is placed. It is very rare that this crown lengthening can be accomplished strictly by a gingivectomy. In almost all cases some bone must be removed. Because of the confusion that seems to be associated with this topic, I believe some time should be spent discussing what is meant by the term biologic width and its relationship to the dental restoration. The biologic width consists of a minimum of 2 mm of space above the alveolar crest in which the supracrestal fibers and the junctional epithelium attach to the root surface.⑤ (See Figure 2.) The biologic width is a physiologic constant that is always present and required in health. If, for any reason, the margin of a restoration must be placed closer than 2 mm to the alveolar crest, then resective osseous surgery is indicated prior to the restorative procedure. This will ensure that the operator can end the margin on sound tooth structure (i.e., below a fracture or old restoration) and still have at least 2 mm of root surface below the margin and above the bone for the attachment of the gingival tissues. Infringement of the biologic width even with the most exquisite of margins will result in an inflammatory process and ultimately attachment loss (pocket formation). One must also remember that the attachment crown preparation with a straight line interproximally will often infringe on the biologic width. This later gives rise to an interproximal defect. This chronic inflammation can occur around any tooth, but it is most often seen around the maxillary incisors where an overzealous attempt has been made to ensure that the margins are not exposed. In the past, we have often attempted to explain away the inflammation by insisting that the patient must be allergic to the restorative material because we were certain that our margins were perfect and closed (Figure 4). In reality, the inflammation was caused by the restorations infringing on the biologic width. Subgingival margins are always a compromise to periodontal health, but if they must be used, particular attention should be given to ending the margins within the existing gingival sulcus.

Deeper osseous craters (7 mm or greater) are generally not amenable to resective techniques because too much supporting bone would have to be removed to eliminate the defects.⑤
In treating these cases of severe attachment loss, we usually turn to regenerative techniques. There is no doubt that the future of periodontal therapy rests in regenerative therapies, but at present, their results are not as predictable as we would like. This fact emphasizes the importance of prevention and/or early diagnosis and treatment of periodontal problems. Hard-tissue grafting has been performed for years, and what we have placed into the defects has been limited only by our imagination. Bone has proven to be the most successful grafting material, but in some cases it seems that what we place in the defect is not as important as the shape of the defect itself. Almost all grafting material acts only as a scaffolding to allow the osteoblasts to bridge the defect. These osteoblasts come from the bony walls of the defect, and it is for this reason that periodontists place much emphasis on how many bony walls a crater has. The more bony walls making up the defect, the more surface area available to produce osteoblasts, and therefore the greater the potential for regeneration. We do not consider a tooth as one of these bony walls because it is avascular and cannot contribute any osteoblasts. In general, we can expect greater than 50% fill, 80% of the time in three-wall defects, less in two-wall and even less in furcations. This bone that fills the defect is our best grafting material at the present time. Bone grafting is a very technique-sensitive procedure, and is therefore best left to the operator with a great deal of experience in periodontal surgery.

In bone grafting, it appears that when successful we can gain an average of 2.5 mm of attachment regardless of the type of grafting material used. This constant 2.5-mm average led some investigators to wonder whether perhaps the osteoblasts from the bony walls were not as important as we believed. Perhaps the limiting factor was that under normal circumstances the periodontal ligament could only proliferate 2.5 mm from the base of
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that I will present is reconstruction. Just as in crown lengthening, reconstruction of the alveolar ridge is best carried out as a preprosthetic procedure. Therefore, careful treatment planning is essential. One of the most difficult tasks facing a restorative dentist is the creation of an esthetic and hygienic restoration in an area where there has been a deformity of the alveolar ridge. In the past, these deformities were managed primarily prosthetically and generally without good results. Today we have a number of options to correct these defects surgically prior to the prosthetic procedures. As a rule, these procedures are carried out after the teeth have been prepared and a provisional fixed restoration is in place. A number of different localized ridge augmentation procedures have been presented in the literature.\textsuperscript{9-11} Currently two types are in general use. If there is a ridge height deficiency, then an onlay graft as described by Seibert is generally used.\textsuperscript{12} A bed is prepared in the deficient area and a full-thickness graft is adapted to the bed, creating a more natural ridge contour (Figure 7).

This is effective, but its limiting factors are the size of the defect, amount of donor tissue available, and possible problems with color match. If there is a buccal-lingual width ridge deficiency, then a pouch is generally created in the deficient zone (Figure 8). This pouch is typically filled with connective tissue or a synthetic grafting material such as hydroxyapatite. The ceramic materials are generally pre-

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**Figure 7:** The top drawing demonstrates how the case would have to be restored with an abnormally long pontic (maxillary right lateral) if a ridge augmentation is not performed. The remaining drawings demonstrate the correction of the defect by an onlay graft and the final restoration.

**Figure 8:** Ridge augmentation by the creation and expansion of a pouch.

**Figure 9:** This patient had lost a significant amount of bone in the premaxilla, making replacement of his maxillary teeth difficult. Following ridge augmentation, the pontics were shortened and a more esthetic and hygienic prosthetic result was achieved.
fered because of their ease of handling and dimensional stability. These procedures can create a normally contoured alveolar ridge that will allow construction of a more ideal esthetic and hygienic restoration (Figure 9).

The future of periodontics is very bright. It is exciting to eliminate disease and a challenge to keep the patient healthy. Periodontal surgery is much more than just reducing pockets. With thoughtful pre-prosthetic treatment planning, we can create an environment for restorations that is conducive to the preservation of health and more esthetic as well. Regeneration of lost attachment is now possible, and there is no doubt that it is in this direction that the future of periodontics lies. Resection, regeneration, and reconstruction are the foundation of osseous surgery. If you have a good knowledge of the basics, then there is no limit to what you can achieve. There are many variations on each of these three categories, and with one of them, it is almost certain that we can not only improve our patients' dental health but also their quality of life.

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REFERENCES


