

Periodontal and Prosthetic Aspect of the Biological Width Part II: Reconstruction of Anatomy and Function

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Summary

In the second part of the article the authors describe techniques for dealing with reconstruction of the biologic width. The stress is on surgical techniques, from gingivectomy to apical repositioning with osseous surgery, and orthodontic forced eruption. Correct indication for each technique, and correct procedure, as well as equilibrated prosthetic reconstruction, may preserve the biologic width and prevent its new violation.

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Reconstruction of biologic width

Reestablishment of healthy anatomic relations in the area of the tooth neck is a prerequisite for any reconstructive therapy and prevention of further development of periodontal disease. Violated biologic width can be reconstructed by means of a number of techniques (1). According to the need of rebuilding damaged teeth and possibilities offered by dentistry today, there are two possible way of reconstructing the anatomy in this susceptible area of the tooth supporting structures.

The periodontologist, will use the optimal and faster but more invasive way implementing one of the periodontal surgical techniques. Different therapeutical procedures have the same goal, and that is the healing of periodontal tissues in natural relations. Procedures achieve a longer clinical crown, and can be called lengthening of clinical crowns. Table 1 shows a classification of possible techniques.

The other way is forced eruption, orthodontic eruption of the root. This procedure is more time consuming and requires greater patient compliance.

Surgical techniques

Prior to each surgical procedure, especially in cases when inflammation around the tooth is present, instructions in oral hygiene, plaque control, scaling and root planing are necessary (initial, cause - related therapy). Failing fillings and prosthetics must be reshaped, removed or changed for temporary solutions that should enable plaque control. Sometimes a greater number of visits is necessary in order to regain health of the gingiva. This part of therapy may last for some weeks, or even months. Healthy gingiva is hard, relatively inert tissue, and its position stable and reliable. This is a fact that must be taken into account, especially if the rehabilitation includes the esthetic component (2,3).

Gingivectomy (gingival reduction)

Gingivectomy is a very successful and predictable surgical procedure for reconstruction of biologic width (4,5), but it can be used only in situations with hyperplasia or pseudopocketing as a disorder in which there has not been significant violation of the biologic width (5). It has been shown that, after gingivectomy, more than a year has to pass before the gingival margin establishes its fixed position (6,7). In a situation of clinically healthy gingiva, gingivectomy procedure can be performed without significant change of the alveolar ridge height. However, it is hard to predict the location of the gingival margin, because of the gradual formation of the biologic width (5).

Gingivectomy is relatively rarely performed as the only procedure, since the violation of the biologic width leads to bone resorption and loss of bone height. While planning a gingivectomy procedure the clinician must bear two things in mind. Not only has he got to ensure a sufficient amount of clinical crown, but he has to know the amount of gingival tissue that is going to remain, without jeopardizing the width of keratinized gingiva, as well as jeopardizing just restored periodontal health.

Gingivectomy can be performed by means of special knives or by electrotomy. Electrotomy can cause bone necrosis, if it is touched by the electrotomy knife. Electrosurgery does not only cut the tissue, it also burns the margin, so it can not be

described as precise. After electrosurgery the margin is always uneven (8). Therefore, the method of choice is gingivectomy using special knives according to Kirkland and Orban.

Periodontal flap

Clinical crown lengthening by means of periodontal flap with or without osseous resection has been proven to change the location of the gingival margin (2,4,10-16). If there is no periodontal disease present at the site, the distance between the gingival margin and alveolar ridge has to be computed. Thus, a therapist decides on the definite location of the gingival sulcus and gingival margin before the preparation for the crown.

In cases of insufficient zone of attached gingiva, gingivectomy is contraindicated, since it may result in a tooth surrounded by new tissue - soft, non-keratinized, elastic alveolar mucosa.

A mobilized mucogingival flap can be transpositioned in all directions: apically, coronally, or laterally. The only thing determining the apical transposition is the bone margin. There should be at least 2 millimeters between the gingiva and alveolar bone margin for the tissue that builds the biologic width.

Apically repositioned flap with resective osseous surgery

The procedure matches the one described above, but resective osseous surgery cannot be performed on only one tooth, so the whole sextant or quadrant must be planned. Gingiva follows the new architecture and establishes normal relations between periodontal tissue.

After the bony architecture correction, the facial flap must be sutured 2 millimeters coronally from the bone, and papillae fill the interdental areas in order to faster rebuild the biologic width (2,17).

Orthodontic techniques

Brown (18) described the effects of straightening mesially inclined mandibular molars, and later the orthodontic measures became important instruments

in clinical crown lengthening. The methodology has recently been described by Starr (19). According to Starr, there are two concepts of forced eruption: forced eruption with minimal osseous resection, and forced eruption combined with fiberotomy (20). Frank et al. (21) described forced eruption of multiple teeth.

The literature has shown that crestal morphology lies in close relation to the location of the cemento-enamel junction of healthy teeth. If a tooth fractures on the gingival margin, or just beneath it, and the remaining tooth root can orthodontically erupt, it can be expected that the supporting tooth structures will move coronally along with it. The superficial structures can be removed, resulting in anatomically ideal bone contour and a longer clinical crown (22).

The first disadvantage of orthodontic crown lengthening is the discrepancy in root length between the moved tooth and the contralateral tooth. It is absolutely necessary to employ fixed orthodontics to achieve crown lengthening, and after obtaining the desired length there follows a period of retention. Osseous resection is necessary in slow eruption, but can be avoided in fast eruption combined with fiberotomy (5). The disadvantages of fast eruption are frequent visits (every two weeks) in which the supracrestal fibers are cut and the root surface is planed. This procedure is repeated until the tooth reaches the desired height (23). After which follows a period of retention for at least 4 weeks.

Reconstruction procedures

After gingivectomy it is necessary to wait 3 to 4 weeks for the tissue to heal. In cases of apical repositioning the time of healing is 8 to 10 weeks, in which the tissue attaches to the root. It is important not to take any casts during this period. Immaculate oral hygiene is a must, but the patient should be warned not to be too vigorous, since interdental brushes may cause gingival recession, especially in patients with thin gingiva and compression. If it is important that gingival tissue covers the preparation margin (but not more than 0.5 millimeters!), prosthetic rehabilitation should follow after at least 20 weeks, or even a year.

Reconstructive procedures combine the harmonious proportions of the final restorations and periodontal health, which is the basic of esthetic dentistry (24). The interaction of these two factors very often leads to conflict between wishes and realization. What must be obtained is precise work, and respect for hygienic and also aesthetic principles (25). In prosthetic rehabilitation importance should be given to the functional issue, with regard to the above principles (26,27).

Oral hygiene

Without patient cooperation and motivation healthy gingival tissues cannot be achieved. This applies to ceramic and sythetic material restoration as well. Plaque removal is an essential factor in the long-term success of restorations (28).

Periodontal health in optimal crown rehabilitation is characterized by unchanged clinical situation, apart from aging. The patient must comprehend, not only the proper brushing technique, but also the importance of additional appliances, interdental brushes, dental floss, superfloss and interdental stimulator. Check-ups and remotivation visits are just as important as any other part of the therapy. Prosthetic restorations are places of plaque accumulation, although proper oral hygiene does diminish this disadvantage.

Instead of a conclusion

Subgingival placement of a restoration margin usually results in iatrogenic marginal inflammation. There is data that show that restoration margins, placed even at the gingival margin, may worsen clinical and microbiological parameters of periodotal health (29,30). In these studies, some parameters were worse in the group that had restoration margins placed in the gingival parr than in the group that had the restoration margin subgingivally.

Incorrectly placed restoration margin and unadapted restoration are not welcome, but a perfectly adapted restoration, whose margin lies more than 0.5 millimeters subgingivally, violates the biologic width (31-34). This results in marginal iatrogenic irritation, especially in narrow zones of attached gingiva.

Supragingivally placed margin has less possibilities of unfavorable influence on the progression of periodontal disease. Additionally, a supragingivally placed margin can be polished. In recall visits, caries and marginal corruption are detected easier in such restorations.

If the margin must be placed subgingivally, the factors to be taken into account are:

- correct crown contour in the gingival third,
- correct polishing and rounding of the margin,
- sufficient zone of the attached gingiva,
- the margin does not violate the biologic width.

In successful rehabilitation of the stomatognathic system an interdisciplinary collaboration between the prosthodontist, periodontist and orthodontist is of utmost importance. Observance of the stated rules will significantly lessen the potential negative effect that might be caused by subgingivally placed restoration margins.

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