Accurate Elastomeric Impressions: The Importance of Effective Soft Tissue Management

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It is quite clear that a majority of elastomeric impressions sent to commercial dental labs in the United States have not adequately captured the prepared cervical margin of the impressed teeth. A recently completed master's thesis conducted at the University of North Carolina's Department of Operative Dentistry determined that 55% of over 1,500 impressions sent to three major dental laboratories failed to record the prepared gingival margin.[1] Although this finding is in agreement with several previously published studies, it is somewhat surprising because current impression materials have been improved dramatically over the past several decades.

The etiology of this high percentage of failed impressions is multifactorial and primarily relates to poor soft tissue management rather than the inherent difficulty in making an elastomeric impression. This article will identify the critical areas of soft tissue management and provide protocols to assist the clinician in making predictably accurate elastomeric impressions. Items that will be discussed include gingival enhancement, cervical margin location, gingival displacement materials and techniques, and the use of cordless gingival displacement materials.

Perhaps the single most important factor in making accurate impressions is ensuring that the gingival tissues surrounding the prepared teeth are in a state of optimal health prior to determining the definitive margin location and making the impression. Frequently, teeth requiring crowns do not have gingival tissues in an optimum state of health. A periodontal diagnosis must be made prior to initiating restorative treatment. If the tissues are healthy, treatment can proceed immediately. If definitive periodontal therapy is indicated, it must be completed and the outcome evaluated prior to beginning restorative treatment. If the diagnosis is marginal gingivitis, a program of gingival enhancement should be initiated.

The gingival enhancement protocol introduced by Sorensen suggests scaling and root planning followed by use of chlorhexidine mouth rinse twice a day for 6 weeks to reduce chronic gingival inflammation prior to tooth preparation.[2]

If it is determined that the tissues supporting the teeth to be prepared require periodontal surgery, then the tissues must be allowed to heal and return to health before initiation of restorative therapy. There is a tendency for tissue to migrate a short distance coronally after periodontal surgery. For patients with a thick gingival biotype and where esthetics is not a major consideration, 8 weeks is a reasonable time to wait after periodontal surgery to initiate restorative therapy. In situations where esthetics is paramount,

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especially with a thin periodontium, the recommended interval between periodontal surgery and restorative therapy is 20 weeks.

Once the tissues are deemed healthy, the clinician must carefully consider the location of the cervical margins of the tooth preparations. The attachment apparatus around each tooth is a combination of junctional epithelium (JE) and connective tissue attachment together known as the biologic width. Although the connective tissue attachment is relatively constant, the JE and sulcular depth will vary in dimension depending on the presence or absence of gingival inflammation. Placing the preparation margins too close to the crest of the alveolar bone will cause violation of biologic width resulting in chronic inflammation of the gingival margin surrounding the restoration. In order to achieve a predictable gingival response, the finished margin should be placed 3 mm coronal to the crest of the underlying bone as determined by sounding.

The gingival margin generally follows the rise and fall of the underlying bony crest. Inappropriate use of a more horizontal tooth preparation margin as opposed to a scalloped margin will often violate the biologic width in the interproximal area. Failure to respect the normal contours of the gingival margin and the underlying bone during restorative therapy will also result in chronic inflammation of the gingiva followed by periodontal disease. Care should be taken to protect the gingival tissue from iatrogenic harm during tooth preparation. Rotary instruments such as tissue protection burs help prevent damage to the epithelial lining whereas still enabling the clinician to place the finish line at a desirable depth.

Currently, there are multiple options available for gingival displacement, including electrosurgery, rotary instruments, and soft tissue laser. However, a recent survey conducted to determine the use of various gingival displacement techniques in dental offices showed that 92% of dentists prefer the mechanical–chemical deflection technique.[3] This involves the use of gingival retraction cord in conjunction with a specific hemostatic medication. Although the single cord technique works well in the presence of a supragingival or equigingival finish line, the double cord technique is considered the gold standard. This allows for the impression material to flow beyond the prepared margin and capture a certain amount of sound tooth structure beyond the margin.

Cords are generally classified into three types based on their appearance: knitted, braided, or twisted. Braided cords have a consistent tight weave that makes them resistant to separation while packing and absorb hemostatic medicaments at a much more rapid rate than knitted cords.

One of the common mistakes that contribute to poor impression making is choosing a narrow diameter cord that does not provide adequate gingival displacement. The largest cord that conveniently fits in the sulcus should be used, as the critical sulcular width is 0.22 mm. Another critical mistake is not leaving the cords in place long enough to achieve adequate displacement. The cord needs time to achieve displacement and the medicament needs time to achieve fluid control. The minimum required time has been shown to be 4 minutes; however, the authors prefer to leave the cords in place for 8 minutes.

After placing the cord in the sulcus, the prepared margin should be visualized throughout the entire circumference of the tooth. If the tissue collapses over the packed cord, it will impede accurate impression making. Hence the excess tissue should be eliminated using a scalpel, electrosurgery, or a soft tissue laser.

Care should be taken to prevent injury to the gingival lining while removing the cord. Removing cord from a dry sulcus, with desiccation of the cord and the gingival crevice, will cause adherence of the cord to the gingival soft tissue and will cause tearing of the epithelial lining and bleeding. Therefore, it is recommended to rinse or soak the cord with water prior to removal to prevent damage to the gingival sulcus epithelium.

A number of products are available to ostensibly provide "cordless" gingival displacement. In the

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aforementioned survey, 28% of dentists indicated they sometimes use these products. Studies on such products are at best equivocal, and the limiting factor with these systems seems to be the diameter of the tips of the syringes used, which make it extremely unlikely these materials can be successfully injected into a healthy gingival sulcus and provide adequate displacement.

Many dentists believe that the introduction of digital impressions using optical scanners will solve the problems of impression making. Unfortunately, nothing could be further from the truth. The factors that cause dentists to miss conventional impressions are the same factors that result in faulty digital impressions. Effective soft tissue management is the key to both conventional and digital impressions.

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SUGGESTED READING

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