Anterior and Posterior Partial-Coverage Indirect Restorations Using Supragingival Dentistry Techniques

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The literature is replete with articles arguing which is the next best restorative material to substitute porcelain fused to metal (PFM) crowns. Sadly, most of the discussion is about the strength and cost of the materials and often not about how—when properly used—some of these materials, combined with the appropriate techniques, can actually improve the quality of the dentistry we provide to our patients and make our restorative life easier and more predictable.

Full crowns, of any type, should be considered obsolete. They are destructive and generally more difficult and unpredictable.[1] (See Figures 1 and 2.) For example, opacious PFM crowns or monolithic zirconia crown margins must be placed subgingivally for esthetic purposes, impression taking, and cementation challenging, even for experienced clinicians. Keeping crown preparation margins supragingival would make dentistry so much easier and predictable. Most people are unaware that the main benefit of nonmetal indirect restorations is not only improved esthetics, but also the fact that some characteristic of these restorations allows us to perform "supragingival dentistry." In other words, it allows clinicians to make alterations in our techniques to deliberately stay above the gingiva, making dentistry more predictable and healthy for the patient.

Figure 1. Traditional destructive crown preparation.

Figure 2. Gingival inflammation caused by poor margins.

The increasing use of and interest in bonded porcelain and resin composite restorations has been sparked by the increased demand by the average patient to have natural-looking restorations. Over the years, newer and more esthetic materials have come into the market, and the dental profession has embraced them to keep up with the patient demand for these types of high esthetic restorations. Clinicians have rapidly started to substitute the old, less esthetic restorative materials with newer, more esthetic options, but they are mostly used with techniques similar to those with traditional metal, mechanically retained materials. As a result, some clinicians may miss some of the most important benefits of these new restorative materials.

Why Do We Need Supragingival Dentistry?

One of the most challenging and often unsuccessful procedures in dentistry is the impression of a subgingival margin for a PFM or full zirconia crown.[2] Subgingival crown preparation margins are required on PFM and opacious full zirconia crowns if we hope to have an acceptable esthetic outcome, due to the dramatic difference in color between the restoration and the tooth. Taking impressions of subgingival margins is challenging, to say the least. When we consider the additional possibility of human error during both laboratory work and the difficult subgingival cementation, it is no wonder that we see many full crowns with poor marginal adaptation. This subgingival margin placement is one of dentistry's biggest problems. Day in and day out, dentists work hard to carefully place subgingival margins for esthetic purposes and then have an extremely difficult time controlling the soft tissues, placing cord and taking a good impression of these margins, and managing tissues during cementation. It is almost like we are making our own lives more difficult.

One of the consequences of subgingival margin placement is the difficulty of isolation during crown cementation. If cement mixes with blood or saliva during cementation, caries may start soon after, but it usually goes undetected. The restoration will stay in the mouth for years until the decay is detected and the tooth has to have even more aggressive procedures to try to save it. Also a consequence is the poor gingival health often observed around PFM crowns. Any subgingival margin will be an irritation for the periodontium, but a poor-fitting margin will have a devastating effect on the periodontal health.[3,4] And, unfortunately, poor-fitting margins are a common occurrence.

Another drawback of traditionally retained full crowns, gold, zirconia, or PFMs is the need to cut healthy tooth structure to create axial walls for retention purposes.[5] By using a partial coverage, an adhesively retained indirect restoration like a veneer or onlay, we remove less tooth structure, because it doesn't need axial wall preparation. With a tooth-conserving preparation, we will also usually be further from the vital pulp, decreasing the likelihood of negative pulp implications.[7] Properly used partial-coverage bonded restorations will permit the use of supragingival dentistry in most cases, prolonging the life of the tooth, improving esthetic results, and making our dentistry more predictable.

Supragingival Dentistry: How?

A desirable characteristic of nonmetal restorations is translucency, which allows for an easier blend of the restoration to the tooth because it allows some light to go through into the tooth. Of course, some nonmetal restorative materials are more translucent than others; for example, layered and pressable feldspathic porcelain is very translucent, depending on the technician's skills and the dentist's needs, while alumina, zirconia, and lithium disilicate can vary from very opacious to semitranslucent.

Translucency has some very important advantages. First, it allows for a more esthetic restoration. Teeth are like fiber-optic rods: when light hits the crown, it goes down the root.[8] Traditional metal-ceramic restorations are completely opaque and full monolithic zirconia is opacious, as well, thus obstructing the light from going into the tooth and root, making the root look dark and creating a grey margin appearance; even the gingiva looks grey. Most ceramic restorations permit light to go through to the tooth and root, and the shadowing effect of the metal coping is eliminated or diminished. When using highly translucent feldspathic porcelain, we can achieve a "contact lens" effect, or make our margin disappear; thus, the need to hide the margin is absent, and placing a subgingival margin is unnecessary and contraindicated. When using a more opaque, full zirconia crown, we may still have to hide the margin, although properly used layered zirconia is more translucent and we can safely place the margin at gingival level on the esthetic zone and 0.5 mm above the gingiva in nonesthetic areas.

An additional benefit of supragingival dentistry is that more of the tooth is preserved during tooth preparation. Axial reduction is destructive, and subgingival margins are far more destructive, because the more apical we place the margin, the narrower the tooth becomes and the more tooth has to be removed to maintain the same margin width and taper. The effect of apical placement of margins is well explained by Shillinburg.[9]

Keeping margins supragingival or at gingival level will make us better dentists. Our impression will be predictably good, with minimal or no cord packing, our provisional will be easier to make with good margins, and the patient's soft tissues will be healthier when he or she returns for cementation. Additionally, cleaning cement is much easier when we can see the margins, eliminating the common problem of leaving small amounts of cement subgingivally, and we may finish our margins better. The key to success with partial-coverage bonded restorations is understanding that new materials mean new preparation and cementation techniques. Different rules apply for bonded feldspathic porcelain and full zirconia crowns, and different rules apply for the high esthetic zone (anteriors and bicuspids) versus the molar region.

Supragingival Dentistry in the Anterior Area

In the esthetic zone, layered and pressed feldspathic porcelain is the most esthetic option available, and for that reason it is the ideal material for partial-coverage bonded porcelain veneers and porcelain veneer/onlays on first bicuspids. Layered and, to a lesser extent, pressed porcelain can have different shades and opacities throughout the restoration, allowing it to best mimic the tooth. Feldspathic porcelain can be highly translucent, based on specific needs. Translucency allows for a very good blend between the natural tooth and the restoration—even a contact lens effect—which, in turn, makes hiding the margins subgingivally unnecessary.

Figure 3. Supragingival margin preparation.

Figure 4. Good restoration margin blending with "contact lens" effect.

Feldspathic porcelain must be cemented with resin cement, and resin cements have no tolerance for contamination. Isolation of subgingival margins is very difficult, and any contamination could lead to improper bonding and early failure of restorations. If we use this restorative material and place the margins subgingivally, as we do with old materials, we complicate the procedure and miss out on the benefits of supragingival dentistry. On the highly esthetic zone (anterior and first bicuspid), it is desirable to leave the preparation margins of feldspathic porcelain veneers and PJC 0.25 mm above the gingiva equal to the gingival level. (See Figures 3 and 4.) Making sure that the color of the tooth and the color of the restoration are not dramatically different is an important first step, and for this reason, bleaching the teeth is desirable before a high esthetic restoration is started.

Due to the lower forces in the anterior area of the mouth, it is rare to find the need to use stronger materials, such as lithium disilicate. The additional strength of lithium disilicate comes with the disadvantage of requiring deeper preparation, or more space, if we want a polychromatic restoration. It also has lower translucency than feldspathic porcelain.

Supragingival Dentistry in the Posterior Area

In the posterior area of the mouth, porcelain onlays should be the first choice when indirect restorations are needed, because they allow for tooth preservation during preparation and also allow for a supragingival margin placement.[10] There is much evidence of excellent results with porcelain partial onlays.[10–13] Using translucent restorative material, like pressed lucite reinforced porcelain, is very important when partial-coverage onlays are attempted. The translucent margins and good marginal blend allow for supragingival margin placement and minimal tooth reduction without the need of axial wall.[14] (See Figures 5 and 6.) Lithium disilicate onlays are more opacious than pressed ceramics, and the margin blending is less ideal, but it is a much stronger material.

When full crowns have to be replaced, a good choice is layered zirconia. To achieve maximum translucency and minimize fractures, it is important to communicate the thickness and design of the coping to the laboratory. Maximum esthetics and translucency can be achieved with layered zirconia crowns, which also require less space for porcelain and less tooth preparation than a PFM crown. Although layered zirconia has translucency, it is much less than with feldspath and supragingival margin will be noticeable. Nevertheless, the translucency of layered zirconia is sufficient to allow for supragingival margin placement. Layered zirconia is not usually unsightly on the nonesthetic zone, and patients tolerate it well. Monolithic zirconia is not translucent and will not allow for supragingival margin placement.

It is important to note that in order for porcelain fused to zirconia crowns to be more translucent and to minimize fractures of the veneer porcelain, it is important to have proper coping design with the right thickness and also to have a technician who understands translucency and porcelain temperature. Full zirconia or monolithic zirconia crowns are becoming quite popular. They are opacious and not very esthetic, with the huge drawback that when they have to be removed, it can be quite problematic. It must be accepted that all crowns have to be removed at some point, even gold crowns. Rather than hope for indestructible crowns, we should strive to manage occlusion, as that is most important when using porcelain restorations. Knowing how to spot occlusal disease can also be very helpful.

Conclusion

The techniques used for rational, mechanically retained full crowns are destructive, unpredictable, and often self-punishing. The benefits of modern, partial-coverage bonded restorations extend beyond just improved esthetics. By performing supragingival dentistry for our patients, we may be able to predictably provide better crown margins and give our patients a restoration that protects their gingival health and preserves more natural tooth, and thus lengthens the life of the dentition. ■

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Figure 5. Minimally invasive preparation using supragingival margins.

Figure 6. Excellent margin blending with contact-lens effect using pressed ceramics.

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