A Connective Tissue Graft as a Biologic Alternative to Class V Restorations in Miller Class I and II Recession Defects: Case Series

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Although cervical lesions are commonly treated using restorative materials, the esthetics and durability of the restoration can be problematic. Despite improvements in bonding to dentin, the performance of resin-based cervical restorations suffers from a variety of clinical problems. Biologic options using connective tissue grafts to replace the lost soft tissues have proven longevity and esthetic benefits. A collection of case reports is presented to demonstrate a surgical alternative to correct carious and noncarious cervical lesions. Clinicians should consider the biologic option of replacing the missing gingival tissue prior to placement of restorative materials on exposed root surfaces. Int J Periodontics Restorative Dent 2016;36:21–27. doi: 10.11607/prd.2366

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Root exposure can lead to dentinal hypersensitivity and caries. Although Class V restorations treat these problems as a quick and inexpensive dental procedure, they have significant limitations.

Composite and glass ionomer restorations are often chosen to treat carious and noncarious cervical lesions. Unfortunately, clinical observations suggest that bonding to dentin is less predictable than bonding to enamel.[1] Weak adhesion can allow bacteria to undermine the restoration, resulting in microleakage.[2–4] Degradation of the resin-enamel bond is minimal in vitro and in vivo, as evidenced by the long-term retention of pit and fissure sealants.[5,6] Bonding to enamel is enhanced by the fact that its composition is nearly 100% inorganic. In contrast, dentin contains much organic material, is traversed by fluid-filled tubules, and is therefore a less predictable and less reliable substrate for bonding.[7]

Despite the difficulties in bonding to dentin, continuing advances in adhesive technology have resulted in development of resin-based agents that provide excellent bonds to dentin.[8,9] The absolute bond strength values depend not only on the type of adhesive being tested, but also on the test method being used.[9,10] Regardless, numerous in vitro studies have reported that the

initial bond of resin to dentin degrades substantially over time.[11–15] According to Liu et al,[16] "bond degradation occurs via hydrolysis of suboptimally polymerized hydrophilic resin components and degradation of water-rich, resin-sparse collagen matrices by matrix metalloproteinases (MMPs) and cysteine cathepsins." The bond degradation observed in vitro is manifested in loss of retention and degradation of margins in clinical trials. A recent meta-analysis of clinical trials of cervical restorations revealed retention loss rates ranging from 0 to 50% and marginal discoloration rates of 0 to 74%.[17] Clinical performance was best for the three-step etch-and-rinse and two-step self-etch systems, as indicated by recently reported long-term clinical trials.[18–20] Even with the most effective adhesives, bonding of resin-based restorations in the cervical area can be compromised by the common presence of sclerotic dentin, which is less receptive to bonding than normal dentin.[21] Unfortunately, sclerotic dentin is commonly present with chronically exposed root surfaces.

In addition to the inherent problems of retention and leakage, poorly adapted or contoured cervical restorations may also compromise periodontal health. The restorative materials themselves can affect the bacterial flora. For example, Paolantonio et al[22] reviewed the clinical and microbiological effects of different restorative materials on periodontal tissues adjacent to Class 5 restorations. They concluded that composite resin restorations can have negative effects on the quantity and quality of subgingival plaque, increasing total bacterial counts with a decrease of gram-positive aerobic bacteria and a significant increase of gram-negative anaerobic bacteria.

The addition of a connective tissue graft to cover root surfaces could raise concern for creation of a periodontal pocket. Minimal probing depth is desirable following root coverage procedures. In 1980, Cole et al showed for the first time that new attachment in humans was possible.[23] Using this same strategy for new attachment with gingival grafting, human histology has shown connective tissue grafting surgery can achieve new attachment to a previously exposed root surface.[24,25] The use of a connective tissue graft with a bilaminar technique is well established.[26]

The Miller classification of recession provides guidelines for predictability of root coverage.[27] Modern gingival augmentation techniques can offer predictability in root coverage, regeneration of attachment, and cosmetics.[28–30] It has been shown that periodontal root coverage procedures are highly predictable for Class I and II recessions even when root surface defects are present and success rates for complete root coverage range from 92% to 99% and are stable over time.[31,32]

Case reports

Case 1

A 50-year-old nonsmoking man was referred to the periodontal practice due to multiple failing Class 5 restorations and Miller Class I recession defects. The patient was also concerned about the black lines around his existing restorations, pitting of the surfaces, and gingival inflammation (Fig 1a). A treatment plan was established to remove the cervical restorations and provide a connective tissue graft procedure for teeth 11 and 21.

In all of the following cases, the composite restorations and/or carious lesions were removed using a surgical dissecting microscope, rotary, and hand instruments. The microscope enhanced visibility to ensure that the entire composite was removed. After thorough debridement and smoothing of all root surfaces, tetracycline paste was applied for 2 minutes. Tetracycline was used for removal of the smear layer and exposure of the dentinal collagen fibers.

The Nordland N-6900 microsurgical blade was used to make a split-thickness sulcular incision around all facial surfaces, including undermining the interdental papilla to avoid releasing incisions (Fig 1b). The N-6900 blade was customized using orthodontic bending pliers to create the precise contours needed to mimic the anatomy of the area (Fig 1c). The split-thickness dissection is extended past the mucogingival junction to allow for mobility of the undermined facial flap (Fig 1d).

Palatal connective tissue was harvested with precise dimensions to be long enough to extend to the line angles of the adjacent teeth. The graft was placed inside a tunnel-type recipient bed by

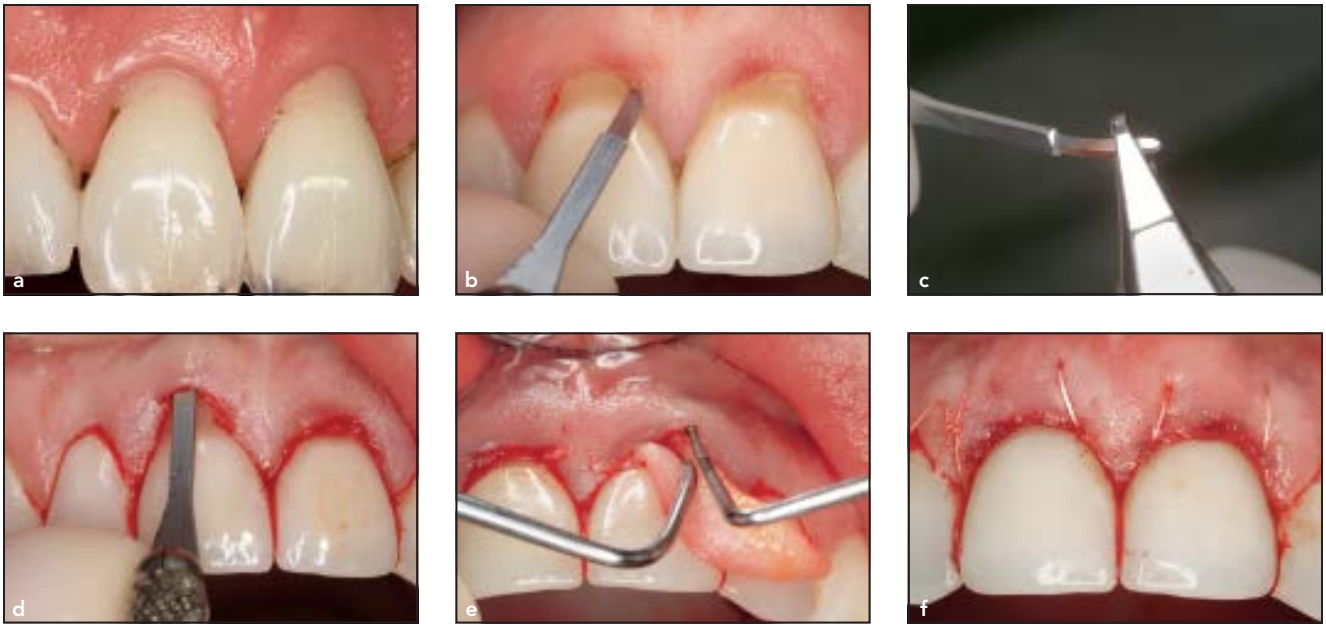

Fig 1a *Failing Class V composite restorations of teeth 11 and 21 with microleakage.*
Fig 1b *Intrasulcular incision performed with the N-6900 microscalpel.*
Fig 1c *Customization of the N-6900 blade wth orthodontic pliers.*
Fig 1d *Split-thickness dissection extending past the mucogingival junction.*
Fig 1e *Connective tissue graft manipulated into the tunnel.*
Fig 1f *Gore-Tex sutures anchor graft into ideal location.*
Fig 1g *Surgical healing after 2 months.*

manipulating it with a periodontal probe and curet (Fig 1e). A continuous 5-0 Gore-Tex suture was used to provide positioning of the external flap over the graft with no graft exposure, which could otherwise jeopardize cell survival (Fig 1f). The Gore-Tex suture allows custom tensioning of the flap for ideal positioning. The patient was followed for 2 months to monitor the surgical healing (Fig 1g).

Case 2

A 36-year-old nonsmoking woman presented to the periodontal practice for consideration for gingival augmentation. She had visited her restorative dentist, who recommended placement of maxillary anterior veneers. A diagnostic wax-up indicated that re-establishing normal gingival contours would be ideal as the restorations covered previous recession defects and the restorative dentist wished to place the restorative margins on enamel for a normal tooth length and to maximize the restorative bond strength to enamel. This would require removal of the composite material and gingival augmentation to the cementoenamel junction (CEJ). This patient presented with Miller Class I recession defects ranging from 2 mm to 3.5 mm (Fig 2a).

Fig 2a *Preoperative view showing recession defects covered with Class V composite restorations.*

Fig 2b *Final healing following restoration removal and connective tissue graft surgery.*

Fig 3a *Extensive recession and a Class V restoration.*

Fig 3b *Healing 6 weeks after connective tissue graft surgery.*

The composite was removed using a surgical microscope and rotary instruments. The root surfaces were treated with tetracycline hydrochloride. A microsurgical tunnel was created using an N-6900 microsurgical blade. Bilateral connective tissue grafts were placed into the tunnel without graft exposure, creating a bilaminar vascular supply. A trap door incision was used to minimize postoperative discomfort and allow for a closed palatal wound. Full root coverage was achieved through the use of connective tissue grafts. The patient was followed postoperatively for 2 months before returning to the restorative office to complete veneer restorations (Fig 2b).

Case 3

A 45-year-old nonsmoking woman presented to the periodontal practice with a history of multiple Class 5 restorations for tooth 23, which had a Miller Class II recession defect. Teeth 22 and 24 had Miller Class I recession defects (Fig 3a). The referring dentist and patient were both concerned with the progressive recession associated with the restorative retreatment.

The restoration was completely removed with hand and rotary instruments and gingival augmentation was accomplished for teeth 22 and 23 using a connective tissue graft harvested from the maxillary left palate, which was then placed into a tunnel created with N-6900 microsurgical blades without a releasing incision. The graft was stabilized with 6-0 Gore-Tex sutures, and the healing was monitored for 6 weeks. Even though tooth 24 was not part of the treatment plan, it benefited from the procedure by its close proximity to the targeted area (Fig 3b).

Case 4

A 55-year-old nonsmoking man was referred to the periodontal practice for treatment of tooth 43, which had a Miller Class II recession defect. This tooth had a failing composite restoration, 7 mm of obvious gingival recession, and an additional 4 mm of gingival cleft, creating a total of 11 mm recession (Fig 4a). The composite was removed and a connective tissue graft placed as described previously to provide root coverage with a biologic restoration using autogenous connective tissue (Fig 4b).

Case 5

A 50-year-old nonsmoking woman wanted veneer restorations but had experienced significant root decay along with a Miller Class II recession on tooth 13. The canine had a

Fig 4a *Tooth 43 with 11 mm of recession and a failing Class V composite restoration.*

Fig 4b *Root coverage was achieved through removal of the restoration and connective tissue graft surgery.*

Fig 5a *Recession defects and severe tooth decay on tooth 13.*

Fig 5b *Postoperative view 6 years after caries lesion removal and connective tissue surgery.*

guarded prognosis both functionally and esthetically due to root caries. Teeth 12 and 14 had also experienced recession to a lesser degree (Miller Class I) (Fig 5a).

The caries lesion was removed, all roots were mechanically and chemically treated as previously described, and a connective tissue graft was placed microsurgically using a tunneling procedure. The new gingival margin was established at the CEJ to provide an esthetic foundation for the planned restorations with gingival tissue symmetry across anterior maxilla. The patient was followed for 6 years with minimal pocket probing depth (Fig 5b).

Discussion

While gingival grafting over root surfaces is predictable, bonding to root surfaces is not. Even under the best circumstances, root bonding creates an unesthetic long clinical crown and a questionable long-term result.

Ideally, grafted gingival tissue should establish a new attachment back to the previously exposed root surface with a natural tissue appearance and should do so with predictability. Minimal probing depth and long-term success should be goals. A biologic rationale for new attachment has been well established with demineralization of the root surface,[23] and this rationale has shown clinical success with human histology following successful gingival root coverage procedures.[24,25] Tetracycline preparation has been demonstrated to be effective for removal of the smear layer, thereby exposing dentinal tubules and the dense network of collagen fibers that make up the dentin structure.[33]

Successful root coverage grafting has been well documented.[27,31,32] According to Winter and Allen, restorations of cervical lesions should be avoided to circumvent the dilemma of restoring the pathologic dentin.[34] Periodontal root coverage procedures are the preferred method of treatment because of the high predictability for complete root coverage.[34] In a study evaluating the level of root coverage with connective tissue grafts in humans, Harris found that all grafts were successful in producing root coverage, with a mean root coverage of 97.7% in Class I or II defects.[35] The results of soft tissue grafting are stable and have been shown to last for at least 10 years.[36]

Development and refining of surgical root coverage techniques have enhanced the predictability and esthetics. Soft tissue grafting can be a minimally invasive procedure and, unlike restorative materials, replace the lost anatomical structure (gingiva) with autogenous tissue. Therefore, a soft tissue graft

can create ideal esthetics by bringing the gingiva back to the CEJ. Gingiva will insulate the root from thermal changes and can create new attachment to a previously diseased root surface with a stable and shallow probing depth at the end of the healing period.[24,25]

Microsurgical blades should allow for minimal incision access and a customized approach, creating insignificant trauma. A tunnel approach avoids scarring. Trauma associated with harvesting autogenous connective tissue from the palate can be minimized by keeping all the palatal epithelium in situ and using a palatal stent to protect the area.

Additionally, coverage of previously carious root surfaces with connective tissue grafts is very predictable and similar to that of intact roots, providing esthetic, biologically acceptable, and maintainable results.[37] After root surface caries are removed, the exposed root presents a similar clinical challenge to noncarious root surfaces for root coverage grafting, and the treatment is equally predictable.[37]

Interdisciplinary care is sometimes necessary. It is theorized that tooth flexure with occlusal forces can cause loss of enamel at the CEJ, creating what has been termed an *abfraction*.[38,39,40] If cervical enamel is lost, the CEJ can be identified and replicated according to the location of the CEJ of contralateral homologous or adjacent teeth.[41] A composite restoration may be used to reconstruct the CEJ, while the connective tissue graft will reconstruct the missing soft tissue.

Some investigators have gone so far as to suggest that a periodontist should be consulted before placement of restorative materials on the roots to assess the potential for future use of gingival grafts for root coverage, as placement of any bonded restoration prior to grafting might diminish the success rate of such procedures.[42]

Conclusions

The need for and usefulness of root surface restorations is limited because current alternatives are available not only to restore the lost gingiva but also to protect the root from sensitivity and caries while restoring a natural esthetic result.

Root coverage with connective tissue grafts for carious and noncarious lesions has been proven to be predictable. The benefits of replacing the missing tissue with gingiva should be considered among the treatment options available when recession exists.

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