Benco Dental™
We deliver success smile after smile.®
800.GO.BENCO • benco.com

ADA C·E·R·P®
Continuing Education Recognition Program
ACCEPTED NATIONAL PROGRAM
PROVIDER FAGD/MAGD CREDIT

These courses have been designed specifically to meet the needs of busy professionals like you, who demand efficiency, convenience and value. Begin your Benco educational experience with this course today, and watch the mail for live CE events in your area.

Tissue Management, Gingival Retraction and Hemostasis

2 CONTINUING-EDUCATION CREDITS

Howard E. Strassler, DMD, FADM, FAGD
Professor, Division of Operative Dentistry
Department of Endodontics, Prosthodontics and Operative Dentistry
University of Maryland Dental School
650 West Baltimore Street
Baltimore, Maryland 21201
E-mail: hstrassler@umaryland.edu

COURSE OBJECTIVES

At the completion of this program, the participant will be able to:

- List the clinical situations where gingival retraction are beneficial in restorative dentistry
- List the different methods of gingival retraction and hemostasis
- List three different types of gingival retraction cord
- List different astringents used in dentistry for retraction and hemostasis

COURSE SPONSOR

Benco Dental is the course sponsor. Benco's ADA/CERP recognition runs from November 2009 through December 2013. Please direct all course questions to the director: Dr. Rick Adelstein, 3401 Richmond Road, Suite 210, Beachwood, OH 44122. Fax: (216) 595-9300. Phone: (216) 591-1161. E-mail: toothdoc@core.com

SCORING & CREDITS

Upon completion of the course, each participant scoring 80% or better (correctly answering 16 of the 20 questions) will receive a certificate of completion verifying two Continuing Dental Education Units. The formal continuing-education program of this sponsor is accepted by the AGD for FAGD/MAGD credit. Term of acceptance: November 2009 through December 2013. Continuing-education credits issued for participation in this CE activity may not apply toward license renewal in all states. It is the responsibility of participants to verify the requirements of their licensing boards.

COURSE FEE/REFUNDS

The fee for this course is $54.00. If you are not completely satisfied with this course, you may obtain a full refund by contacting Benco Dental in writing: Benco Dental, Attn: Education Department, 295 CenterPoint Boulevard, Pittston, PA 18640.

PARTICIPANT COMMENTS

Any participant wishing to contact the author with feedback regarding this course may do so through the course director: Dr. Rick Adelstein, 3609 Park East Dr., Suite 404, Beachwood, OH 44122. Fax: (216) 595-9300. Phone: (216) 591-1161. E-mail: toothdoc@core.com

RECORD KEEPING

To obtain a report detailing your continuing-education credits, mail your written request to: Dr. Rick Adelstein, 3401 Richmond Road, Suite 210, Beachwood, OH 44122. Fax: (216) 595-9300. Phone: (216) 591-1161. E-mail: toothdoc@core.com

IMPORTANT INFORMATION

Any and all statements regarding the efficacy or value of products or companies mentioned in the course text are strictly the opinion of the authors and do not necessarily reflect those of Benco Dental. This course is not intended to be a single, comprehensive source of information on the given topic. Rather, it is designed to be taken as part of a wide-ranging combination of courses and clinical experience with the objective being to develop broad-based knowledge of, and expertise in, the subject matter.

COURSE ASSESSMENT

Your feedback is important to us. Please complete the brief Course Evaluation survey at the end of your booklet. Your response will help us to better understand your needs so we can tailor future courses accordingly.

WHY TAKE THIS COURSE?

To properly manage gingival tissues and improve your ability to manipulate all necessary instruments for each procedure.

PATIENT CARE — Overcoming the challenges of treating the oral cavity in restorative dentistry due to constraints of the lips, tongue and cheeks.

CONVENIENCE — Continue your education without traveling, taking time away from work and family or paying high tuition, registration and materials costs.

CE CREDITS — Successful completion of this course earns you two Continuing Dental Education Units.

HIGH QUALITY — Authored for dental professionals, by dental professionals, Dental U® continuing-education courses are engaging, concise and user-friendly.

WHO SHOULD TAKE THIS COURSE?

Dentists, Dental Assistants and Dental Hygienists.

THE ORAL CAVITY IS A DIFFICULT AREA TO TREAT IN RESTORATIVE DENTISTRY because of the constraints of the lips, tongue and cheeks, challenges for access to visualize and manipulate instruments, as well as the position of the teeth that are being treated relative to the gingival tissues — which bleed if improperly managed. While for operative dentistry and single-tooth restorations, the use of the dental dam provides control of the field and access to tooth preparation and restoration, there are many times in restorative dentistry that use of the dental dam is precluded. There are times that caries or non-carious cervical lesions are at or below the free margin of the gingiva — as well as, for fixed prosthodontics, crown or inlay/onlay margins are at or below the free margin of the gingiva and access to them for preparation, impressioning and cementation is impossible without additional techniques to displace the gingival tissues and control gingival hemorrhage and sulcular fluids.

One of the most challenging aspects of crown and bridge is management of the gingival tissues when making an impression. Tissue management includes placing the gingival tissues away from the preparation margins so they can be impressed, combined with providing for hemostasis when the gingival tissues are susceptible to bleeding.[1, 2] The rationale for tissue management is a critical aspect of impression making, whether the impression is made with a conventional impression material or by a digital impression technique so that all tooth preparation margins are captured in the impression to assure an excellent marginal fit of a laboratory fabricated restoration.[1, 3] From this, the final restoration will be well adapted to the tooth preparation so that when cemented, the restoration will prevent recurrent caries, tooth sensitivity and gingival irritation.

Tissue management is also critical for placement of direct restorative materials, especially for the restoration of Class V lesions. In our practices we have seen a significant increase in Class V cervical lesions. Whether these lesions are carious (Fig. 1) or non-carious cervical lesions (Fig. 2), when these teeth need restoration, the cervical margin can be difficult to access due to both the extent of the lesion and the need for a dry, controlled field when placing the restoration — whether it be composite resin or glass ionomer.

Table 1
Partial listing of gingival retraction cords

NAME	TYPE	IMPREGNATED	MANUFACTURER
Fas-Tract	knitted	none	Benco
Fas-Tract	knitted	epinephrine	Benco
Crown-Pak	twisted	epinephrine	Gingi-Pak
Gel-Cord	braided	aluminum sulfate	Pascal
GingiBraid+	braided	none	DUX Dental
GingiBraid+	braided	epinephrine/alum	DUX Dental
GingiBraid+	braided	aluminum potassium sulfate	DUX Dental
GingiCord	twisted	epinephrine/alum	DUX Dental
GingiGel	braid	precoated aluminum chloride	DUX Dental
GingiKNIT	knitted	none	DUX Dental
GingiKNIT	knitted	aluminum sulfate	DUX Dental
Hemodent Cord	braided	aluminum chloride	Premier Dental
Knittrax	knitted	none	Pascal
Pascord	twisted	aluminum sulfate	Pascal
Racord	twisted	epinephrine	Pascal
Racord Two	twisted	zinc phenolsulfonate/epinephrine	Pascal
Retrax	twisted	none	Pascal
Roeko Stay-Put Retraction Cord	braided	none	Coltene/Whaledent
Sil-Trax	braided	aluminum sulfate	Pascal
Sil-Trax	braided	epinephrine/zinc phenolsulfonate	Pascal
Sil-Trax	braided	epinephrine	Pascal
Sil-Trax	braided	none	Pascal
UniBraid+	braided	aluminum potassium sulfate	DUX Dental
UniBraid+ (unit dose/precut)	braided	epinephrine	DUX Dental
UltraPak (unit dose/precut)	knitted	none	Ultradent
Z-Twist	twist	aluminum sulfate	Gingi-Pak
Z-Twist	twist	epinephrine	Gingi-Pak
Z-Twist	twist	none	Gingi-Pak


FIG. 1


FIG. 2

FIG. 1: Class V carious lesions where gingival retraction will be necessary to prepare and restore. **Fig. 2:** Class V non-carious cervical lesions (NCCL) where gingival retraction would be useful to control the field when restoring.

No matter what the circumstance for soft-tissue mangement for restorative dentistry, the goal for managment of gingival tissues requires that the periodontium be in a state of health. As part of any comprehensive treatment plan, especially if a restorative intervention is required and there is need for control of the gingival tissues, that the teeth be cleaned and the periodontium brought to a state of health. With this accomplished, restoration will be more easily accomplished. Management of the gingival tissues for access, visualization, maintaining a controlled field for restoration placement and cementation can be accomplished with a variety of techniques. This article will provide the clinician with an overview of the techniques available for clinical situations that are frequently encountered.

Techniques for Soft-Tissue Management, Displacement Retraction and Hemorrhage Control

Mechanical Methods

Among the first techniques developed and available to clinicians for displacement

FIG. 3

FIG. 4

FIG. 5

FIG. 6

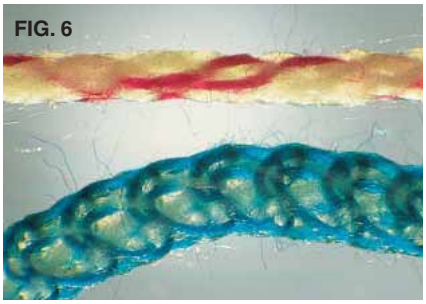


FIG. 3: Dispensing GingiBRAID+ with ShortCut (DUX Dental) click dial dispensing to length desired. **Fig. 4:** Built-in cutter on ShortCut dispenser to cut to length needed. **Fig. 5:** Placement of braided cord for retraction for a Class V carious lesion with a smooth, non-serrated cord placement instrument (Fischer UltraPak Packer, Ultradent). **Fig. 6:** Comparison of braided cord (top) and knitted cord (bottom).

of gingival tissues, especially for crown and bridge impressions, were mechanical displacement. Mechanical displacement refers to physically moving the gingival tissues aside from the tooth/tooth preparation margins to allow for visualization and access for treatment.[1, 2, 4, 5] In many cases, the materials used for gingival retraction can be used by themselves or in combination with other materials and techniques.

One of the earliest techniques for mechanical displacement of gingival tissues for restoration was the use of the dental dam. Specialized gingival retraction retainers (clamps), when placed, displace the gingival tissues to allow for access for tooth preparation and restoration.[6] The use of gingival retraction clamps has also been described to provide access for scaling and root planing.[7]

Among the most popular methods of gingival displacement is the use of gingival retraction cord.[1, 2, 4, 5, 8-10] Gingival retraction cords can be woven, braided or twisted in a variety of configurations to provide for different diameters and thicknesses (Table 1). They are typically dispensed from containers or bottles and cut to length. The cord is usually dispensed by pulling the cord from a bottle using a cotton pliers and cutting with a scissors. Hemodent Cord (Premier) has addressed this problem by dispensing its braided and twisted cords in self-cutting plastic dispensing boxes. These techniques have the risk of contamination of the retraction cord. Some recent innovations have addressed this shortcoming of cord dispensing. Unit dose dispensing of retraction cords has been introduced where the chemically treated braided cord is pre-cut and individually packaged in 2-inch lengths (UniBraid+, DUX Dental). Of issue is that there is the need for different lengths of cord for different clinical situations and for the various diameters of teeth. There have been no measuring tools as part of the dispensing system, so it is not uncommon to dispense too short a cord, or too long a cord, for the clinical indication. Most clinicians and their chairside dental assistant err by dispensing too long a section of retraction cord that is more difficult to manage when placing the cord into the gingival sulcus. It must then be cut intraorally to the length desired.

This shortcoming in cord dispensing and cutting has been addressed with the introduction of an all-in-one delivery system that combines convenience, efficiency and effectiveness in gingival retraction cord dispensing and cutting.[11] This system, ShortCut (DUX Dental) dispenses the braided gingival retraction cord (GingiBRAID+) by merely turning the click-stop dial of the ShortCut device the number of clicks specific to the length of cord needed. (Fig. 3) Typically 3-4 clicks provides a length of braided cord for an anterior tooth; 4-5 clicks for a premolar; and 5-6 clicks for a molar. Large molars, in this author's experience, require five clicks for the needed length. Once dispensed, the built-in cutter is activated and pushed in with firm pressure, dispensing to the length needed for your clinical procedure. (Fig. 4) The ShortCut device has proven itself to be both durable and easily disinfected. ShortCut is available in braided cord diameters sizes 0, 1 and 2. It is provided as non-impregnated, allowing the clinician to choose the astringent-hemostatic agent, or the GingiBraid+ can be used impregnated with 8% racemic epinephrine/7% aluminum potassium sulfate or impregnated with 10% aluminum potassium sulfate and still allow for soaking in an astringent-hemostatic agent.

The choice of gingival retraction cord has proven itself to be one of personal preference by the clinician. Keep in mind that different cord types offer a variety of properties that to some make them more desirable. Also, as will be reviewed later in this article, many manufacturers have a range of options of non-impregnated and chemically impregnated cords. Some clinicians prefer twisted cords so they can hand-twist the cord to be tighter when placed in the sulcus — and, as the cords untwist, they expand, creating a physical effect of expanding the sulcus for access.

The preference for braided cords relates to their tight and consistent weave. They provide two benefits: First, braided cords for many clinicians are easier to place in the gingival sulcus with packing-placement instruments, both serrated and smooth, non-serrated, because they are solid and can be pushed into place. (Fig. 5) Some braided cords are not only impregnated with astringent-hemostatic agents but are covered with a gel of that reagent (Gel-cord, Pascal; GingiGel Coated Braid, DUX Dental). A braided cord wrapped around an ultrathin copper wire (Roeko Stay-Put Retraction Cord, Coltene-Whaledent) is described as being more stable in the sulcus once placed. Some recent improvements in braided cords (e.g., GingiBraid+) have a modified weave with a unique cotton yarn to allow the cord to have less memory. In this author's hands, this braided cord has offered more precise placement with minimal soft-tissue damage. Also, the change in the yarn used for the braided weave allows the cord to be significantly more absorbent and not split or tear during placement. This superior absorbency contributes to increase absorption of gingival fluids in the sulcus, as well as a swelling effect in the sulcus which contributes to improved retraction for better visualization of margins when making an impression.

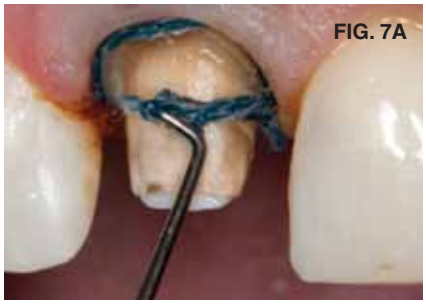


FIG. 7A

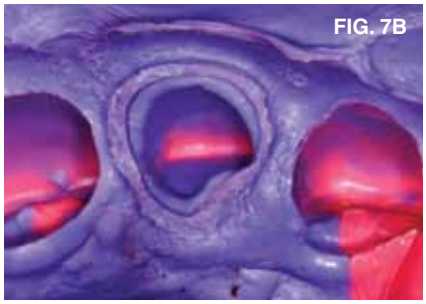


FIG. 7B


FIG. 8


FIG. 9

FIG. 7A: Placement of knitted cord (UltraPak, Ultradent) for central incisor crown preparation using a double-cord technique. **Fig. 7B:** Impression demonstrates excellent gingival retraction for making an impression of the subgingival crown margins. **Fig. 8:** Dual-packing blade of TN010 Double Cord Packer (Garrison Dental Solutions). **Fig. 9:** Placement of braided cord (GingiBraid+) for crown preparation.

Knitted cords have increased in popularity. Among the major benefits of knitted cords is their unique knitted weave (Fig. 6), which minimizes unraveling and fraying after cutting and during cord placement. Knitted cords offer easy placement, and they expand when wet, opening up the sulcus greater than the original diameter of the cord.[1, 2] The knitting and yarn selection allows for a greater range of knitted cotton cord diameters/sizes. In this author's experience, when using knitted cord, a smooth, non-serrated placement instrument allows for precise placement without pulling the cord out of a gingival sulcus. Also, the range of sizes/diameters allow for placement in both the easy-to-access gingival sulcus and the tighter, healthier gingival sulcus. (Fig. 7)

When describing mechanical displacement of gingival tissues with gingival retraction cords, one would be remiss if there were no mention of retraction cord placement packing instruments. There are many different instruments that have been described.[1] Key to placement of cord with instruments is that the end of the cord packer be thin enough to be placed in the gingival sulcus without damaging the gingival tissue and potentially causing bleeding; and that the angle of the instrument allow for orientation so that cord placement can be accomplished around all surfaces of the tooth. In this author's experience, the use of standard off-angle plastic filling instruments (PFI) is inappropriate due to the thickness of the blade. Also, there is variation in the size, length and shape of the end of the blade of the cord-packing instrument. Most commonly, the clinician will use double-ended instruments. Recently a novel double-ended instrument with multiple orientations of a dual-packing blade (TN010 Double Cord Packer, Garrison Dental Solutions) has been introduced so that the instrument does not need to be twirled to get the end orientation needed (Fig. 8). A good friend, Dr. Bob Margeas, designed this instrument because when using magnification, he found that this design maintains the instrument in the field of view while packing cord around the tooth.

Which are better, serrated or smooth cord-packer blades? For braided and twisted cords, both serrated and smooth cord packers work well (Fig. 9); for knitted cords, smooth cord-packing instruments are less likely to pull the cord from the sulcus during placement (Fig. 10). If you are satisfied with your cord-packing instrument, there is no need to change. If you desire an instrument to manage shortcomings with your current instrument, it would be worthwhile, at the next dental meeting you attend, to seek out manufacturers that provide excellent cord-packing instruments (Table 2).

Recommendations for improved gingival retraction with cord include use of a double-cord technique where a thin-diameter cord is placed to the base of the gingival sulcus without overlap, and cut to be flush within the sulcus. This cord is maintained during the impression to control any bleeding from the base of the sulcus. A second, wider-diameter cord is placed on top of the first cord to achieve tissue displacement. Immediately before making the impression, the cord should be wetted with water so as not to grab and tear the gingival tissues, which can create bleeding. The cord is removed and the impression is made immediately while leaving the first cord in place. Once the cord is removed, the retraction is maintained for only 30 seconds.[1]

Helpful hint: From this author's experience, if bleeding is persistent when the first cord is removed, continue with the impression, making certain to syringe the impression material within the sulcus. Even with the expectation that the impression will be unsuccessful, this impression will maintain the retraction while allowing for hemostasis. Remove the first impression and *do not* look at it. Immediately make a second impression. The sulcus will still be open and will not be bleeding.

One other method of mechanical displacement for gingival retraction includes making the impression at the same time. The use of copper tubes or copper bands to displace soft tissue for impressions for crown preparations requires that a fitted copper band be cut to shape, contoured and fitted to beyond the crown preparation margins.[4, 5, 12] The fitted band is filled with an elasomeric impression material, compound or a combination of acrylic resin and then relined with rubber base to simultaneously displace the gingival tissue and make the impression.

Table 2
Partial listing of manufacturers that provide cord-packing instruments

MANUFACTURER	WEB SITE
Garrison Dental Solutions	garrisondental.com
Gingi-Pak	gingi-pak.com
Hu-Friedy	hu-friedy.com
Miltex	miltex.com
Pascal	pascaldental.com
Premier Dental Products	premusa.com
Ultradent Products	ultradent.com

Mechanicochemical Methods

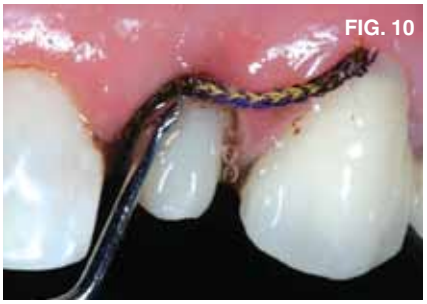
A variety of chemical solutions and gels have been recommended for use with gin-

gival retraction cords because of the properties as drugs to act as an astringent or hemostatic agent.[1, 2, 4] In most cases, these drugs are both astringent, causing contraction-retraction of the gingival tissues, and hemostasis, constricting blood flow through coagulation. When these reagents are placed on a retraction cord, they cause a transient ishemia, shrinking the gingival tissue and blood vessel coagulation. Common astringent-hemostatic agents include ferric sulfate, aluminum chloride and racemic epinephrine. As previously stated, gingival retraction cords are available unimpregnated or impregnated with the aforementioned astringent-hemostatic agents, as well as aluminum potassium sulfate, aluminum sulfate, racemic epinephrine and zinc phenolsulfonate/racemic epinephrine, among others. Chemically impregnated cords offer greater sulcus displacement with the combined physical and chemical effect.[1] Also, cord diameter, astringent-hemostatic agent and cord type have a direct effect on the physical properties of the cord.[13] In some cases, both solutions and gel formulations are recommended for direct placement into the gingival sulcus with specialized tips (Astringedent, Ultradent; ViscoStat, Ultradent; Racecord, Septodont) to achieve a hemostatic effect with some ischemic effect before cord placement.

A 20–25% aluminum chloride and 15.5–20% ferric sulfate are among the most popularly used chemical reagents.When used for durations within the gingival sulcus of less than 10 minutes, they cause minimal tissue damage.[1, 2, 14] There has been concern over the use of an 8% racemic epinephrine impregnated cord.[4, 15-18] It has been reported that epinephrine-impregnated cords should be used with care. It has been reported that an 8% racemic epinephrine cord can cause elevation in blood pressure and tachycardia, especially if the gingival tissue is bleeding due to laceration.[16] In fact, it has been demonstrated that no clinical benefit in gingival retraction could be recognized between an epinephrine-containing cord and other cords.[17] A systematic review of the dental literature of cardiovascular effects of epinephrine-containing anesthetic agents and epinephrine-impregnated cords was done to identify any additional risks of adverse cardiovascular outcomes to hypertensive individuals.[18] Although the increased risk for adverse events among uncontrolled hypertensive patients was found to be low, and the reported occurrences of adverse events in hypertensive patients associated with the use of epinephrine in local anesthetics minimal, the quantity and quality of the pertinent literature is problematic.[18]

Table 3
Cordless gingival retraction

PRODUCT	MANUFACTURER
Expasyl	Kerr
GingiTrac	Centrix
Magic Foam Cord	Coltene/Whaledent
Racegel	Septodont
Traxodent	Premier Dental



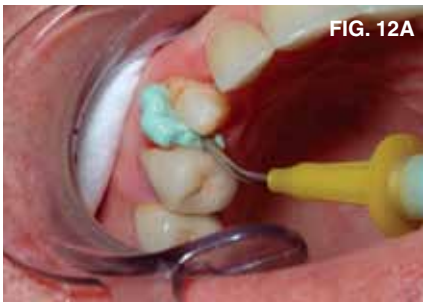


FIG. 10: Placement of knitted cord (UltraPak) for crown preparation. **FIG. 11A:** Crown preparation maxillary central incisor. **FIG. 11B:** Placement of GingiTrac paste (Centrix) into gingival sulcus before reseating putty matrix to force paste into sulcus for retraction. **FIG. 11C:** Impression for crown demonstrating the retraction accomplished by the GingiTrac cordless retraction system. **FIG. 12A:** Syringing the retraction paste into the sulcus prior to inserting the compression cap. **FIG. 12B:** GingiCap compression cap placed over the crown preparation to push the paste into the sulcus.

Of special note, the solutions that are used as astringents and for hemostasis are acidic. There has been evidence demonstrating that the use of these products removes the smear layer.[19, 20] There is concern that if the root surfaces beyond the crown preparation margins are exposed to these solutions, there may be an increase in postoperative sensitivity. If, as a clinician, you have this problem, it is recommended that after making the impression and before cementation of the provsisional restoration, the preparations be treated with a desensitizing agent such as Gluma (Heraeus-Kulzer) or Calm-It (Dentsply Caulk).

Cordless Retraction

In most cases, gingival retraction cord is the most effective method for retracting tissue to the depth of the sulcus. Unfortunately, many times on the day of the tooth preparation, gingival bleeding is difficult to control — or, when packing a cord into the sulcus, the tissues start to bleed, making impression difficult or impossible. For this reason, a new class of gingival retraction materials have been introduced (Table 3).

These cordless retraction materials provide for excellent hemostasis and some gingival retraction. Some of the materials incorporate the use of a compression cap to enhance the retraction effects of the material.

GingiTrac (Centrix) was an improvement over the first-generation cordless retraction and tissue-management material, Retrac (Centrix).[21] The technique for GingiTrac is the use of a heavy-viscosity matrix combined with a light-body retraction/hemostatsis paste for single and multiple tooth preparations (Fig. 11) or for single teeth with a compressible closed foam cap (GingiCap, Centrix)[22] (Fig.12). In this author's experience, another paste-like material, Expasyl (Kerr) provides for excellent hemostasis but minimal retraction even when syringed into the sulcus. A poly vinyl siloxane material (Magic Foam Cord, Coltene-Whaledent) not only pro-vides for hemostasis but also, when used with its compression cap, expands the sulcus to allow for easy access for impression making. GingiTrac and Magic Foam Cord are more easily used for impression techniques; Expasyl can be used for impression techniques and for hemostasis during routine restorative procedures. Clinical studies evaluating Magic Foam Cord and Expasyl demonstrated their effectiveness in cordless retraction and control of bleeding during and after the retraction.[23, 24] Expasyl was found to cause slightly more inflammation than Magic Foam Cord and UltraPak knitted cord, and Expasyl had a higher rate of postoperative dentin hypersensitivity.[23] Also, both products caused less histologic damage than a retraction cord technique.[25]

Using these cordless retraction techniques provide for a non-traumatic, non-invasive tissue management of the sulcus for fixed prosthodontic impressions. Expasyl offers the additional advantage of hemostasis for routine restorative procedures. For the Retrac and Magic Foam Cord, control of the soft tissue for exposing the margins of the tooth preparation using pressure, astringency and time allows the clinician to get predictable gingival retraction and hemorrhage control. These materials and techniques can be used by themselves or in combination with the use of gingival retraction cord, electrosurgery or laser tissue sculpting when bleeding is difficult to control.

Surgical Methods of Gingival Retraction

The use of specialized devices to reshape and remove gingival tissue to control bleeding and to create access to preparation margins has been shown to be successful.[26-28] The surgical method for gingival retraction and exposure of the margins of the tooth preparation has been referred to as "troughing" or "tissue dilation."[26, 27] The first use of this technique was with electrosurgery.[26, 27, 29] In recent years, the use of laser tissue sculpting for gingival retraction has been described.[28] The trough, soft tissue excision, extends from the height of the free margin of the gingiva to a point 0.3–0.4mm apical to the finish line margin of the tooth preparation. The displacement of the soft tissue is accompanied by hemostasis. Unlike other techniques that provide retraction without removal of the gingival tissue, this technique removes gingival tissue and requires soft-tissue healing. It may be problematic in the esthetic zone where the healing and height of the gingival margin has a direct impact on the esthetics of the gingival tissue. Most manufacturers of lasers have specialized tips and settings for this technique. This author has limited experience with these techniques and would recommend that a clinician interested in the use of lasers for soft tissue management review with manufacturers' representatives and colleagues familar with the use of lasers.

Conclusion

There are a variety of techniques and materials that allow the clinician to manage the gingival tissues during restoration and when making an impression. These include gingival retraction cords, chemical reagents, electrosurgery, laser tissue sculpting, copper tube impressions, hydraulic impressions and non-invasive, atraumatic displacement/hemostatic materials. In most cases, gingival retraction cord is the most effective method for retracting tissue to the depth of the sulcus. The other methods have their advantages and indications. In any case, the control of the soft tissue for exposing the margins of the tooth preparation for restoration and impressioning is critical. It would be worthwhile for the clinician to understand all the choices available.

References

1. Rosenstiel SF. Tissue management and impression making. From Contemporary Fixed Prosthodontics editors Rosensteil, Land and Fujimoto. 4th edition, Mosby-Elsevier, St. Louis, MO. 2006, pp. 431-465.
2. Morgano SM, Malone WF, Gregoire SE, Goldenberg BS. Tissue management with dental impression materials. Am J Dent. 1989; 2:279-84.
3. Wostmann B, Rehmann P, Trost D, Balkenhol M. Effect of different retraction and impression techniques on marginal fit of crowns. J Dent. 2008; 36:508-12.
4. Benson BW, Bomberg TJ, Hatch RA, Hoffman, Jr W. Tissue displacement methods in fixed prosthodontics. J Prosthet Dent. 1986; 55:175-81.
5. Porzier J, Benner-Jordan L, Bourdeau B, Losfeld R. Access to the intracrevicular space in preparations for fixed prosthesis. Cah Prothese. 1991; 73:6-20.
6. Wilder Jr AD, May Jr KN, Strickland WD. Isolation of the operating field. From Art and Science of Operative Dentistry. 3rd Ed. Editors: Sturdevant DM, Roberson TM, Heymann HO, Sturdevant JR. Mosby. St Louis, MO. 1995. pp. 378-405.
7. Brinker HA. Access- the key to success. J Prosthet Dent. 1972; 28:391-4.
8. Al-Ani A, Bennani V, Chandler NP, Lyons KM, et al. New Zealand dentists' use of gingival retraction techniques for fixed prosthodontics and implants. N Z Dent J. 2010; 106(3):92-6.
9. Hansen PA, et al. Current methods of finish-line exposure by practicing prosthodontists. J Prosthodont. 1999; 8:163.
10. Kumbuloglu O, User A, Toksavul S, Boyacioglu H. Clinical evaluation of different retraction cords. Quintessence Int. 2007; 38(2):e92-8.
11. Strassler HE. Convenient, accurate retraction cord dispensing. Inside Dent. 2011; 7(1): 84-6.
12. Singer IL. Simplified copper tube impressions for full crown coverage. J Prosthet Dent. 1976 36:588-92.
13. Del Rocio Nieto-Martinez M, Maupome G, Barcelo-Santana F. Effects of diameter, chemical impregnation and hydration on the tensile strength of gingival retraction cord. J Oral Rehabil. 2001; 28:1094-100.
14. Akca EA, Yildrim E, Dalkiz M, Yavuzyilmaz H, et al. Effects of different retraction medicaments on gingival tissue. Quintessence Int. 2006; 37:53-9.
15. Donovan RE, Gandara BK, Nemetz H. Review and survey of medicaments used with gingival retraction cords. J Prosthet Dent. 1985; 53:525-31.
16. Pelzner RB, et al. Human blood pressure and pulse rate response to racemic epinephrine retraction cord. J Prosthet Dent. 1999; 39:287.
17. Jokstad A. Clinical trial of gingival retraction cords. J Prosthet Dent. 1999; 81:258-61.
18. Bader JD, Bonito AJ, Shugars DA. A systematic review of cardiovascular effects of epinephrine on hypertensive dental patients. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2002; 93:647-53.
19. Land MF, et al. Disturbance of the dentinal smear layer by acidic hemostatic agents. J Prosthet Dent. 1994; 72:4.
20. Land MF, et al. Smear layer instability caused by hemostatic agents. J Prosthet Dent 1996; 76:477.
21. Strassler HE. Cordless gingival retraction with Retrac. Contemporary Esthetics and Restorative Practice. 1999 3(8):64-66.
22. Strassler HE, Polhaus J, Cordless gingival retraction and hemostasis. Contemp Esthet. 2006; 10(7):64-66.
23. Al Hamad KQ,r WZ, Alwaeli HA, Said KN. A clinical study on the effects of cordless and conventional retraction techniques on the gingival and periodontal health. J Clin Periodontol. 2008; 35:-8.
24. Bieir US, Kranewitter R, Dumfahrt H. Quality of impressions after the use of the Magic Foam Cord gingival retraction system- a clinical study of 269 abutment teeth. Int J Prosthodont. 2009; 22:143-7.
25. Phatale S, Marawar PP, Byakod G, Lagdive SB, et al. Effect of retraction materials on gingival health: a histopathological study. J Indian Soc Periodontol. 2010; 14:35-9.
26. Azzi R, Tsao TF, Carranza Jr FA, Kenney EB. Comparative study of gingival retraction methods. J Prosthet Dent. 1983; 50-561.
27. Kelly WJ, Harrison JD. Tissue dilation during multiple cast restorative techniques. Dent Clin North Am. 1982; 26:759.
28. Scott A. Use of an erbium laser in lieu of retraction cord: a modern technique. Gen Dent. 2005 53:116-19.
29. Flocken JE. Electrosurgical management of soft tissues and restorative dentistry. Dent Clin North Am. 1980; 24:247.

1. Displacement of gingival tissues in restorative dentistry may be necessary for

a. restoring Class V carious lesions below the free margin of the gingiva.
b. restoring Class V non-carious cervical lesions (NCCL) below the free margin of the gingiva.
c. for fixed prosthodontic impressions where the margin of the crown preparation is below the free margin of the gingiva.
d. all the above.

2. In this article, the description of tissue management when making impressions for fixed prosthodontics includes:

a. placing the gingival tissue away from the preparation margins.
b. providing soft-tissue hemostasis when the gingival tissues are susceptible to bleeding.
c. surgically creating a soft-tissue flap to reflect the gingiva from the crown margin to visualize the presence of calculus.
d. a and b.

3. The rationale for tissue management is a critical aspect of impression making. The rationale includes both conventional impressions with impression materials and using a digital impression technique.

a. Both statements are true.
b. The first statement is true; the second statement is false.
c. The first statement is false; the second statement is true.
d. Both statements are false.

4. Tissue management is critical for placement of direct restorative materials, especially for Class V lesions. When teeth with Class V lesions need restoration, the cervical margin can be difficult to access due to the extent of the lesion and the need for a dry, controlled field when placing the restoration.

a. Both statements are true.
b. The first statement is true; the second statement is false.
c. The first statement is false; the second statement is true.
d. Both statements are false.

5. The goal of tissue management for restorative dentistry requires that the gingival tissue be in a state of health.

a. True.
b. False.

6. Mechanical methods for gingival retraction when restoring Class V carious lesions that are subgingival include all the following EXCEPT:

a. dental dam (rubber dam) using gingival retraction clamps.
b. gingival retraction cord.
c. wooden wedges.

7. Gingival retraction cord can be woven, braided or twisted. There is only one diameter of cord available to dentists to use.

a. Both statements are true.
b. The first statement is true; the second statement is false.
c. The first statement is false; the second statement is true.
d. Both statements are false.

8. Easy methods of dispensing cord include all of the following EXCEPT:

a. cord dispensed in self-cutting dispensing boxes (Hemodent Cord).
b. precut, individually packaged cord (UniBraid+).
c. 100-inch-long cords dispensed like thread in a sewing machine (The Long and Short of It).
d. all-in-one delivery with a dispensing device that dispeneses and cuts the cord (ShortCut).

9. Gingival retraction cord is a very popular method for gingival retraction.

a. True.
b. False.

10. Gingival retraction cords are available both chemically treated/impregnated with astringents and hemostatic agents and not impregnated. The benefit of a non-impregnated cord is that clinicians can choose their own hemostatic/astringent to use.

a. Both statements are true.
b. The first statement is true; the second statement is false.
c. The first statement is false; the second statement is true.
d. Both statements are false.

11. According to this article, the choice of gingival retraction cord is

a. because one type is much better than other types.
b. personal preference by the clinician.
c. to save money.
d. to save time.

12. Braided gingival retraction cord can be easily used with what type(s) of cord-packing instruments?

a. Smooth, non-serrated cord-packing instruments.
b. Serrated cord-packing instruments
c. Porous, notched, cardboard single-use flexible cord-packing instruments.
d. a and b.

13. In this article, the type of cord-packing instrument recommended for knitted cords is

a. smooth, non-serrated cord-packing instruments.
b. serrated cord-packing instruments.
c. porous, notched, cardboard single-use flexible cord-packing instruments.
d. b and c.

14. Chemical solutions and gels have been recommended for use with gingival retraction cords. These solutions and gels are drugs that

a. act as an astringent causing contraction-retraction of gingival tissue.
b. are anticoagulents to promote gingival bleeding to flush the gingival sulcus of any bacteria before doing the restorative procedure.
c. are hemostatic to control bleeding when doing the restorative procedure.
d. a and c.

15. All of the following drugs are listed in the article for use either as a hemostatic agent or astringent or both EXCEPT:

a. aluminum chloride.
b. ferric sulfate.
c. racemic epinephrine.
d. citric acid.

16. Chemically impregnated cords offer greater sulcus displacement with a combined physical and chemical effect. Also, cord diameter, astringent-hemostatic agent and cord type have no effect on the physical properties of the cord; you need only one large diameter to accomplish the task.

a. Both statements are true.
b. The first statement is true; the second statement is false.
c. The first statement is false; the second statement is true.
d. Both statements are false.

17. The acidity of astringents and hemostatic agents can remove the dental smear layer. There has been concern that using these agents can cause an increase in dentin hypersensitivity of crown margins and the root surfaces beyond the crown margins and an increase in postoperative pain.

a. Both statements are true.
b. The first statement is true; the second statement is false.
c. The first statement is false; the second statement is true.
d. Both statements are false.

18. Cordless retraction refers to the atraumatic placement of hemostatic and astringent pastes into the gingival sulcus to control bleeding and retract the gingival tissues. There have been clinical studies that demonstrate that these techniques are not effective and should be discarded from our practice of dentistry.

a. Both statements are true.
b. The first statement is true; the second statement is false.
c. The first statement is false; the second statement is true.
d. Both statements are false.

19. The use of lasers and electrosurgery for gingival retraction and hemostasis is a surgical method for controlling the soft tissue. The exposure of margins using these devices is referred to as

a. air abrasion.
b. tissue resorption.
c. troughing.
d. tissue redaction.

20. The use of lasers for gingival retraction is effective in creating a space by tissue excision from the height of the gingival margin to a point 0.2–0.4mm apical to the finish line of the tooth preparation. This tissue displacment is accompanied by hemostasis.

a. Both statements are true.
b. The first statement is true; the second statement is false.
c. The first statement is false; the second statement is true.
d. Both statements are false.

Course Order Number [4342-150]

NAME: _____

TITLE: (CIRCLE ONE) DDS DMD RDH CDH RDA CDA EFDA

ADDRESS: _____

CITY: _____ STATE: _____ ZIP: _____

TELEPHONE: HOME ( ) _____ OFFICE ( ) _____

MAILING INSTRUCTIONS: When you finish reading the course text, use the form to submit your answers to the self-test. Fill in the correct box for each question indicating your answer. Pen or pencil may be used. There should be only one correct answer for each question. Upon completion of the course, mail the answer sheet to: Benco Dental, Attn: Education Department, 295 CenterPoint Boulevard, Pittston, PA 18640.

NOTE: We recommend that you photocopy your answers before mailing this course. This will ensure that you have a record of your course completion in case of loss due to postal system error.

COURSE EVALUATION: Please take a moment to answer the questions below. Your responses will help us in developing future course material. Your feedback is important to our evaluating the content and value of our courses. Please indicate how well the course met the criteria below. Circle one number in each criterion: 1 = Poor; 2 = Average; 3 = Good; 4 = Excellent.

The course provided clear information about the topic.	1	2	3	4
The course had relevance for my practice.	1	2	3	4
Overall rating	1	2	3	4
The course evaluated my understanding of the topic through the post-course questions.	1	2	3	4

How likely would you be to take a similar course on a different topic in the future?
❑ highly unlikely ❑ highly likely

On a scale of 0–5 (0 = Poor; 5 = Excellent), please rate the following:

Course Objectives	0	1	2	3	4	5
Course Content	0	1	2	3	4	5
Author's Grasp of Topic	0	1	2	3	4	5
References	0	1	2	3	4	5
Overall Effectiveness	0	1	2	3	4	5

Was the course clearly written and easy to understand? ❑ Yes ❑ No

If no, please elaborate: _____

Which additional continuing-education topics would you be interested in?

_____

Additional comments: _____

_____

PAYMENT OF $54.00 IS ENCLOSED (CREDIT CARDS AND CHECKS ACCEPTED)

• Please charge to my Benco Account # _____

• If paying by credit card, please complete the following information:
❑ Visa ❑ Mastercard ❑ Discover ❑ American Express

Account # _____ Exp. Date _____

Please direct all questions or requests for additional information pertaining to this course to: Dr. Rick Adelstein, 3609 Park East Dr., Suite 404, Beachwood, OH 44122. This examination is graded manually. Upon completion of this course, a certificate will be mailed within two to three weeks of receipt of payment and completed examination.

❑ Please check if you would like to receive your score with your certificate of completion.

ANSWER KEY

1. Ⓐ Ⓑ Ⓒ Ⓓ
2. Ⓐ Ⓑ Ⓒ Ⓓ
3. Ⓐ Ⓑ Ⓒ Ⓓ
4. Ⓐ Ⓑ Ⓒ Ⓓ
5. Ⓐ Ⓑ
6. Ⓐ Ⓑ Ⓒ
7. Ⓐ Ⓑ Ⓒ Ⓓ
8. Ⓐ Ⓑ Ⓒ Ⓓ
9. Ⓐ Ⓑ
10. Ⓐ Ⓑ Ⓒ Ⓓ
11. Ⓐ Ⓑ Ⓒ Ⓓ
12. Ⓐ Ⓑ Ⓒ Ⓓ
13. Ⓐ Ⓑ Ⓒ Ⓓ
14. Ⓐ Ⓑ Ⓒ Ⓓ
15. Ⓐ Ⓑ Ⓒ Ⓓ
16. Ⓐ Ⓑ Ⓒ Ⓓ
17. Ⓐ Ⓑ Ⓒ Ⓓ
18. Ⓐ Ⓑ Ⓒ Ⓓ
19. Ⓐ Ⓑ Ⓒ Ⓓ
20. Ⓐ Ⓑ Ⓒ Ⓓ