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CLINICAL UPDATE: Flowable Composite Resins

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- Describe the techniques for using flowable composite resins in a range of different procedures

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Introduction

Since the introduction of adhesive bonding, the types of dental resins have increased along with the number of uses. The earliest composite resins were usually quartz-filled with reasonably large filler particles, making restorations difficult to polish. Due to recent innovations, resins are now available with smaller filler particles for better polishability. A number of new product types have also emerged in response to needs expressed by practitioners.

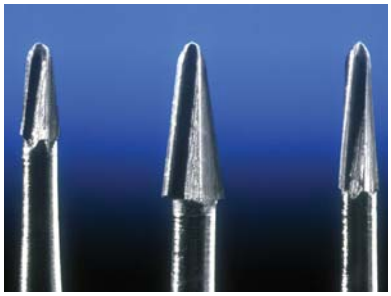

FIGURE 1: Fissurotomy burs (SS White Burs, Lakewood, NJ).

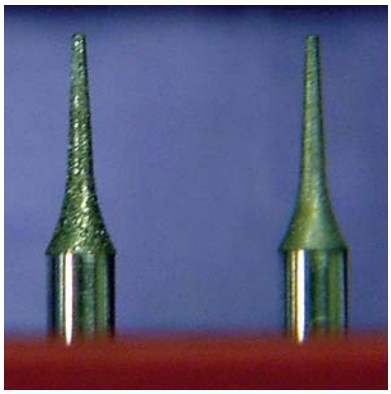

FIGURE 2: Thin and narrow diamonds for minimally invasive cavity preparations.

FIGURE 3: Pit and fissure caries on the occlusal surfaces of the first and second maxillary premolars.

FIGURE 4: Preparation of the occlusal lesions with air abrasion.

Composite resins are polymer matrix filled, tooth-colored restoratives that derive their physical properties and handling characteristics from loading with reinforcing filler particles and the viscosity of the resin matrix. Composite resins can be classified by filler size and per cent filler loading, as well as by the viscosity of the composite. With the expanded categories of composite resins, they can also be classified by their uses.

The majority of direct restorative composite resins fall into one of the following categories: hybrid, nano-filled or micromatrix hybrid, microfill, packable composites and flowable composites. What characterizes a composite resin are its resin matrix and filler particles. One of the primary reasons for the increased loading of fillers in composite resin is to improve physical properties and resistance to functional wear. As filler loading increased, so did composite resin viscosity. Most direct restorative composite resins have a putty-like consistency.

While the putty-like consistency of composite resins was a desirable characteristic for most clinical uses, there was a desire to have a less viscous composite resin but not one that was as runny as dental sealants. For this reason, a new class of composite resins was introduced to the dental profession in late 1996. These flowable composites had as their principal characteristic a viscosity that allowed them to be injected into a cavity preparation.(1) Most manufacturers packaged these flowable composites in small syringes that allow for dispensing with very small gauge needles (usually 20 gauge). Two manufacturers provide their flowables in unit dose packaging in tubes with either a needle end (VersaFlo, Centrix, Shelton, CT) or a small canula end (Tetric Flow, Ivoclar/Vivadent, Amherst, NY). For practitioners with small hands, or skeleto-muscular difficulties, e.g., arthritis, these small tubes can be inserted into a dispensing gun, making application of these resins easier. The application of flowable composites through small needles or canulas made them ideal for use in small preparations that would be difficult to fill with more conventional composite resins.

Why use a flowable composite?

The development of flowable composites was based upon its flowable viscosity and not any clinical evidence of success for specific applications. At first glance, flowable composite resins are not highly filled and are more susceptible to wear in stress-bearing areas. Depending on the type of filler used, the majority of flowables are filled between 41-53% by volume which translates into 56-70% by weight.(2) Most manufacturers will cite filler content by weight because the number is always higher. Some of the manufacturers are using fluoride containing glass fillers and can make the claim that they contain fluoride. The availability of the fluoride is questionable. Table 1 lists many of the more popular flowable composite resins. While the earliest uses cited were for small, conservative Class I preparations of pits and fissures (preventive resin restorations), today there have been case reports on expanded uses of flowable resin composites.

These uses include:

- preventive resin restorations (minimally invasive occlusal Class I)
- pit and fissure sealants
- base or liner
- small, angular Class V abfraction lesions
- sealing ditched amalgam margins
- repair of small porcelain fractures in non-stress-bearing areas
- surfacing ribbon-reinforced composite resin splints
- repairing temporary restorations and adding to mar-

gins of temporaries fabricated using bis-acryl composite resins
- inner layer for Class II posterior composite resin placement in sealing the gingival margin to avoid deficiencies
- enamel defect repair
- repair of crown margins
- repair of composite resin margins
- luting porcelain and composite resin veneers
- routine Class I restorations
- small Class III restorations

Restoration of posterior teeth using flowable composites

Minimally invasive Class I - preventive resin restorations (PRR)

In 1978, Simonsen described a minimally invasive preparation using small burs and restored with a combined adhesive-composite resin-sealant technique that he named preventive resin restoration, or PRR.(3) Later reports demonstrated the clinical success of these conservative restorations.(4) Today, with the introduction of less viscous, wear resistant composite resins (i.e. flowable composite resins), the PRR can be accomplished in a more simplified restorative technique.(5, 6) Flowable composites offer the advantage of needle tip placement into the small, conservative preparations of PRR's. Flowable composite resins do not have the same depth of cure as other restorative composite resins. They require incremental placement at a thickness of 2 mm and light curing of 10 seconds with a quartz halogen curing light or LED curing light with a light energy emission of 600 mW/cm^2. Plasma arc (PAC) curing lights should have a curing time of 5 seconds.(6)

TABLE 1: Partial Listing of Flowable Composite Resins

NAME	MANUFACTURER
Filtek Supreme Plus Flow	3M-ESPE
FlowTEC	Benco Dental
VersaFlo	Centrix
Synergy Flow	Coltène/Whaledent
Virtuoso Flowable	Den-Mat
Dyract Flow	Denstply
Esthet-X Flow	Dentsply
Gradia Direct Flo	GC America
Gradia Direct LoFlo	GC America
Unifil Flow	GC America
Venus Flow	Heraeus-Kulzer
Four Seasons Flow	Ivoclar
Tetric Flow	Ivoclar
Heliomolar Flow	Ivoclar
Point 4 Flowable	Kerr-Sybron
Revolution Formula 2	Kerr-Sybron
Wave	Southern Dental Industries
Wave HV	Southern Dental Industries
Wave MV	Southern Dental Industries
PermaFlo	Ultradent

FIGURE 5: Completed preparations.

FIGURE 6: Single component, 5th generation adhesive applied to preparations.

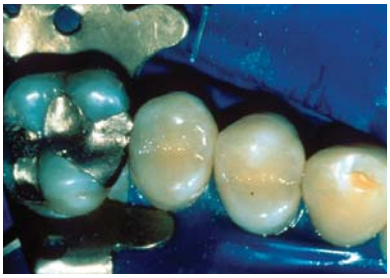

FIGURE 7: Completed restorations with flowable composite resin.

FIGURE 8: Pit and fissure caries in the maxillary second premolar, first and second molars.

Since the main use of flowables is to restore occlusal surfaces of posterior teeth as a preventive resin restoration, one could be skeptical about the benefit of changing to a less wear-resistant, less filled composite resin. Actually, flowable composite resins are an excellent choice as a preventive resin restoration. By definition, preventive resin restorations are very small preparations of isolated areas of caries in pits and fissures restored with composite resin. After restoration of the isolated preparations, the entire occlusal surface is sealed with a sealant. For billing purposes, these are one-surface posterior composite resins, but because these restorations require multiple mate-

rials—etch, prime, adhesive, hybrid composite resin, sealant—they can be time-consuming and relatively expensive to do. With a flowable composite resin, the adhesive technique is the same but only one restorative material, the flowable composite, is necessary, and it is easier to place in these mini-preparations using needle tip dispensing. In fact, with those flowables that are less runny, e.g. Gradia Direct LoFlo (GC America, Alsip, IL) and FlowTEC (Benco Dental, Wilkes-Barre, PA) you can build contours to the restoration by adding small increments and light curing instead of overfilling and using a finishing bur to carve the contour and anatomy. This translates into less occlusal adjustment.

FIGURE 9: Initial preparation with NTF Micro Narrow Tapered Fissurotomy bur (SS White Burs, Lakewood, NJ).

FIGURE 10: Completed preparations.

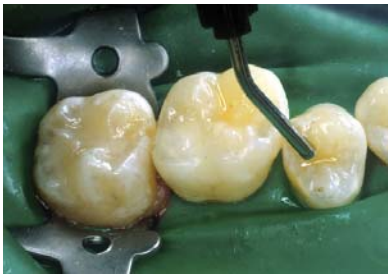

FIGURE 11: Restoring the minimally invasive preparations with flowable composite.

It is important that flowables not be used to merely seal the pits and fissures as a sealant replacement with a thin application. Thin applications of flowable resin composites will fracture in function and be less durable. If a flowable resin composite is desired, some preparation of the tooth is necessary to increase the bulk of the composite to improve durability and resistance to fracture. When using sealants for the preventive sealing of occlusal pits and fissures where there will be no preparation, their success is based upon their flexural modulus making them less susceptible to fracture. In fact, even with sealant placement you must apply at least a thickness of 0.3-0.4 mm to achieve longer clinical success in sealing the occlusal surface from caries. Since most patients having sealant placement are children with a transitional dentition, the addition of sealant to functional occlusal surfaces is not a problem. This thickness will allow the sealant to be maintained in a pit and fissure as the sealant wears in function.

Flowable composite resins have demonstrated a usefulness for being matched with the use of air abrasion for cavity preparations .[7] Also, minimally invasive cavity preparations can be accomplished with tooth preparation using a YSGG (Yittrium Scandium Gallium Garnet) like Waterlase or Biolase for preparation of enamel, dentin and carious tooth structure[8] or a VersaWave (Hoya ConBio) for oral use, which is not only for hard tissue applications but also for soft tissue and endodontic applications. In many cases there is no need for local anesthetic when performing these preparations. They are ideal for the pediatric patient. These minimally invasive cavity preparations created with an air abrasion unit or a laser can be controlled to be narrow and deep into pits and fissures on the occlusal surface and thus are more difficult to fill with the more heavily filled, putty-like composite resins. However, precision needle placement with a flowable composite assures a well adapted restoration. Bear in mind that the clinical success of preventive resin restorations is based upon a minimal thickness of composite resin in order to resist both wear and fracture. Therefore, the use of air abrasion and the laser allow adequate room for sufficient thickness of the flowable composite resin restorative material.

If you do not want to use an air abrasion system, yet want to prepare minimally invasive conservative cavity preparations as preventive resin restorations (PRRs), then site specific burs can be used.[9] These smaller-tipped burs have been introduced to both diagnose and treat enamel lesions and to evaluate the extension of caries. Originally, smaller burs such as the #330, #½ round, #1 round, and #33½ inverted cone were recommended for preparing PRRs. Recently, a new class of burs that are thin enough to allow easy penetration into pits and fissures was introduced (Fissurotomy burs, SS White, Lakewood, NJ).[10-12] In some cases, the surface of the pit or fissure appears to be intact and relatively healthy with only some slight discoloration or staining of the pit and fissure. Use of these burs allows the clinician to prepare the pit or fissure, in many cases without anesthesia due to the small surface area of the tip. Once the preparation access has been opened and the caries explored, decisions for further extensions can be made.

Fissurotomy burs are available in three different configurations: Fissurotomy original (1.1 mm wide/2.5 mm long), Fissurotomy Micro NTF (0.7 mm wide/2.5 mm long) and Fissurotomy Micro STF (0.6 mm wide/1.5 mm long).(Figure 1) Other manufacturers have developed thin diamonds to mimic the Fissurotomy shape.(Figure 2)

Case reports for use of flowable composite for Class I carious lesions

Flowable composite matched with air abrasion techniques

With a diagnosis of caries, the treatment of the occlusal fissures on the maxillary premolars was initiated. (Figure 3) A dental dam was placed. When using an air abrasion device, the dental dam provides a better means of controlling and evacuating the fine abrasive powder that is used during cavity preparation. Since the lesions were expected to be minimal with only slight extension into the dentin, local anesthetic was not administered. If the lesions became more extensive, the patient understood that local anesthetic would be used.

FIGURE 12: Completed restorations.

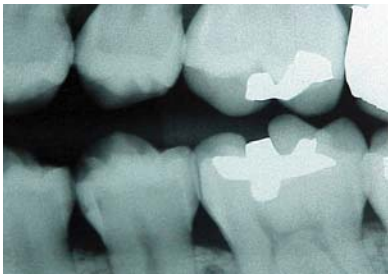

FIGURE 13: Radiographic evidence of mesial caries in mandibular second premolar.

FIGURE 14: Completed cavity preparation.

Using a setting of 70 psi, with a powder flow of 2 grams/minute set on pulsed mode with a 0.014" nozzle, the aluminum oxide air abrasion device prepared the occlusal surfaces.(Figure 4) Santos-Pinto and coworkers found that different tip designs and diameters of the air abrasion nozzle produced different cutting patterns.[13] Smaller diameter tips produced narrower, more controlled cuts. Narrow cutting follows the conceptual preparation parameters of occlusal surfaces of preventive resin preparations. The preparations were evaluated for complete caries removal. (Figure 5) The cavity preparations were etched for 15 seconds with a phosphoric acid etchant, then rinsed for 10 seconds with an air-water spray and dried. A single component, 5th generation adhesive was applied to the preparations with a microapplicator. (Figure 6) An air stream was used to evaporate the solvent from the adhesive and air-thin the adhesive before light curing. The adhesive was light cured for 10 seconds. A flowable composite resin was placed into the preparations and light cured for 20 seconds with a quartz halogen curing light. The restorations were finished and polished using conventional techniques. The completed restorations were well sealed.(Figure 7) The dam was removed and the occlusion was checked and adjusted.

Use of site-specific burs and flowable composite

A patient presented for treatment with a past history of not having dental treatment for five years. The maxillary first and second molars and second premolar were diagnosed with caries. (Figure 8) Bitewing radiographs did not show the extent of the caries. After anesthesia was administered, a dental dam was placed. In order to gain access to the distal portion of the maxillary second molar, a W8AD wingless distal extension rubber dam retainer (Hu-Friedy, Chicago, IL) was used. While the occlusal surface felt hard to an explorer, when the teeth were transilluminated the caries appeared to be more extensive. The first and second molars were entered with a Fissurotomy bur (SS White, Lakewood, NJ) and after the caries was better visualized, the teeth were prepared using a #245 bur. The mesio-occlusal pit of the first molar and occlusal pit of the second premolar had minimal caries. The decision was made to do a preventive resin preparation using a NTF Micro Narrow Tapered Fissurotomy bur. (Figure 9) The NTF Fissurotomy bur allows the fissure to be explored with minimal tooth removal to evaluate the extent of the caries and to complete the preparation. The outline of the preparations was dictated by the extension of the caries. (Figure 10)

The cavity preparations were etched for 15 seconds with a phosphoric acid etchant, then rinsed for 10 seconds with an air-water spray and dried. A single component,

FIGURE 15: Placement of flowable composite resin as first increment in proximal box.

FIGURE 16: Completed restorations.

FIGURE 17: Periodontally compromised mandibular anterior teeth with incisal wear of these anterior teeth.

FIGURE 18: Preparation into the dentin to a depth of 1.0 mm of the incisal edges of the mandibular incisors.

FIGURE 19: Completed restorations and fiber reinforced periodontal splint.

5th generation adhesive was applied to the preparations with a microapplicator. An air stream was used to evaporate the solvent from the adhesive and air thin the adhesive before light curing. The adhesive was light cured for 10 seconds. The larger preparations were restored by placing increments of packable composite resin into the preparations with preloaded tips. The minimally invasive preventive resin preparations in the first molar and second premolar were restored with flowable composite resin. (Figure 11) As stated before, flowable composite resins are perfectly matched to fissurotomy preparations because they can be placed with a needle tip and the material adapts to the small conservative sized preparations. The restorations were finished and polished using conventional composite resin techniques. The rubber dam was removed and occlusion verified. (Figure 12)

Flowable composites for Class II preparations

For conservative preparation of Class II interproximal caries with only initial caries on the proximal surface and no caries on the occlusal surface, a facial approach for the cavity preparation will leave the marginal ridge intact.(14) Flowable composite resins are also ideally suited for the restoration of a facial approach Class II cavity preparation. Another use for flowable composite resins is in conjunction with placement of viscous packable composite resins.

For this case, the diagnosis of proximal caries can be seen in the bitewing radiograph (Figure 13). The cavity preparation was completed (Figure 14). After the adhesive procedure, an initial increment of a flowable composite was syringed into the proximal box (Figure 15) to assure complete adaptation of the composite resin at all aspects of the gingival margin. The flowable composite resin was not light cured until placement of the first increment of the packable composite. Once placed, the flowable and packable composite resins become sandwiched together and are then light cured. Tung and coworkers evaluated packable composite resin placement with and without a flowable composite resin. They found that there was significantly less microleakage in teeth restored with the flowable composite resin as the first increment in the proximal box.(15) Leevailoj and others also showed less microleakage at the gingival margin of Class II preparations.(16) These findings have been confirmed by other research at New York University School of Dentistry.(17) Figure 16 shows the completed Class II restoration.

Flowable resins used as a base or liner

Bases and liners have been traditionally used as pulpal protection when the dentin is thin over the pulp, to build-up cavity preparations and to block out undercuts. It has been reported that flowable composite resins have been used as a base and liner in clinical applications. In recent years, there has been interest in using flowable composite as a liner that parallels the increase in postoperative sensitivity reported by clinicians when placing posterior composite resins.(18-20)

The use of a flowable composite resin as a liner has been controversial.(21) While many clinicians have been achieving success at reducing postoperative sensitivity with the use of flowable composite resin as a liner,(18) clinical research shows no difference in postoperative sensitivity between using an adhesive alone compared to using a flowable composite as liner.(21) Also, anecdotally, the use of self-etch systems have been reported to decrease postoperative sensitivity with posterior composite resins that are not supported by clinical trials comparing total etch and self etch adhesive use with posterior composites.(22) The final conclusion of this research study was that postoperative sensitivity is clinician specific.

Due to the techniques they are using, some practitioners tend to see increased postoperative sensitivity.(22) When using flowable composite resins as liners, increase the curing time for conventional quartz halogen and LED lights to 20 seconds. The depth of cure of flowable composite resins when compared to hybrid composite resins is less due to increased light scatter created by the

filler particles and opacity of flowable composite resins.[23] Also note that in future radiographs, flowable composites may appear less radiopaque than the packable composite resin placed with them. There are variances in the radiopacity of different flowable composites.[24, 25] If used as the first increment for a Class II restoration or as a liner to prevent sensitivity, they may appear as a gap or less radiolucent under a more radiopaque hybrid composite resin that you typically use to restore teeth. The clinical appearance of the radiograph may mimic recurrent caries. It is important that you verify intact margins with your explorer. If using a flowable composite as a liner to prevent postoperative sensitivity, a good recommendation is to make a radiograph of your chosen flowable placed in an extracted tooth to mimic the placement of a liner in a routine cavity preparation and then restore that tooth with your chosen restorative composite resin. This will provide you with a baseline. The restored tooth can now be used as a reference to the radiographic appearance of the flowable within the cavity preparation.

Restoration of Class V preparations with flowable composites

Small, angular Class V non-carious lesions have been associated with abfraction.[26] These lesions, which are caused by flexure of the tooth once it has been restored with stiff hybrid composite resins, have been associated with a clinical success rate of only 70%.[27] It was assumed that the stiffness of the composite resin contributed to this high failure rate. By using a flowable composite resin with a lower biaxial flexural strength than traditional hybrid composite resins, it was assumed that clinical success of adhesive restorations for these Class V lesions would improve. After one year, a Class V clinical study using a flowable composite resin demonstrated that all restorations were intact.[28] This study also reported no sensitivity after one year. This correlates to in-vitro microleakage studies of flowable composites that have demonstrated good marginal sealing at enamel and dentin margins with an adhesive technique using a flowable composite resin.[29,30] Use of a flowable composite resin with an adhesive technique for non-carious Class V lesions has merit.

Other applications for flowable composites

Besides the primary uses for flowable composite resins that have been stated, other uses for flowable composite resins have been described. In clinical situations where there are small areas of incisal wear into the dentin, a small preparation with a 329 bur to a depth of 1.0 mm and an adhesive restoration with a flowable composite resin is indicated.[1, 31] For this case, the teeth were periodontally compromised with mobility.(Figure 17) The patient's chief complaint was discomfort when biting into food due to the occlusal trauma on the anterior teeth and she was unhappy with the appearance of the worn incisal edges.

A minimally invasive preparation with a depth of 1 mm was made using a 329 bur. (Figure 18) The mandibular anterior teeth were splinted with an adhesive fiber reinforced composite resin and the incisal edges restored with a flowable composite resin. (Figure 19) The lingual surface of the fiber splint was covered with flowable. When using fiber reinforcement ribbon for periodontal splinting, the use of a flowable composite resin to smooth the lingual surface of the splint has been demonstrated to be useful.[32, 33] Also, there has been an increasing number of young patients with the "cupping out" of the cusp tips on the maxillary and mandibular first molars.[31] (Figure 20) These are prepared with either a 329 or 330 bur to a depth of 1 mm. (Figure 21) The depth of 1 mm improves the durablility of these restorations.[31] Using either a total etch or self-etch adhesive, these are then restored with a flowable composite resin. (Figure 22)

Other uses for flowable composite include the repair of amalgam margin defects to extend the life of an amalgam restoration.[34] With the

FIGURE 20: "Cupping" of cusp tips of mandibular first molar due to wear.

FIGURE 21: Preparation of cusp tips to depth of 1.0 mm.

FIGURE 22A: Cusp tip preparations restored with flowable composite.

FIGURE 22B: 7-year recall of restorations (note the wear of the flowable as a sealant over the past seven years.

FIGURE 23A: . Preoperative view of overlapping maxillary central incisors.

FIGURE 23B: Minimally invasive preparation of the maxillary incisors

FIGURE 23C: Completed LUMINEERS porcelain veneers bonded using a flowable composite resin.

increased usage of auto mix BIS-acryl composite resins as provisional restorations, the need to repair margins has been a problem. Methylmethacrylate repairs have been unsuccessful. However, the use of a flowable composite resin has been shown to be a reliable method of repair for BIS-acryl composite resin provisional restorations.[35] The flowability of these composites have made it useful for placement of porcelain veneers[2] (Figure 23), reattachment of a tooth segment(20) and for repairing composite resin and crown marginal defects [2, 37].

Conclusion

When flowable composite resins were first introduced, they appeared to be one- dimensional restorative materials with very limited uses. Over the last few years, the usefulness of flowable composite resins has been demonstrated. When choosing a flowable composite resin, pick one that works well in your hands. Most flowables have a variety of shades to manage most esthetic clinical situations. There is variability in the viscosity of these restorative materials; choose the viscosity that will best suit your needs.

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Self-Test

1. All the following are types of composite resins EXCEPT:
a. hybrid composite resin
b. flowable composite resin
c. xenophobic composite resin
d. packable composite resin

2. According to this article, flowable composite resins were introduced in:
a. 1985
b. 1996
c. 2001
d. 2005

3. Flowable composite resins can be characterized as:
a. having a high viscosity and are filled 75-80% by weight
b. having a low viscosity and are filled 75%-80% by weight
c. having a high viscosity and being filled 56-70% by weight
d. having a low viscosity and being filled 56-70% by weight

4. Flowable composite resins can be used for the following applications EXCEPT:
a. preventive resin restorations (minimally invasive occlusal Class I)
b. sealing margins of amalgam restorations
c. cementing porcelain veneers
d. as an endodontic filling material

5. TRUE or FALSE: A deficient margin of a provisional restoration fabricated from a BIS-Acryl composite resin can be repaired with a flowable composite resin.
a. True
b. False

6. Preventive resin restorations (PRR) are classified as:
a. Class III restorations
b. Class I restorations
c. Class V restorations
d. Class IV restorations

7. Sealants should have a thickness of _____ to assure a higher level of clinical success when placed on occlusal surfaces of posterior teeth.
a. 0.1 mm
b. 0.3-0.4 mm
c. 0.5-1.0 mm
d. 1.5-2.0 mm

8. Preventive resin restorations (PRR) can be prepared using:
a. small burs such as #1 round burs or #330 pear shaped burs
b. air abrasion systems
c. pointed fluted Fissurotomy burs
d. all of the above

9. According to this article, the technique sequence for a PRR after tooth preparation is:
a. laser etch, air abrade, adhesive, flowable composite resin
b. etch, adhesive, flowable composite resin
c. glass ionomer liner, etch, adhesive, flowable composite resin
d. flowable composite resin only

10. According to this article, which unique feature of flowable composite resins makes them easier to place in small, minimally prepared preventive resin preparations?
a. wide selection of shades
b. needle-tip placement
c. easier to shape with plastic filling instruments
d. putty-like consistency allows them to be placed without distorting

11. Flowable composite resins are useful for Class II, proximal surface restorations of posterior teeth when using a packable composite resin as:
a. a surface sealer after placement of the packable
b. as the first increment in the proximal box before placement of the packable composite resin
c. as an intermediary second increment to assure occlusal sealing of the margins
d. total filling of the proximal box of a Class II restorations with only the occlusal surface filled with packable composites

12. TRUE or FALSE: It has been reported that a flowable composite resin can be used as a liner when placing posterior composite resin restorations as a way to reduce post operative sensitivity.
a. True
b. False

13. One way of minimizing post operative sensitivity when placing posterior composite resins is to:
a. extend the etching time before adhesive placement
b. use only self-cure composite resins
c. use a flowable composite resin as a liner
d. make sure the tooth is very dry before placing bonding agent

14. When a flowable composite resin is used as a liner in cavity preparations, the curing time for LED and quartz halogen lights as recommended by this article is:
a. 5 seconds
b. 10 seconds
c. 20 seconds
d. 60 seconds

15. When viewing a radiograph, flowable composite resins appear:
a. to be more radiolucent than amalgam
b. to be more radiopaque than amalgam
c. vary from product to product
d. a and c

16. TRUE or FALSE: Adhesive flowable composite resin is used for the restoration of angular, Class V non-carious lesions because these resins have a lower biaxial flexural strength than traditional hybrid composite resins, and as a result, have been demonstrated to have good clinical success.
a. True
b. False

17. Flowable composite resins are a good choice as a restorative when restoring the worn incisal edge of anterior teeth that:
a. are small in size and are prepared with very small diameter burs
b. are large in size, even if you are building additional incisal height
c. Flowable composite resins should never be used for worn incisal edges
d. Flowable composite resins should only be used for maxillary incisors because there are not enough shades to match the color of teeth

18. TRUE or FALSE: Fiber reinforcement materials embedded in composite resin are successful when splinting periodontally compromised teeth. When using fiber reinforcement ribbon for periodontal splinting, the use of a flowable composite resin can be used to smooth the lingual surface of the splint after embedding the fiber ribbon into the more highly filled composite resin.
a. True
b. False

19. When using an automix BIS-acryl composite resin for provisional (temporary) crowns and bridges, when a margin is deficient, the material of choice to repair that margin would be:
a. microfill composite resin
b. methyl methacrylate unfilled resin
c. flowable composite resin
d. do not repair, remake the restoration

20. Although there are specific light-cured composite resin cements for use in placing porcelain veneers, what other restorative material can be used for porcelain veneer bonding?
a. zinc phosphate cement
b. resin-modified glass ionomer cement
c. flowable composite resin
d. packable composite resin

1. Ⓐ Ⓑ Ⓒ Ⓓ
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CLINICAL UPDATE:
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