WHITE PAPER:

Sometimes Simpler Really IS Better

Presenting the Posterior Compression Technique—a Fast, Simple Way to Improve the Longevity of Your Posterior Composites.

By David H. Roholt, DDS

parkell®
PARKELL.COM

Sometimes Simpler Really IS Better

Presenting the Posterior Compression Technique—a Fast, Simple Way to Improve the Longevity of Your Posterior Composites.

By David H. Roholt, DDS

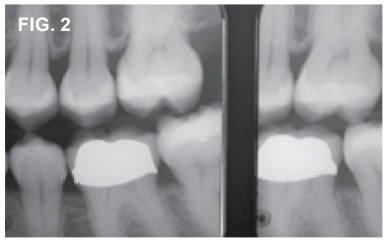
There's a lot of research suggesting that the stress caused when a light-cured composite shrinks can lead to a number of problems, particularly in deep, high C-factor restorations.

It may break the bond between tooth and restoration allowing leakage, gapping, sensitivity and marginal breakdown. If it doesn't break the bond, this rapid shrinkage may bend the cusps inward or crack the enamel prisms creating a mysterious white line immediately outside the margins.[1]

Though most researchers agree that shrinkage stress is a problem, there's no consensus on what to do about it.

For example, some research suggests that curing a flowable liner before you start to build the composite will reduce the stress and prevent leakage and gapping. But other studies suggest that the flowable resin doesn't reduce gapping at all.[2,3]

Some lecturers suggest that curing the first increment through the tooth from the opposite side or building the restoration in multiple oblique layers will solve the problem. But other studies suggest this doesn't accomplish anything, except increase the chance of leaving the restoration poorly cured.[4,5]



Figs. 1 & 2. *These three restorations (#14MO, #13 MOD, #12DO) were placed in 1999 using a bulk-compression technique. The photo and radiographs were snapped at recall appointment 9-years later. Notice the tight margins.*

Fig. 3. *Placed three years ago using a core material.*

About the Author

David H. Roholt, DDS

Dr. Roholt received his undergraduate and pre-dental education from the University of Minnesota and San Jose State University before obtaining his dental degree at the University of CA San Francisco School of Dentistry. He has since engaged in extensive postgraduate education, achieving Mastership in the International Congress of Oral Implantologists.

Dr. Roholt is also certified in the Pinhole Surgical Technique(tm) for minimally invasive gum surgery and has attended the Dawson Academy for training in TMJ disorders. He is a member of the American Dental Association, California Dental Association, and Academy of General Dentistry. Dr. Roholt serves the community as a member of the board of the Sutter Auburn Faith Hospital Foundation.

He and his wife Tina are very proud of their two grown children, and in his spare time, he enjoys artwork, vacations, and working on their property taking care of their goats and pig (Arnold!).

Some suggest that you can reduce gapping if you use a composite with low shrinkage—or a low modulus of elasticity—or a high "internal flow rate" (whatever that is.).

Still others say you can minimize shrinkage stress using a special light-curing protocol—a pulsed-cure or soft-start cure or a stepped-cure procedure.[6] But again, other studies suggest this doesn't really make much difference and (once again) there's the possibility of leaving the composite undercured.[7,8,9,10,11]

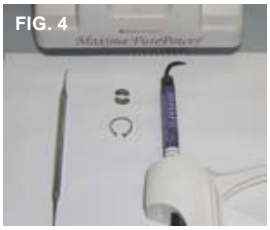
When even the researchers don't agree on how to address the light-cure shrinkage problem what is the poor evidence-based dentist to do?

Well, here's what I've done.

In deep posterior preparations I don't use light-cure composites. Not at all. And I haven't for the past 10 years.

You see, it's not the shrinkage that creates the gapping problem so much as it's the speed of that shrinkage. Light-cure composites set very rapidly. This creates a lot of stress at the bonded interface.

Self-cure composites, on the other hand, set much more slowly. And as they shrink, they remain much more plastic. This means the shrinking resin can draw material from the free surface as it shrinks ... almost like the castings we did in dental school drew metal from the reservoir on the sprue. In theory, this should relieve the stress.



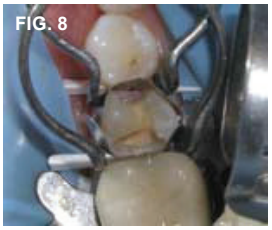
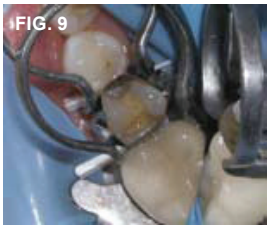
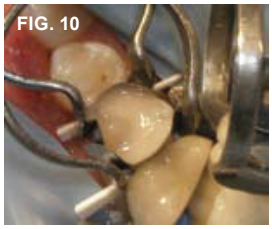


Fig. 4. *Here's my armamentarium.* ***Fig. 5.*** *The amalgam MOD was failing and required replacement.* ***Fig. 6.*** *So we fitted the rubber dam...* ***Fig. 7.*** *removed the old filling...* ***Fig. 8.*** *and applied the matrix, wedges and rings.*





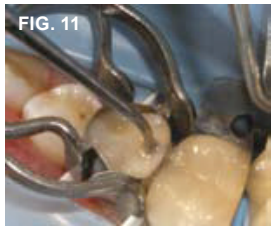


Fig. 9. *The bonding agent was applied and cured. (I use an etch/prime/bond system. But whatever you use, be sure to check with the supplier that it's compatible with self-cure composites. Many bonding agents are not.)* ***Fig. 10.*** *I overfilled the preparation with HyperFIL. Now here's where the technique differs from Parkell's instructions...* ***Fig. 11.*** *Instead of immediately light-curing from the occlusal, I use a large plugger to compress the material against the tooth surface. For small preps, I start with a small plugger or ball burnisher. This assures that the composite is in intimate contact with the prep and helps counteract any shrinkage.* ***Fig. 12.*** *As the polymerizing composite develops body, I switch to a larger plugger and apply progressively more pressure.* ***Fig. 13.*** *When the HyperFIL has set and I can no longer compress the composite, I loosen the matrices...*

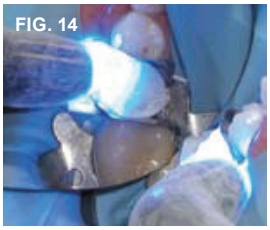


Fig. 14. *and light-cure from the buccal, lingual and occlusal.* ***Fig. 15.*** *This creates a surface that's immediately hard.* ***Fig. 16.*** *I remove the matrices. I always need a hemostat because the contacts are so tight.* ***Fig. 17.*** *Here's the restoration before contouring and shaping...* ***Fig. 18.*** *And after. . .*

And in fact, studies suggest that in deep Class I and II preparations, self-cure composites generate significantly less shrinkage-stress and less gapping than light-cure composites.[12,13]

And there's another advantage to using a self-cure resin.

Because self-cure resin develops its body slowly, I can physically push it against the tooth using a plugger. My theory is that this compression both assures intimate contact between resin and tooth, and also helps counteract any potential gapping due to shrinkage.

Can I prove it? Not really. (But something is causing those margins to look so good after serving 10 years on a functional surface.)

What materials?

In the early days I used hand-mixed chemicalcure resins and a two-material technique (that is, one material for the base with another material laminated over it.) They were a pain to mix, load into the tube and into the tooth—but the margins held up beautifully. Some of the earlier materials discolored with time–but, again the margins looked great at recall, even if the shade didn't.

The cartridge-based dual-cure core materials made the procedure much easier, especially when companies started offering smaller cartridges with mixing tips that fit easily into preparations.

Now I'm using HyperFIL®. The angled tip fits nicely into a posterior prep with minimal waste and the material finishes much better than a core material.

Here's where Parkell and I differ.

HyperFIL is a dual-cure composite. It includes two separate initiator systems...one light-cure...the other self-cure.

The technique Parkell promotes for HyperFIL treats it essentially as a light-cured composite. For example, Parkell recommends zapping the restoration immediately after filling the preparation.

The self-cure catalyst is there to compensate for poor light-curing at the bottom of a deep, dark preparation.

In contrast, I use HyperFIL essentially as self-cure composite. I don't reach for my light until the resin is almost hard – say at 3 minutes. I'm using the light to achieve a hard final surface cure. Self-cured resin takes a long time to reach maximum hardness (DAYS!), so I light-cure the surface to resist early staining, color change and wear.

Here's the technique step-by step. It can save you significant chairtime, particularly when you're placing multiple restorations. But in my opinion the real benefit of the compression technique is what those margins will look like at recall. ■

References:

1 Pensak T.Clinical Showcase. Jour Can Dent. 70:2, p118-119, Feb 04

2 Ziskind D, et al. The effect of an intermediate layer of flowable composite resin on microleakage in packable composite restorations. Int J Paediatr Dent. 15:5, p349-54. Sep 05

3 Miguez PA, et al. Effects of flowable resin on bond strength and gap formation in Class I restorations. Dent Mater. 20:9, p839-45, Nov 04

4 Duarte S Jr, et al. Influence of resin composite insertion technique in preparations with a high c-factor. Quint Int. 38:10, p829-835, Nov-Dec

5 Cakir D, et al Polymerization shrinkage – A clinical review. Inside Dentistry. P84-87, Sept 07 6 Nalcai A, et al. Effect of thermocycling on microleakage of resin composites polymerized with LED curing techniques. Quint Int. 38:7, p433-9. Jul-Aug 07

7 Nalçaci A, et al. Effect of LED curing modes on the microleakage of a pit and fissure sealant. Am J Dent. 20:4 p255-8 Aug 07

8 Goncalves F, et al. Effect of photoactivation protocol and radiant exposure on monomer conversion and flexural strength of a resin composite after water and ethanol storage. J Biomed Mater Res B Appl Biomater.82:1 p89-92, Jul 07

9 Visvanathan A, et al. The influence of curing times and light curing methods on the polymerization shrinkage stress of a shrinkage-optimized composite with hybrid-type prepolymer fillers. Dent Mater. 23:7 p777-84. Jul 07

10 Hofmann N, et al. Influence of curing methods and matrix type on the marginal seal of class II resin-based composite restorations in vitro. Oper Dent. 31:1, p97-105 Jan-Feb 06

11 Fleming GJ, et al. Cuspal movement and microleakage in premolar teeth restored with resin-based filling materials cured using a 'soft-start' polymerisation protocol. Dent Mater. 23:5, p637-43. May 07

12 Griffiths, BM, et al. Variable polymerisation shrinkage and the interfacial micropermeability of a dentin bonding system. J Adhes Dent. 1:2, p119-31, Summer 99

13 Idriss S, et al. Marginal adaptation of class II resi composite restorations using incremental and bulk placement techniques: an ESEM study. Jour Oral Rehab. 30:10,p 1000-7, Oct 03