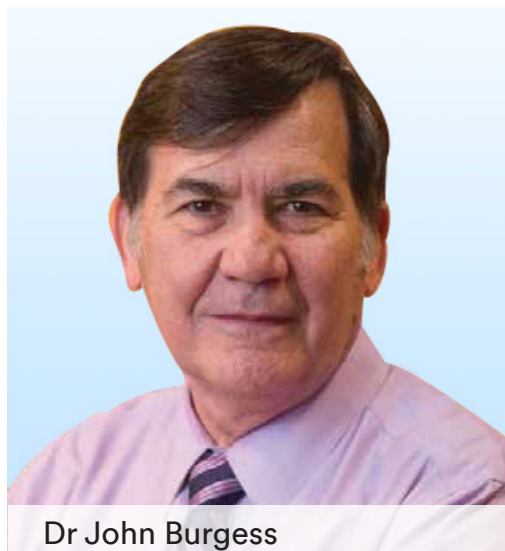


4 is the new 2: Bulk fill composites continue to evolve

by Joseph Allbeury

An interview with Dr John Burgess. If there is a dental equivalent to a Myth buster on the dental speaking circuit then Dr John Burgess would likely fit the bill. Dr Burgess, a regular visitor to Australia – ADP caught up with him most recently at the Australian Dental Congress in Brisbane. When it comes to dental materials, he has spent his career testing what will and will not cut it in the clinical dental practice. In this article Dr Burgess discusses the new category of Bulk Fill Composites materials.



Dr John Burgess

If there is a dental equivalent to a Mythbuster on the dental speaking circuit, then Dr John Burgess would likely fit the bill. Dr Burgess, a regular visitor to Australia - we caught up with him most recently at the Australian Dental Congress in Brisbane - is the Assistant Dean for Clinical Research and Director of the Division of Biomaterials at The University of Alabama at Birmingham. And, when it comes to dental materials, he has spent his career testing what will and will not cut it in clinical dental practice.

“Part of what we do at the University is to independently test the dental products of tomorrow,” Dr Burgess said. “We work with a broad range of manufacturers who are looking for feedback on products they are developing to establish both efficacy and clinical relevance.

“We’re testing systems that are in the future; systems that are not on the market yet and may not be for some time. So we see a lot of where the profession is heading in terms of material technology.

“Wouldn’t it be nice, for instance, to either not cure your composite resin at all with a light, or shorten down the time significantly? Or what if composite resin materials were self-adhesive and actually bonded to tooth structure, so you don’t need to use an adhesive. That would shorten placement time considerably.

“So those are some of the innovations that manufacturers are really trying to develop in new systems that are simpler, faster, easier to place and that improve healthcare delivery.

“To this end, one category of products we’ve done a lot of work on are the bulk fill composite resins that are becoming popular. Bulk fill materials have been designed with the goal of shortening treatment times. This is an area where there is confusion and so I am asked to speak about that topic a lot. We’ve told everyone to build-up resin restorations in 2mm increments for years and now all of a sudden, we’re saying 4mm is OK, so hence I get a lot of

questions about this relatively new product category. “Bulk Fill materials are generating a lot of interest because they are much faster to place. Incrementally building up in 2mm layers takes time; being able to place 4-5mm at once is far more efficient for the dentist and patients really appreciate less time in the chair.

“So there is both interest and confusion. Dentists are interested in the science behind these materials and essentially, whether it’s appropriate to adopt their use into every day practice.”

Dr Burgess said that he and his team at The University of Alabama at Birmingham’s Division of Biomaterials utilise a range of metrics when testing the efficacy of new materials.

“When we test composite resins, we test the stress and the strain the restoration places on the tooth, we test shrinkage, wear resistance and we test the depth of cure. We look at how well the material polishes and how well it wears and retains that polish in the long term. In addition, in our clinical studies, we measure and compare marginal integrity, marginal discolouration and how well the restorative material matches the colour of tooth structure.

“We are looking at the pros and cons of new materials, both initially at time of placement and over time to test overall longevity and resilience. We provide manufacturers with feedback as to whether their new products meet the needs of practitioners and if not, advise them on how to adapt the product to ensure it will.”

3M™ Filtek™ Bulk Fill Posterior

Amongst numerous manufacturers, Dr Burgess has tested many products from 3M over the years, including the newly launched 3M Filtek Bulk Fill Posterior composite.

“We’ve tested many of 3M’s products clinically and in laboratory studies. As a company, they tend to have a very solid history in developing outstanding composite resin technology. The new 3M Filtek Bulk Fill Posterior material was a product we tested prior to its launch and it could easily be one of the best products in the bulk fill category today.

“It is suitable for use in occlusal load areas and it has the same wear resistance as Filtek Supreme XTE. The handling is also exactly the same as Supreme XTE and it doesn’t stick to instruments.

“A key element we test, particularly with bulk fills, is the depth of cure to ensure the entire restoration has cured fully. According to the ISO standard, the bottom of the restoration should be at least 80% of the hardness of the top. The ability of the curing light to penetrate is affected by the shade and opacity of the restorative as well as the depth. For 3M Filtek Bulk Fill Posterior, we’ve determined that it is acceptable to use a 4mm increment on Class I restorations and up to 5mm on Class II where light penetration is greater and the material can be light cured from the facial and lingual.

“It’s also suitable for the open sandwich technique, where we place a gingival increment of 3-4 mm of GIC on the bottom, then add, for example, one 3-4mm layer of bulk fill material. This is ideal for high caries risk patients as the GIC will recharge; however GIC’s wear, so they are not suitable for load bearing areas of the restored tooth.

“3M Filtek Bulk Fill Posterior can be used for both enamel and dentin replacement and can be injected straight into the cavity. The wear resistance is excellent. If the wear resistance of the material is not good, then capping composite resin has to be used to provide an ‘enamel’ layer of composite to prevent excessive wear during clinical use. Filtek Bulk Fill Posterior is also highly radiopaque and in the posterior, it’s a good alternative to amalgam.”

Shrinkage

Another key metric tested at the University is how a material behaves during the curing process.

“When you put any bulk fill material into a cavity preparation and light cure it, it shrinks,” Dr Burgess explains. “All the composite resin materials do to some extent. If you have a lower filler rate, the shrinkage rate is slightly higher. The material is bonded to the walls of the prepared cavity, so as the material shrinks, it actually deforms the tooth by pulling the cusps together. We call this strain.

“We have a way of measuring tooth deformation using strain gauges and so we can tell you what materials put the least strain on the tooth. If the restoration is large and the strain is too great, then it can cause cusps to crack.

“3M’s new Filtek Bulk Fill Posterior can be described as both a low shrinkage - 1.8% - and a low strain-producing material. “From our studies I should also point out that using bulk filled materials doesn’t place the tooth under any more strain than using incrementally placed 2mm layers with currently used composites.”

The Science of Bulk Fill Materials

Dr Burgess explained that a number of factors have contributed to the success of bulk fill restorative materials.

“In the case of Filtek Bulk Fill Posterior Restorative, 3M have increased the translucency of the material which helps facilitate greater light penetration and as a result, a greater depth of

cure. Other manufacturers have increased the amount of photo initiator or developed new, more sensitive photo initiators to provide a complete cure with these larger (4-5mm) increments.

“In addition, the typical curing light used these days has greater radiance than ever before and adhesive technologies also continue to significantly improve. However, it is important to remember that your curing light must match the wavelength of the photo initiator in the restorative material. There are at least five photo initiators commonly used in dental materials today so it is worth checking.”

3M has also used two novel methacrylate monomers in Filtek Bulk Fill Posterior Restorative that act in combination to lower polymerisation stress.

The Future

Dr Burgess believes that rather than a fad, bulk fill composites represent an evolutionary change that will endure and continue to grow in acceptance.

“Dentists have initially had reservations about using bulk fill materials because they’re afraid of tearing at the margins, cracking cusps or creating white lines caused by grinding debris which accumulate in the open marginal areas produced by shrinkage of the composite during light curing.

“However, these problems have not been seen in our clinical studies and any drawbacks are more than offset by multiple benefits, the largest of which is time saved.

“Bulk Filling is simply faster because you can layer in 4-5mm with a single cure. Curing time is dead time. You now only need to use incremental placement if you’re trying to develop colour using multiple shades and translucences of composite, say in the 11 or 21.

“Patients appreciate less chair time and with less treatment time, it’s also easier to maintain isolation. The shorter the placement time, the less chance of contaminating the site with blood or saliva as most clinical operators don’t use a rubber dam to isolate the restorative area.

“Bulk filling significantly reduces voids that occur when you place multiple increments composite. These voids weaken the restoration leading to bulk fractures of the restoration. We consistently see these voids on x-rays of layered restorations.”

Dr Burgess said that 3M’s Filtek Bulk Fill Posterior Restorative is a durable, long lasting material with low shrinkage and low strain that will save practitioners considerable time.

“US Dentists have been huge adopters of this technology and some 75% are now using bulk fill materials,” he said. “Bulk fill materials are still evolving too; ultimately we want to see a 10mm cure in 1 second or even a dual cure.

“The data shows that there is no longer any difference between incrementally placed restorations and bulk filled restorations so given the dramatic time saving, I think bulk fills will take over. In a word, bulk fill and be done with it!”

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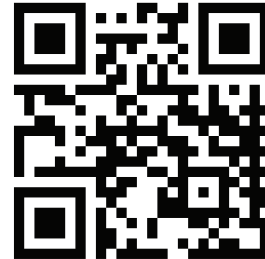
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3M Australia Pty Ltd
Building A, 1 Rivett Road
North Ryde NSW 2113
Ph: 1300 363 454
www.3M.com.au

3M New Zealand Ltd
94 Apollo Drive
Rosedale Auckland 0632
Ph: 0800 80 81 82
www.3M.co.nz

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