**SDR® Plus – The Ideal Bulk-Fill Material in High-C Factor Cavities**

**By Dentsply Sirona**

The configuration of post endodontic treatment cavities are typically deep if the surrounding tooth structure is intact, there will be a high C-factor (cavity configuration factor) due to the large surface area for the filling material to bond to.

Polymerisation shrinkage stress builds up inside a cavity according to the size of the bonded surface area that is holding a composite in place. The larger the bonded surface area the higher the level of polymerisation stress, resulting in an increased risk of composite detachment from the cavity walls or marginal leakage. Not only does this result in a failed restoration, it also poses risk to the integrity of the endodontic procedure underneath1.

**SDR® Plus from Dentsply Sirona** is the ideal material for coronal sealing of endodontic cavities especially with high C-factors. SDR® Plus can be bulk-filled in increments of 2mm due to its patented formulation which provides the necessary viscoelastic properties for low-stress, controlled polymerisation. As a result, SDR® Plus has up to 60% lower shrinkage stress than competing conventional and bulk-fill composites. In addition, SDR® Plus has unique self-leveling properties which allow it to automatically adapt to the geometry of a cavity. Thus, in combination with the fact that SDR® Plus has sufficient mechanical strength for use in the posterior region, high micro tensile bond strength and has shown excellent adhesion to the cavity-floor, makes SDR® Plus the ideal material for post endo, high C-factor access cavities.

**Case Study**

The present case shows the use of SDR® Plus for coronal sealing and bulk-filling of endodontic cavities in one single step.

**Conclusion**

Given the depth of many access cavities, the possibility of bulk-filling cavities is also important in post-endodontic treatment. In the present case SDR® Plus was used to fill Class I and II cavities in bulk up to 4mm immediately after the root canal treatment. The self-leveling consistency as well as the reduced polymerisation shrinkage stress of SDR® Plus in cavities (Van Ende et al. 2016), allows both optimal adaptation and adhesion to the cavity and thus coronal sealing of the root canal filling. Another advantage of this bulk-filling composite is its transparency allowing an easy retrieval of the root canal filling, e.g. in case of a subsequent post placement.

**References**

2. Data on file

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**The Rivelin patch sticks to the mucosal surface for much longer than any other treatment**

**By Brendan Dog, DTF**

Though the oral mucosa’s accessibility and high level of blood supply make it an ideal site for drug delivery, various other factors can make drug delivery quite difficult. However, a new polymer plaster, the Rivelin patch, developed by scientists from the University of Sheffield’s School of Clinical Dentistry in collaboration with Demirzent from Copenhagen in Denmark, has the potential to revolutionise the treatment of oral conditions. Dental Tribune International spoke with Dr Craig Murdock, Reader in Oral Bioscience at the university and lead author of the research, about how the patch works, its benefits and upcoming plans for clinical trials.

**What was it that motivated you and your team to develop the Rivelin patch? Was it designed to target any specific conditions?**

There are very few ways to deliver drugs to the oral mucosa. The current methods use mouthwashes, gels, creams or sprays that are delivered to the entire lining of the mouth, in which case they affect both healthy and diseased tissue. In addition, drugs that are delivered using these methods have short contact times with the diseased tissue before they are washed away, so delivering drugs this way is often ineffective or requires the use of high drug concentrations to reach a therapeutic dose.

I have worked in the oral medicine unit at the University of Sheffield’s School of Clinical Dentistry for over ten years alongside Prof. Martin Thornhill, a world-leading expert in oral medicine. Thornhill, along with many other oral medicine consultants, has known for some time about the inadequate treatments for oral conditions. The issue has been with the development of a patch that is able to stick to the moist surface of the oral cavity, and the willingness of polymer chemists, drug delivery specialists and commercial enterprises to identify this unmet clinical need.
The project really took off when we were approached by Jens Hansen to enter into collaboration. Jens had worked extensively in the pharmaceutical industry and was involved in developing patches for skin treatments. The collaboration started in May 2014, simply as an idea to produce a patch to help people with chronic inflammatory oral conditions—a large group of patients that were receiving suboptimal therapy. Since then, Jens has established Dermtreat in Copenhagen, and together with a diverse group of academics, we have developed the Rivelin patch.

The patch has been specifically designed to treat people suffering from oral lichen planus—an inflammatory disease—and oral aphthous ulcers, although the clinical trial will only be conducted on ulcerative oral lichen planus.

How does the patch actually work?
The patch is made using electrospinning technology. Here, the drug—in this instance, dexamethasone—is incorporated into very fine polymer fibres that form a mesh-like lattice as the patch is made. This creates a patch with a very large surface area, which, along with specially selected adhesive polymers, allows the patch to adhere to the moist surfaces of the oral cavity. It’s a bit like the hairs on the feet of a gecko—they provide a large surface area so that they can stick to walls and then climb them. Once adhered, the moisture on the oral mucosal surface interacts with the polymers, causing the release of the steroid or drug directly into the diseased tissue. Because the patch has a backing layer, the steroid or drug release is unidirectional—into the tissue only—and none is released into the oral cavity. This means that healthy tissue does not come into contact with the drug.

What benefits does it offer over conventional treatment methods for oral lichen planus and recurrent aphthous stomatitis?
The patch offers targeted release of drugs directly into the diseased tissue. Our data shows that the patch stick to the mucosal surface for a much longer time than any other current treatment. This makes the contact time between the drug and the oral lesion greater than any other method currently used, thereby providing greater therapeutic benefit. The close contact of patch and lesion over a longer period may also mean that, compared to our current methods, smaller drug amounts are required to treat lesions.

Does the patch have any potential for treating other oral conditions?
Yes. It is highly likely that just a plain patch without a steroid could be used as a covering for an oral wound—it would prevent bacteria entering the wound and so aid healing. Though the clinical trial will be for oral lichen planus, the patch could be used to treat several other inflammatory oral conditions, such as aphthous ulcers, that affect a large proportion of the population. We are also working with Dermtreat to create new patches containing other drugs that would be useful in an oral setting. The patches are able to incorporate many drugs, so this flexibility holds much promise.

What role has Dermtreat played in the development of the Rivelin patch?
Dermtreat has been central to the development of the patch. Without its funding and industrial knowledge, the development of the patch would not have occurred. Likewise, without the experimental knowledge and expertise of researchers at the University of Sheffield, the patch would not have been developed. Both parties acknowledge the crucial input the other had in the project. This is a very healthy relationship that has fully benefited the research as a whole.

Phase two clinical trials for this patch are set to take place at several sites in the US and the UK. Has it been determined where and when exactly these trials will take place, and when will they begin?
In the UK, the trials will take place in Sheffield and Leeds and at two hospitals in London. The European arm of the trials will be coordinated from Munich whilst the US trials will be coordinated by Michael Brennan at the Carolinas Center for Oral Health in Charlotte in North Carolina. They will commence in late July, with the first recruits most likely being in the US.

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The Rivelin patch, a new polymer plaster developed by scientists from the University of Sheffield’s School of Clinical Dentistry, will soon undergo phase two clinical trials. (Photograph: Craig Murdoch)