

Glass ionomer fissure sealants

Glass ionomer fissure sealants are an option if resin-based sealants are not indicated.

The occlusal surfaces of the first permanent molars are one of the sites most commonly affected by dental caries development. This is due primarily to their early eruption, posterior location, immature enamel, and anatomic pits and fissures, which facilitate the development of a bacterial biofilm. Sealing these pits and fissures can prevent biofilm development and thus form part of a comprehensive caries prevention programme. Current guidelines recommend caries risk assessment for all children and the placement of resin-based fissure sealants on the first and second permanent molars of those deemed high caries risk.¹

While highly effective, resin-based sealants have several limitations. Firstly, resin-based dental materials are hydrophobic, meaning effective moisture control is very important. This can be difficult in cases of poor patient co-operation or when dealing with partially erupted teeth. It has been found that permanent molars can take up to 34 months to erupt fully.² Therefore, teeth may be exposed to the oral environment unprotected for nearly three years. As caries development is most likely in the first few years following eruption, this represents a significant risk.

In the case of molar incisor hypomineralisation (MIH), altered enamel morphology may prohibit the successful bonding of resin-based materials. In addition, hypersensitivity can prevent completion of etching, rinsing and drying without local anaesthetic. Furthermore, if there is evidence of post-eruptive breakdown, resin-based sealants may be contra-indicated.²

Alternatives to resin-based sealants

Glass ionomer (GI) sealants can be utilised when a resin-based sealant is indicated but cannot be placed due to poor moisture control, resulting from either inadequate tooth eruption or poor patient co-operation. GI is hydrophilic, making it more compatible with the oral environment. Another significant advantage of GI sealants is their action as a fluoride reservoir, aiding in the remineralisation of enamel.

Finally, in instances of MIH, GI may be considered the first-line sealant material (**Figure 1**).³ Placing a resin-based sealant on a sensitive tooth may be distressing for a child and may increase the risk of treatment-induced anxiety. Even though the retention rates for GI sealants are reduced compared to those of resin-based sealants, studies have shown that small amounts of material remain in the pits and fissures even after the sealants appear to have debonded.⁴



FIGURE 1: Hypomineralised mandibular right first permanent molar with early post-eruptive breakdown – suitable for a GI sealant.

Process of fissure sealing with high-viscosity glass ionomer using the atraumatic restorative treatment technique³

1. Employ a four-handed technique where possible.
2. Achieve isolation using cotton wool rolls (**Figure 2**).
3. Dislodge plaque and debris with a probe and clean the surfaces using wet cotton pellets or a toothbrush.
4. Apply an enamel conditioner (e.g., 20% polyacrylic acid such as GC Cavity Conditioner) for 10 seconds (**Figure 3**).
5. Remove the conditioner and dry the surface, using wet, and then dry, cotton pellets. Care should be taken not to desiccate the enamel.
6. Apply a high-viscosity GI material, such as GC Fuji IX, directly onto the tooth using an applicator gun, dental instrument, or a gloved finger lubricated with petroleum jelly (**Figure 4a**).
7. Manipulate the material into the pits and fissures using finger pressure (**Figure 4b**).
8. Remove finger in a lateral direction after 10–15 seconds.
9. Remove excess with an instrument such as an excavator, and adjust occlusion as required.
10. Place a new layer of petroleum jelly and allow the material to set fully while maintaining isolation (**Figure 5**).



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FIGURE 2: Effective cotton wool roll isolation.



FIGURE 3: Conditioning of the pits and fissures.

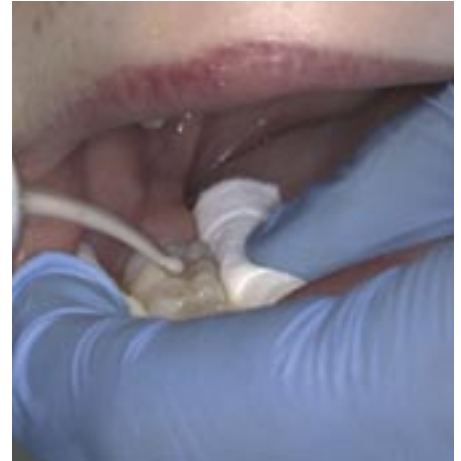


FIGURE 4a: Application of a GI sealant (GC Fuji IX).

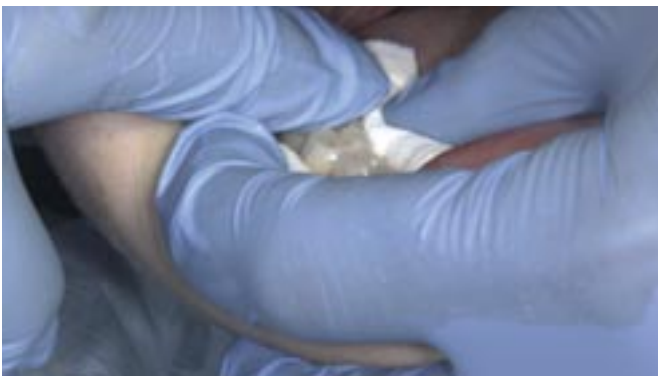


FIGURE 4b: Manipulation into the pits and fissures using the 'finger press' technique.



FIGURE 5: GI fissure sealant.

11. Patients should avoid eating for one hour afterwards if possible.
12. Recall patients in line with their caries risk status.

If a sealant has debonded on review, options include replacement with another GI sealant, or placement of a conventional resin-based sealant if moisture control can be achieved.

How can we adapt for children with limited co-operative ability?

Unlike resin-based sealants, GI materials chemically bond to enamel.² This means that GI can be dispensed directly onto the tooth structure without prior conditioning in instances of particularly challenging patients.

In cases of unpredictable co-operation, using high-viscosity GI may not be ideal, as removal of excess material may not be possible. In these instances, GC Fuji Triage may be employed.

In the authors' experience, this specially formulated GI sealant requires more frequent re-application compared to high-viscosity GI sealants, but is less technique sensitive.

This makes it an excellent choice for challenging cases, such as patients with intellectual disabilities.

In cases of very limited patient co-operation, where a GI sealant is not possible, fluoride varnish containing 22,600ppm F should be applied to the pits and fissures at three- to six-month intervals, with a view to placing fissure sealants once co-operation improves.¹

Should pre-encapsulated or hand-mix glass ionomer be used?

In addition to a pre-encapsulated form, high-viscosity GI materials are available as hand-mix powder and liquid. Some dentists may prefer the handling properties of hand-mix GI. It may also be more economical for general dental practices where children make up a small cohort of patients. Both hand-mix and pre-encapsulated forms can be used to place successful GI sealants, provided manufacturer's instructions are followed regarding powder-liquid ratio and mixing times.

References

1. O'Neill, D., Nayyar, J., Kinirons, M., Harding, M. Fissure sealants – an update. *J Ir Dent Assoc* 2021; 67 (2): 93-97.
2. Wright, J.T., Crall, J.J., Fontana, M., Gillette, E.J., Nový, B.B., Dhar, V., *et al*. Evidence-based clinical practice guideline for the use of pit-and-fissure sealants: a report of the American Dental Association and the American Academy of Pediatric Dentistry. *J Am Dent Assoc* 2016; 147 (8): 672-682.e12.
3. Lygidakis, N.A., Garot, E., Somani, C., Taylor, G.D., Rouas, P., Wong, F.S.L. Best clinical practice guidance for clinicians dealing with children presenting with molar-incisor-hypomineralisation (MIH): an updated European Academy of Paediatric Dentistry policy document. *Eur Arch Paediatr Dent* 2022; 23 (1): 3-21.
4. Frencken, J.E. The state-of-the-art of ART sealants. *Dent Update* 2014; 41 (2): 119-120, 122-124.