

Big protection for little teeth

Recommendations
for effective and
successful fissure
sealing in children

Table of Contents

Fissure and pit sealing

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Prof. Dr Jan Kühnisch: Fissure and pit sealing	3
- Introduction	
- Diagnosis and indication	
- Clinical procedure	
- Summary	
- Literature	
Tips & tricks	16
What properties should the sealing product have?	17
Q & A with Prof. Dr Jan Kühnisch and Dr Siegward Heintze	18
Helioseal® F Plus	22
Imprint	24



Introduction

Caries is one of the most common dental diseases worldwide and affects all age groups. In children and adolescents caries predominantly affect the deciduous molars and their proximal surfaces.

When the first permanent molars erupt before 6 years of age, it is their fissures and pits that are initially at risk.

This is due to the complex contours of the fissures and pits, which are susceptible to caries because they are difficult to clean with a toothbrush during daily oral care. Fissure and pit sealing was described for the first time more than 50 years ago as a means of effectively preventing caries initiation or arresting caries development in the initial stages. This technique is aimed at transforming plaque-retentive fissures and pits into a surface appropriate for prophylaxis and has become one of the standard procedures in preventive dentistry.

It must be mentioned here that fissure and pit sealing only supplements a healthy diet, systematic and high quality oral hygiene measures, and home and professional fluoride application and cannot be successful by itself. Only the combination of these preventive

measures ensures lifelong dental health. However, it is equally important to ensure that all measures are only applied in accordance with the indication to prevent overtreatment in particular and ensure an appropriate cost-benefit ratio.

By definition, sealing is the formation of a preventive barrier on fissures and pits that are susceptible to caries to prevent caries initiation or arrest the development of early carious lesions (Welbury et al. 2004).

The sealant can in principle be applied to all teeth with fissures or pits in the deciduous and permanent dentition. Because the greatest preventive benefit is achieved for the first and second permanent molars, clinical application of fissure and pit sealants is typically limited to these teeth which are therefore prioritized. Nonetheless, sealing caries-prone fissures and pits is also possible on deciduous teeth, anterior teeth, and canines as well as premolars.

Clinical diagnosis and application of the fissure and pit sealant



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Diagnosis and indication

The indication for fissure and pit sealing is generally determined in children, adolescents, and young adults during the clinical or visual examination. On cleaned and dried teeth, the dentist differentiates between the diagnostic categories "healthy", "initial caries", or "(micro) cavitation / dentinal caries" and justifies the subsequent diagnostic procedure based on this differentiation (Figure). For healthy or caries-free fissures and pits, the indication depends on the general caries risk of the patient or the surface-specific caries activity.

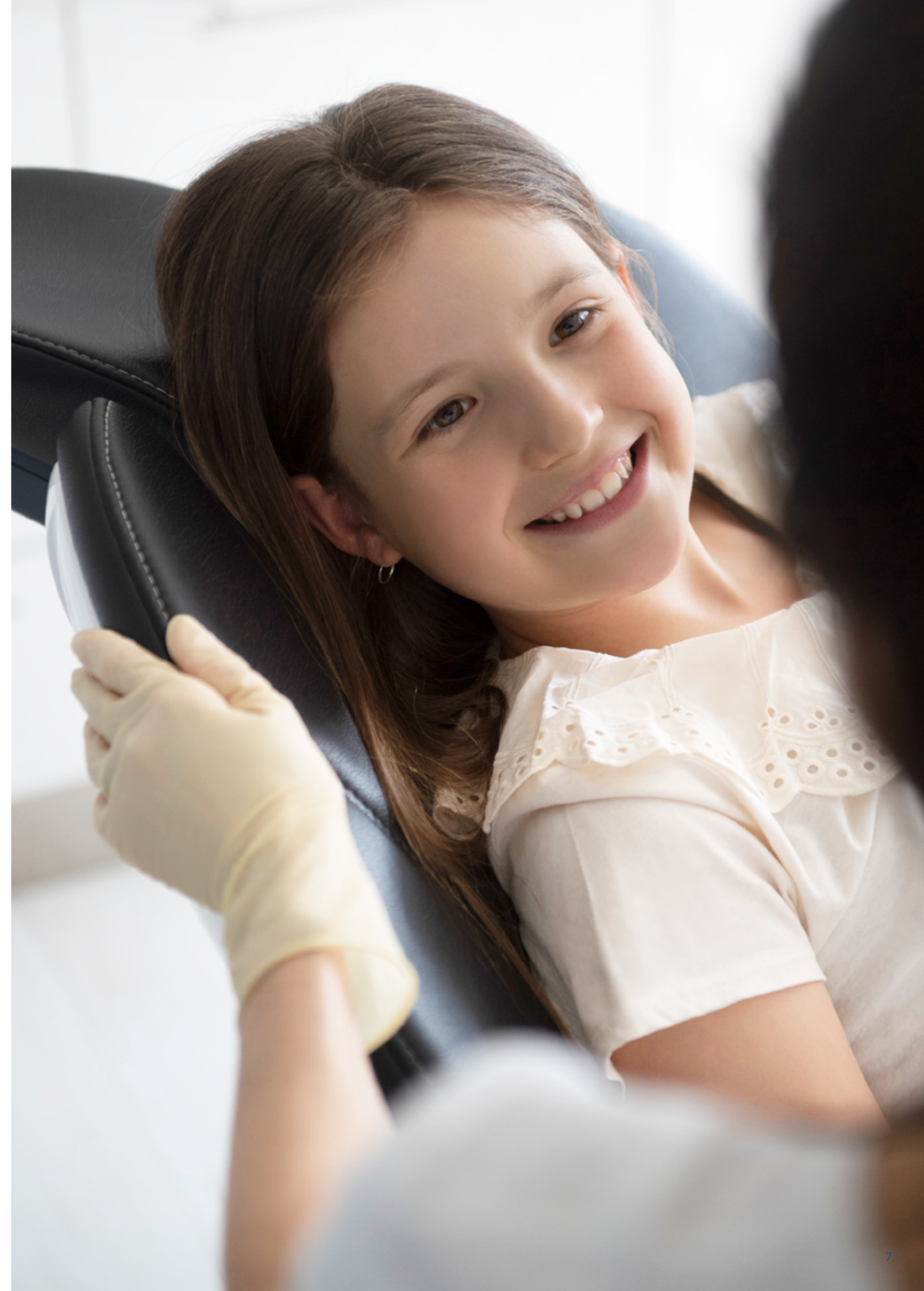
For patients with an increased risk or increased activity, sealing is advocated. This is the case if, for example, there are initial caries or cavitations in the dentition, restorative measures have had to be implemented in the past, or oral hygiene is not optimal. On the other hand, with a low caries risk or low caries activity, fissure and pit sealing can be omitted.

The presence of non-cavitated carious lesions (initial caries) typically requires an additional diagnostic assessment because there is a greater

likelihood of dentinal caries developing on clearly stained fissures or pits. Supplementary measures include bitewing radiographs or even photo-optical diagnostic procedures. If hidden occlusal caries with dentinal involvement can be confirmed, filling therapy must be considered as the treatment of choice. If this is not the case, sealing is indicated to arrest existing initial caries.

If a cavitated carious lesion has been diagnosed, sealing of this lesion is contraindicated. This in no way rules out sealing intact fissures or pits immediately adjacent to any direct restorations that will be carried out.

Indications and contraindications for fissure and pit sealing are summarized in the boxes below (Kühnisch et al. 2016).



Indications for fissure and pit sealing



- ✓ Caries-free fissures and pits in patients with an increased caries risk. This includes, e.g., patients with prior caries in deciduous and permanent teeth.
- ✓ Caries-free fissures and pits with anatomically caries-prone fissure contours.
- ✓ Fissures and pits with non-cavitated carious lesions regardless of the caries risk assessment.
- ✓ Fissures and pits in patients with general diseases or physical and/or mental disabilities that only enable limited implementation of effective daily oral hygiene, increasing their caries risk.
- ✓ Partially or completely lost fissure sealant should be resealed if the caries risk remains unchanged.

Contraindications for fissure and pit sealing



Relative contraindications:

- ✓ If the affected tooth has not yet fully erupted into the oral cavity and if the occlusal surfaces or the palatal/buccal pits are inaccessible or only partly accessible for adequate isolation or instrumentation, sealing should be dispensed with for the time being. Partial sealing may be indicated in patients with a high caries risk.
- ✓ For teeth with confirmed dentinal caries around the fissures or pits, sealing is contraindicated and minimally invasive filling therapy is indicated.

Absolute contraindication:

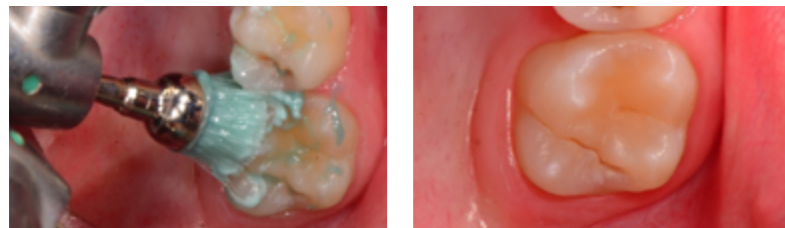
- ✓ Allergy to the sealant materials or individual material components.

Clinical procedure

Fissure and pit sealing is a simple, non-invasive treatment technique that can be performed in a few minutes. Nevertheless, some steps are essential, which will be performed by the dentist or a trained dental assistant. The choice of field isolation – either with relative isolation using cotton rolls or complete isolation with a rubber dam – is the main factor influencing the treatment setup. While in the latter case the requisite steps can also be performed without assistance, the relative isolation procedure requires two people – that is, the involvement of a dental assistant – to reliably isolate the field for the duration of the treatment and also to quickly and effectively carry out the necessary steps.

Cleaning the tooth surfaces

In the first clinical step, the tooth surface is cleaned. This is a prerequisite for the diagnostic examination and also subsequent conditioning of the tooth surface. Tooth cleaning can be performed with a rotary brush with or even without prophylactic paste.



Cleaning the tooth surface with rotary brushes and a prophylactic paste.

Isolation

Another prerequisite for successful treatment is reliable isolation of the oral field. From a practical perspective, it must be emphasized that while complete isolation ensures safe working, the procedure is not always accepted because the rubber dam requires anchorage – often subgingival – with a clamp. This applies particularly to younger school-aged children. Therefore, relative isolation is established in practice but must, however, be performed with a dental assistant to ensure reliable, effective, and child-friendly treatment. From a scientific perspective, both isolation procedures can be considered equivalent.

Conditioning the enamel surface

Conditioning the enamel surface aims to remove the external aprismatic enamel layer and expose the underlying enamel prisms. The resultant etching pattern is used for micromechanical anchorage of the sealant material and enables adhesive bonding with the hydrophobic methacrylate-based sealing resin.

Conditioning with 35% phosphoric acid gel has proven successful in routine clinical use for enamel conditioning. Gels remain in place when applied and are consequently easier to control than liquid acids. It is currently recommended to condition the untreated enamel of the remaining tooth for 30 to 60 seconds.

Shortening the acid conditioning to less than 30 seconds is currently not recommended because this results in an incomplete etching pattern. After allowing the acid to work, thoroughly spray the surface clean for several seconds and then use accelerated air drying of the tooth surface. A chalky white enamel surface is the criterion for a successful etching process. If this is not the case, the etching process must be repeated before applying the sealing material.



Applying the phosphoric acid gel for enamel conditioning.

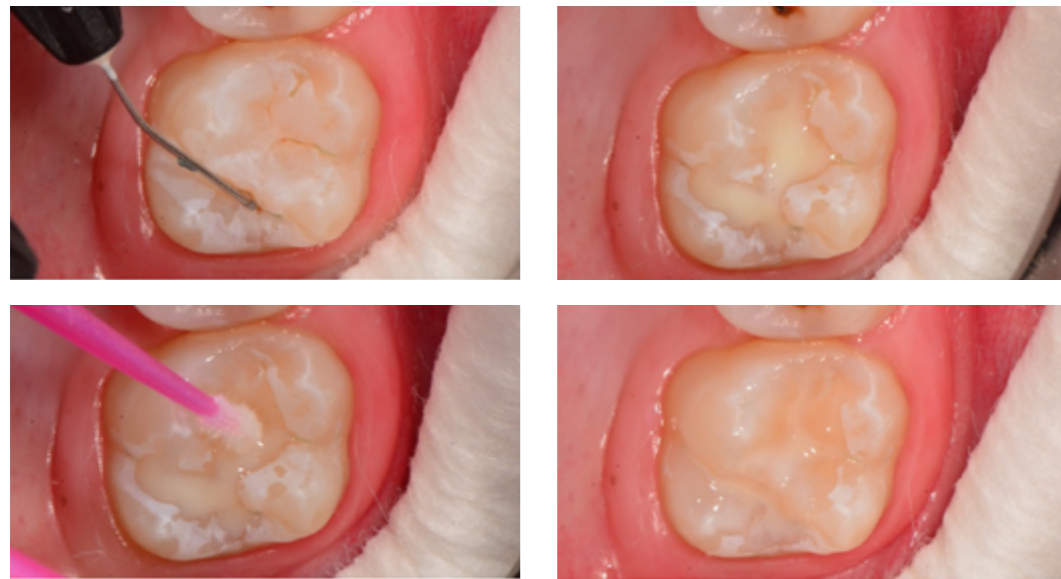


Removing the phosphoric acid gel by spraying clean with effective suctioning directly on the tooth. The chalky white etching pattern is clearly visible.

Application and curing of the sealing material

Sealants are available these days exclusively in the form of low viscosity, white coloured, and light-curing single-component materials (Kühnisch et al. 2012 and 2020). The use of cartridge systems with delicate application tips optimizes clinical use and immediate light curing shortens the treatment time. Both reduce the technique's sensitivity and contribute to a child-friendly treatment process. From a practical perspective, the

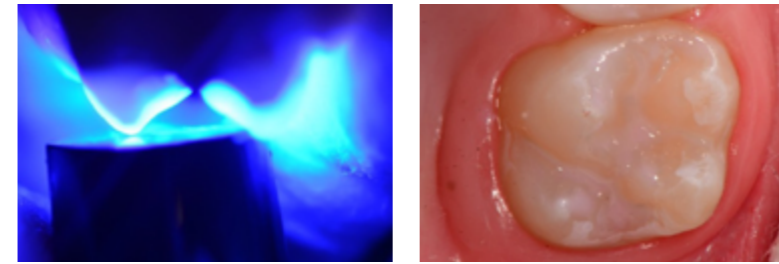
material should be applied with a slight excess in the central fissure and then gently distributed with a brush stick or similar over all the (para)fissures and pits. The brush stick can also be used to remove any excess material that would otherwise subsequently need to be removed with effort using rotary instruments. Before the final light curing, a visual inspection is carried out to ensure that all fissures and pits on the tooth have a thin layer of sealing material.



Applying the sealing material to the occlusal surface. The material is then distributed with a brush stick.

For the curing, use LED or halogen lamps with sufficient intensity. The curing time – typically 10 seconds – must be adhered to. However, it must be noted that the duration of the illumination depends on the particular curing lamp used (Table). Therefore, before using the sealant for the first time, familiarize yourself with the specifications of the light curing unit and check the light intensity as well. The latter must be checked at regular intervals.

Light intensity / wavelengths	Illumination time
Bluephase G4 >1000 mW / cm ² / 400–500 nm	10s
Bluephase Style >1000 mW / cm ² / 400–500 nm	10s
Other >500 mW / cm ² / 400–500 nm	20s
Other >1000 mW / cm ² / 400–500 nm	10s
Other 2000 mW / cm ² / 400–500 nm	5s



Light curing for 10 seconds and cured fissure sealant.

Once the curing is complete, perform an occlusion check and, in case of early occlusal contacts, make any necessary adjustments. In principle, removing any uncured resin on the surface by briefly polishing is recommended. Remineralization of etched but not sealed areas of enamel is supported by local application of a fluoride preparation.



Removing the superficial oxygen inhibition layer by polishing. Fluoridation.



Finished fissure sealing.

Monitoring

Due to the possible loss of retention, it is recommended to regularly check existing fissure and pit sealing. This check can be performed as part of the standard regular checkups. Likewise, the checks can be performed at the risk-dependent preventive sessions. In case of complete or partial loss of retention, the indication is reviewed and, if necessary, a fissure and pit sealant is applied in the same way as the procedure described above.

Summary

Fissure and pit sealing is an evidence-based preventive measure to effectively protect sites on molars that are prone to caries. The caries prevention benefit has been demonstrated in a number of clinical studies that were in turn summarized in systematic literature reviews (Ahovuo-Saloranta et al. 2013 and 2017). The prerequisite for clinical success remains, however, complete sealing of the entire fissure contour while adhering to the relevant steps and ensuring quality management.

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Tips & tricks



- ✓ Relative isolation using the four-hand technique
- ✓ Etching time for the enamel of 30 to 60 seconds
- ✓ Suction the etching gel directly at the tooth
- ✓ Replace the cotton rolls after spraying clean
- ✓ Accelerated air drying until chalky white etching pattern is visible
- ✓ Avoid excess material application
- ✓ Distribute a thin layer of the sealant in all fissures, para-fissures, and pits to prevent early contacts
- ✓ Cure directly on the tooth

What properties should the sealing product have?



- ✓ White and opaque for simple and easy visual inspection
- ✓ Long-lasting adhesive bond
- ✓ Good retention behaviour
- ✓ Good marginal behaviour
- ✓ Good flow properties when applied to the enamel
- ✓ No "running" when applied to the fissures
- ✓ Short curing time

Q & A with Prof. Dr Jan Kühnisch and Dr Siegward Heintze



Isn't the incidence of caries decreasing according to studies?

JK: We see a very positive development here in regard to caries. Many more children, adolescents, and even adults have healthier teeth and fewer fillings these days. A fabulous development. However, the presence of initial caries was not taken into account in several studies, leading to the risks not being fully taken into account. Consequently, the caries risk may be underestimated because this risk is determined not only by cavitations but also by initial caries. The significance of initial caries is enormously important because there is still an opportunity to permanently arrest development of these lesion stages with established preventive measures.

Apart from caries prevention, what are some additional benefits of fissure sealing?

JK: Along with its caries preventive effects, particularly in patients at risk of caries, fissure sealing is also a good first step in the treatment of children. Sealing enables the child to be introduced to conventional treatment

workflows with comparative ease. For fissure sealing, we have to carry out isolation with cotton rolls, and we need suctioning and light curing. But the most critical factor here is that no invasive techniques are carried out. No invasive work is performed on the tooth but the same procedures are still used, which has a positive impact on behaviour management.

Apart from low caries activity, what are additional contraindications for fissure sealing in children?

SH: One example is a child who is not cooperative. If this means that the very important step of isolation is not possible and the enamel is flooded with saliva, sealing is rather counter-productive. There are reviews that confirm that regular fluoride application every six months with a high percentage fluoride varnish is an alternative to fissure sealing but of course only if no carious defects are present. Another example is the time line. If the occlusal surfaces have been free of caries for 5 or 6 years, teenagers aged 14 or 16 with no sealing and no signs of caries no longer need sealing.

The likelihood that caries will still develop in fissures is low, provided that the diet does not suddenly change to one with frequent consumption of sugary foods.

Why is it important to correctly perform every detail of the treatment workflow?

JK: Correct implementation of the treatment workflow makes a very clear contribution to quality assurance. When treating children, however, it also comes down to rapid implementation of the treatment workflow. Every time isolation or suctioning is repeated adds more time to the overall workflow. This means that the child needs more patience. Not to mention that the dental team needs more time. The motto is therefore: work correctly and quickly!

Which step of the technique needs particular attention to ensure good retention of sealant material on the etched enamel surface?

SH: In this phase isolation of the prepared enamel surface is very important. Saliva on the etched occlusal surface leads to a poor bond between sealer and enamel. Complete isolation with a rubber dam is usually difficult with children and is rarely well tolerated by a six-year-old. Many clinical studies have confirmed that isolation with cotton rolls and a large suction unit is just as effective for retention of the sealant as complete isolation with a rubber dam. This is best achieved if a well-coordinated dentist/dental assistant team seals the teeth (four-hand technique). If the dentist or the prophylaxis assistant works alone, there are aids for drying, such as saliva ejectors that also have a tongue retractor, and systems for retracting cheeks/lips. These systems are also available in smaller versions for children. Other problems include underetching the enamel and

applying excess sealant material. If, for example, sealant material ends up on unetched enamel, this creates a retention niche for bacteria and plaque and the sealing encourages caries instead of preventing it.

Is bubble formation on fissure sealing a problem?

JK: On one hand this is essentially not critical – this is the important information. If, however, we are talking about perfect quality, then it would of course be lovely if bubble formation did not occur. In principle, bubbles develop when applying the sealant material on the tooth if air and material are mixed in the cartridge system. Visible bubbles can be "wiped away" before curing. However, bubbles may only become visible later if they open up as the sealant wears. In most cases there are no clinical consequences, however.

Is the use of a loupe recommended?

JK: Of course, magnifying aids can be very helpful. But every dentist has to decide for themselves and this varies from person to person. However, all objects that restrict nonverbal communication by the dentist, in my opinion, interfere with the opportunities for communicating with the child. I personally use my facial gestures to provide positive feedback or sometimes even negative feedback. If the dentist's face or eyes are largely hidden, the positive support this provides for the child and parents no longer comes appropriately into play. That is, during routine treatment of the child, including fissure sealing, magnifying aids can usually be dispensed with. On the other hand, I am grateful to have a microscope available for elaborate and difficult treatment situations.



**What in particular must be taken into account when treating children?
Are there standards?**

JK: Every colleague has their own repertoire of established procedures but there are certainly some principles that should be followed. The first session should not be invasive but as a rule more can be carried out in the second session. The following applies: Move from the simple to the difficult, and fissure sealing is one of the simpler treatment procedures. On the other hand, for adults problematic situations can often be resolved straight away. The situation is simply different for children. For children, the following applies: Build trust, introduce the child to the treatment, and continually expand the range of options. This helps to keep the child on side and create feelings of success.

SH: Treating children is a challenge, especially as dentists do not receive any psychological training. Every child is different and children are not simply small adults. When treating children, particularly young children, it is not about creating optimal restorations but rather preventing the child from being frightened by the dentist or the dental treatment. The child should consider the dentist to be a friend and helper and not the cause of pain and unpleasant experiences. The dentist must approach the child playfully. Much of this involves learning by doing. It may be that in the first encounters with the child no treatment is performed but instead things are

explained, e.g., certain instruments and the workflow are demonstrated playfully. This is best achieved with respect, humility, and empathy. The child must feel that they can influence the workflow at all times. Sometimes it is important to treat the child without the parents present because parents can have a negative effect on things. This varies enormously and experience is very important here. In general, the following applies: Every child is different and the treatment concepts must be modified accordingly for each child. The dentist's appearance also plays a role. Street clothes are better than a long white lab coat, which in and of itself can be intimidating.

What can be done for children who do not cooperate or are difficult to treat?

SH: For children who do not cooperate well or have been traumatized and for children with psychological or physical disabilities, initially compromise treatments or minimal therapies should be carried out, e.g., only remove caries in part or over several steps, or check their development with high percentage fluoride varnishes, or remove the caries but do not place a filling, which incidentally is well tolerated by children and does not cause any pain. Only for severe cases of non-compliance (e.g., with disabled children, children with systemic diseases) and severe caries that affects many teeth, treatment under general anesthetic or sedation may be required.

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Siegward Dietmar Heintze, Ph.D**

Since 2002: Head of Preclinical Research
Ivoclar Vivadent AG, Schaan

1996–2002: Head of Clinical Research Ivoclar Vivadent AG,
Schaan



1, 2, 3, sealed

Helioseal® F Plus

Fast and comfortable fissure sealing
in children



- ✓ Helioseal F Plus is a light-cured, composite-based, white-pigmented fissure sealant that releases fluoride^[2]. The fissure sealant supports caries prevention – the tight seal formed by the sealant around the margins provides protection against cariogenic germs^[2,3,4]. Fine fillers contained in the sealant form a smooth surface^[2].
- ✓ The effective sealant ensures fast and comfortable treatment of children^[1,2,3].
- ✓ Helioseal F Plus is flowable and easy to spread on complex contours such as pits and fissures – even in the upper jaw^[3].
- ✓ Using suitable light curing units such as Bluephase Style or Bluephase G4 from Ivoclar, Helioseal F Plus can be cured in just 10 seconds^[2].
- ✓ The practical syringe with its fine tip enables precise dosing and highly accurate application of the sealant. The fine application tip facilitates fast and accurate application without overfilling the fissure^[3].

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