



Icon – Drilling? No thanks!

User report

Dr. Andreas Schult

Caries is one the most frequent dental diseases. We can detect it either clinically or radiologically and distinguish caries according to its progression and extension. Clinically, proximal spaces can generally not be precisely examined; therefore, for a closed dental arch, an x-ray in form of a bitewing radiograph is indicated. Diagnostic assessments based on x-rays are part of a dentist's daily routine. X-rays are therefore the most important resource to determine and evaluate proximal caries. On x-rays extensive carious lesions stand out clearly as bright areas. A bright area extending beyond the first third of the dentine (D1) (fig. 1) still indicates the need for a filling restoration. For non-cavitated enamel defects with a maximal radiological extension into the first third of the dentine there is now a new solution where, so far, none of the various alternative approaches provided satisfactory results. Shall we wait until they get larger? Will a fluoride therapy be enough? Can we motivate our patients? Will the defect stabilize? Should the dentist take a chance? Many of these questions are going through dentists' minds on a daily basis. To motivate our patients to practice better oral hygiene is an important step to prevent damage. But what about the legal situation if a dentist detects a defect, does not restore it, and the defect progresses? And how do we work with the very distinct species of pubescent adolescents, in whom a considerable increase of caries has been observed and who most frequently evade the rationality of the so-called adults. The following case description introduces a new method that spurs hope that we will soon be able to treat class E1, E2, and D1 carious lesions without drilling and to prevent progression of the caries lastingly.

Medical history

The patient, age 13, comes to us for a routine checkup. Typical prophylactic examination.

Findings

Mucous membrane papillae slightly reddened. Plaque build-up. API 100%, PBI 60%.

X-ray findings

Approximal bright area extending from E1 – D1 on tooth 16, 15, 14, 44 and 45 (fig. 2).

Diagnosis

Caries, gingivitis

Therapy

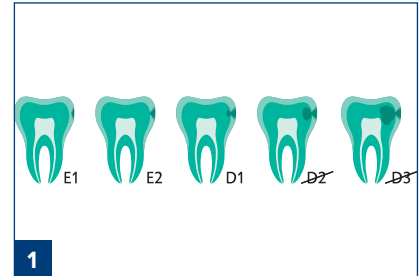
Oral hygiene instruction, tooth cleaning, success control, fissure sealing. Infiltration on tooth 16, 15, 14, 44, and 45. As an alternative treatment to the infiltration method, the option of a filling restoration must be discussed.

Therapy decision

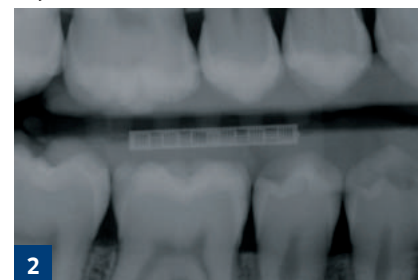
Motivation in the oral hygiene phase was difficult. The treatment needed to be interrupted at times due to lack of compliance on the part of the patient. With direct involvement of the parents the API values decreased to 35% so that a combination therapy of infiltration and filling restoration was decided. The patient also had stable prophylaxis values. First, fissure sealings were performed using the acid etching technique. Subsequently, the lesions on tooth 16, 15, 14, 44, and 45 are infiltrated.

Infiltration therapy

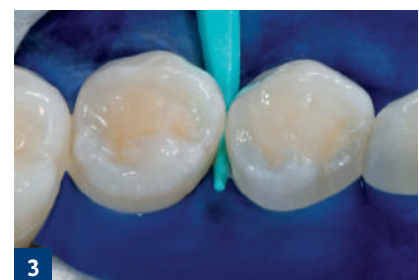
The infiltration concept is a new method for treating caries. The treatment was performed with Icon, a product indicated for lesions extending from E1 to D1. This technique was de-



1 Schematic representation of the extent of radiologically visible caries with infiltration indication



2 Bitewing x-ray



3 Representation and separation of the proximal area with a special wedge



4 Etching gel dispenses on one side of the foil bag. The adjacent tooth is protected



5 Bitewing x-ray, original data

For information only.



For information only.

veloped by Adj. Prof. Dr. H. Meyer-Lückel and Dr. Sebastian Paris, and the product was brought to market maturity under the name of Icon by DMG. The name Icon is derived from the terms Infiltration **Concept**. Icon is offered for approximal and vestibular defects. The trays of the treatment units contain different application aids for the respective applications. Included in the sets are special separation wedges, suitable applicators, HCl etching gel, ethanol and the infiltrant, a low viscosity, light-curing composite. The cover of each treatment unit contains brief illustrated instructions of use to familiarize the dentist quickly and easily with the processing steps and to facilitate a quick application. Not included in the treatment tray is rubber dam equipment.

Content of the tray

The separation wedges have a cross-section in the shape of a trapeze. They are used to separate the teeth to provide an easy to examine and accessible space between the contact points and the wedge (fig. 3). The applicator in the approximal tray is a small plastic tip with a foil bag that can be rotated 360°. The foil bag is perforated on one side to ensure that the material is dispensed only on one side (fig. 4). For ease of handling, the applicator has a green and a white side. The material dispenses only on the green side. With the applicators the HCl etching gel and the infiltrant are applied to the tooth surface. Applicator and syringes are connected according to the Luerlock principle. The fluid materials, HCl gel, ethanol, and infiltrant, are prefilled in syringes, the plungers of which can be turned and moved forward by means of a mechanism that controls the flow of the fluid material from the syringe.

Treatment objective

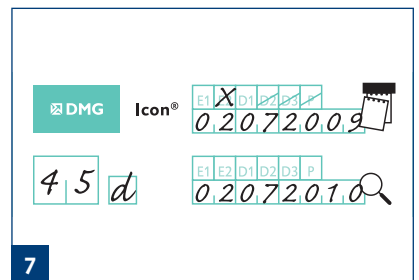
The treatment objective is to fill enamel regions demineralized by caries with a light-curing composite. For this process, the removal of the pseudo-intact surface layer on the enamel is crucial since it is too dense and cannot be penetrated by the composite. Because of frequently asked questions it should be emphasized once again that the infiltration treatment is limited to class E1, E2, and D1 defects only and should not be regarded as preventive measure for defect-free areas.

Radiodiagnostics

Most digital systems allow fairly effortless image processing of x-rays to emphasize important information. Bitewing radiographs required for caries diagnosis exhibit certain quality variations, both digital and analog. These can easily be improved with digital image processing by changing the gamma, contrast, or brightness settings. Furthermore, there are application-specific aids, so-called filters that, if enabled, can highlight targeted structures with a mouse click to bring them out further. The x-ray in fig. 5 shows the original data of a digital bitewing image. After using one of the caries filters included in the software, the lesions are clearly diagnosable (fig. 6). The success of a therapy can only be measured against the documented initial situation as reference. The documentation of the initial situation is the original bitewing image on which findings, diagnosis, and therapy decision are based. A second radiograph taken for a follow-up exam must be made with the same ray path. Due to the infiltrant's excellent penetration characteristics, it is not possible to obtain good radiopaqueness at the same time. In order to document enamel defects, however, especially in consideration of a change of dentist, the patient receives a patient card (fig. 7) in which the treated teeth and their respective radiological lesion extension is marked. Thus, with regular radiological checkups, even the smallest changes can be detected early and treated minimally invasively. With the bitewing radiograph caries is evaluated based on its extension. Different nomenclatures for the extent of dental caries are known. For the infiltration therapy we differentiate between enamel (E) and dentine (D) caries. Enamel



6 Bitewing x-ray processed with the caries filter



7 Treated area, lesion extension, and treatment date are documented in the patient card included in the treatment set



8 Separation with wedge



9 Applied etching gel



10 Removing excess material



caries is divided in two halves and designated as E1 and E2, while dentine caries is divided in thirds and defined as D1, D2, and D3.

Use and application of Icon

The infiltration treatment should be performed in an absolutely dry environment. Therefore, a rubber dam is placed in the affected area. In the posterior section a conventional rubber dam is placed; for a vestibular application in the anterior section a light-curing rubber dam material (Liquid Dam) can be used alternatively. The interdental spaces to be treated are then cleaned with dental floss or air gun. It is recommended to clean the affected area after placing the rubber dam since the proximal region is better visible under rubber dam, and injuries that cause bleeding can be prevented. In the next step, the teeth are separated with the dental wedge to facilitate better access to the interdental space (fig. 8). The area should now be inspected closely one more time. If a cavity is detected the therapy decision must be reconsidered and the cavity prepared. The proximal applicator is attached to the etching gel syringe and introduced into the separated interdental space. The green side faces the side to be treated. The etching gel is applied to the enamel surface, let set for 2 minutes (fig. 9), and then rinsed with water for 30 seconds. The applicator is removed. The surface is blown off for 30 seconds with water-free and oil-free air and then wetted with ethanol for another 30 seconds to remove any residual moisture from the enamel area. The applicator tip is attached to the infiltrant syringe and introduced into the interdendum. The infiltrant should set for 3 minutes. The surface should be well covered with material (fig. 10), and the infiltrant is then carefully blown off. After all excess material is removed the composite is light-cured from all sides for 40 seconds (fig. 11). The infiltrant application and process is then repeated with a setting time of one minute. After light-curing, the interdendum is examined for excess material and finished with dental floss and polishing strips to make sure no excess material remains on the tooth surface (fig. 12).

Advantages for dentist and patient

The infiltration therapy is a new treatment concept for which only one product is approved to date, and therefore, a comparison to other products is not possible. Clinical studies in Germany, Greenland/Denmark and Columbia revealed that the infiltration of proximal and vestibular lesions represents an effective method to reduce lesion progression in vivo. Caries infiltration closes an important gap in the dental therapy spectrum. Until now, the options for smaller carious defects were to wait and administer fluoride or to excavate and fill. An oral hygiene assessment is vital for the decision to wait or to fill. But even with proper oral hygiene, the risk of caries progression remains. With the intent to do the right thing dentists may often be drilling too soon. The infiltration therapy provides a change. Small carious defects can be filled and thus prevent progression. The advantage is that the tooth form remains unchanged. Possible mistakes in trying to restore the challenging chewing surface and proximal spaces can be ruled out. The treatment time is specified: after placement of the rubber dam, 15 minutes per area to be treated.

To be innovative and strike out in a new direction

Although the primary goal of dentistry is to maintain the patient's health, economic success is also very important. In order to achieve both goals today's dental office must be innovative and prepared and willing to strike out in a new medical direction. A company is innovative if it is willing to change. In that regard, infiltration is innovative. However, the dental world is quite skeptical when it comes to new techniques. If a filling material does not meet the expected requirements all parties involved are dissatisfied. The failure is felt at the dental office by the dentist because he/she has to make the corrections and perhaps



11 Light-curing the infiltrant for 40 seconds from all sides



12 Removing excess material



even replace unsuccessful restorations free of charge. He/she is responsible for his/her patients and may lose them. The true ill success, however, is with the patient because he/she will lose even more healthy hard tissue or possibly even the entire tooth. Therefore, non-invasive therapies are increasingly gaining popularity and acceptance, both from the patient and the attending dentist. This explains the dental world's high level of interest in the infiltration therapy. This new approach is not a non-invasive treatment because the etching process removes up to 40µm enamel, but it can be described as a micro-invasive therapy that differs significantly from other filling restorations for which mechanical substance is removed and excavation performed. The worst that can occur with the infiltration therapy is that the caries progresses and a filling restoration will be required after all, which, according to the conventional treatment approach, would have already happened anyway. The greatest gain is that the lesion does not progress and the tooth is preserved. I believe that this therapy provides possibilities for dentists that best meet their wishes.

Contact

Dr. Andreas Schult
Lohstücker Weg 16
24576 Bad Bramstedt
Germany

June 2009

For information only.