

FACULTY PERSPECTIVE

VIEWS ON DENTAL TOPICS & TRENDS

Silver Diamine Fluoride: An Alternative Treatment for Early Childhood Caries?

EARLY CHILDHOOD CARIES (ECC) is defined as caries affecting children younger than 6 years of age. Being more common than asthma (5 times), childhood obesity (4 times) and diabetes (20 times), ECC is by far the most common chronic childhood disease. ECC is a virulent form of caries that afflicts predominantly children of low-income families and can result in painful pulpal infections and systemic complications leading to emergency room visits, hospitalization, and occasionally, even death.

Because children with ECC have a higher risk for future carious lesions in both primary and permanent dentitions, considerable emphasis has been recently placed on caries prevention programs (i.e., dental insurances now reimburse for 3-month recall visits). Traditional treatment of ECC lesions involves the use of a handpiece to remove the carious areas and prepare the tooth for a restoration or placement of a crown. Due to the extent of the disease and the preoperative or uncooperative behavior of the affected children, treatment often takes place under sedation or general anesthesia in a hospital or surgical center setting. These types of treatments exhaust a great share of dental expenditures, and, most importantly, have recently raised serious safety concerns with the U.S. Food and Drug Administration (FDA) issuing a notice that general anesthesia in young children may result in permanent neurological damage.

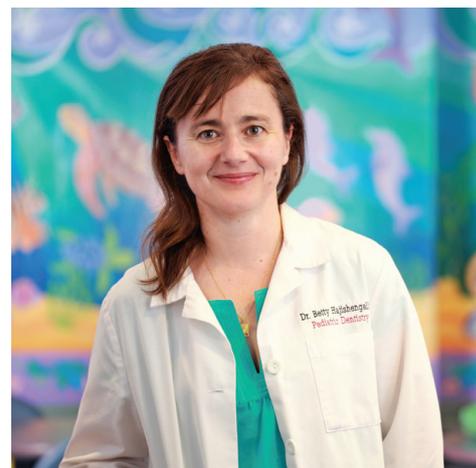
Our understanding of the etiology and progress of caries has evolved in recent years, and the focus now is placed not only on the prevention but also the arrest of the ECC process. In this regard, fluoride varnish and interim/atraumatic restorative techniques are being utilized more often than in the past as less invasive, non-surgical procedures to halt the caries disease in preoperative, uncooperative healthy or special health care needs children,

or children with problem accessing oral health care. The success of these procedures has created hope that other chemotherapeutic agents can be developed to help fight ECC.

One such promising chemotherapeutic medicament is the 38% silver diamine fluoride (SDF), which has recently appeared in the U.S. dental literature and popular magazines as an inexpensive, safe, and easily applied liquid, almost a “magic bullet” in arresting large carious lesions in very young children. SDF contains 24–27% (w/v) silver and 5–6% (w/v) fluoride (approximately 44,800 ppm fluoride, almost double the amount in the 5% NaF varnishes). While the silver ions of SDF exert an antimicrobial action against the cariogenic bacteria, the fluoride ions react with the enamel hydroxyapatite, resulting in the formation of fluoroapatite, which is more resistant to acid attacks than hydroxyapatite.

Following application of SDF, carious dentin is stained black. The black dentin layer is associated with a hard impermeable layer of silver phosphate that protects the exposure of collagen and occludes the dentinal tubules, thereby contributing to arresting dentin caries. This property renders SDF a very effective treatment. Therefore, the main indication of SDF application is to arrest frank cavitated active lesions that involve dentin exposure, whereas fluoride varnish is used to prevent caries and arrest demineralized non-cavitated lesions. These properties of SDF along with its easy application may offer an alternative option to conventional restorative techniques not only for the very young children, but also for adult patients with phobias, medical complexities, or neurodevelopmental disabilities.

The 38% SDF was developed in 1969 in Japan and has been used for many years in Australia, Argentina, Brazil, and other countries. In 2014, the FDA cleared SDF in



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the U.S. as a device to treat hypersensitivity. Therefore, its utilization in arresting caries is an off-label use similar to fluoride varnish. In the U.S., the only commercially available SDF product for dental use is ADVANTAGE Arrest (Elevate Oral Care, LLC). Side effects of SDF application include an unpleasant metallic taste and gingival and mucosal irritation. The most prominent and lasting side effect is the irreversible black staining of the carious areas of teeth. The only contraindication for the use of SDF is stomatitis, ulcerative gingival lesions, and silver allergies.

The majority of the available studies on SDF involve primary teeth and show an average efficacy of 66% in arresting cavitated lesions with the best results following six-month reapplications. The few available studies on permanent teeth also indicate a significant positive affect, most notably to arrest root caries in elderly patients. The application of SDF has raised many questions within the dental community regarding patient selection and best practices for SDF use. As the use of SDF is expanding in the U.S., this will undoubtedly lead to more relevant publications on the indications for SDF application, which in turn will help refine the protocol for its use and define its exact place in oral health care. ■