

Biological management of carious lesions

Introduction

Post COVID-19 and in an aim to reduce aerosol generating procedures (AGP's) we need to look at more minimally invasive biological approach for undertaking paediatric dentistry at LUDH. As a department we need to need to move towards a non-invasive approach, linking in teaching with clinical practice from a conventional restorative to a preventive minimally invasive approach.

Silver Diamine Fluoride is a topical solution comprised of silver, ammonia and fluoride ($(\text{Ag}(\text{NH}_3)_2\text{F})$) and is used as an alternative for fluoride varnish. SDF can be used to prevent and arrest caries as well as treating dentine hypersensitivity, as it is bactericidal and blocks dentinal tubules. Each component of SDF contributes to the action – silver is antimicrobial, ammonia acts as a stabiliser and fluoride aids remineralisation (Timms et al, 2020).

SDF can penetrate both enamel and dentine and retain 2-3 times more fluoride in the tooth structure than sodium fluoride. SDF within enamel can provide an increased mineral content and increases the resistance to acid attacks. Within dentine SDF protects collagen from degradation. SDF can also be used for Molar incisor hypomineralisation (Timms et al, 2020).

SDF block dentinal tubules reducing dentine sensitivity providing a physical barrier to prevent neural stimulation in the dentine-pulp complex. Timms, et al (2020), examined several papers for SDF use on prevention of caries on the primary and secondary dentition with mostly positive outcomes. However, some bias was identified within some of the research and other studies were inconclusive.

Prevention	54% decrease in new carious lesions with annual SDF as opposed to 4 x fluoride varnish
Permanent dentition	not strong evidence to suggest SDF more effective than FS
Dentine sensitivity	SDF had greater efficacy than a placebo or oxalic acid-based preparations
Frequency	insufficient evidence to compare treatment regimens to provide a standardised protocol for frequency or strength of SDF. However, prudent to apply 38% SDF at least once a year to be increased dependent on caries risk status
Toxicity	no reports of acute illness 3-year-old child weighing 10kg would require 8 times of SDF needed to treat entire dentition
Local side effects	uncommon - gingival swelling, discomfort, chemical burn

Licence	In Germany – medical device Use is 'off-label' – similar to other FV applications ie Dentsply Nupro white varnish, deemed by operator's judgement and risk If used in patients' best interest – no liability associated with its use
Product	Riva Star ©- 38% SDF
Cost	£44.75 currently usually (RRP £66.30) as at May 2020

SDF

Taken from Seifo et al, 2020

Disadvantages	<ul style="list-style-type: none"> • Not enough tooth structure remaining • Not always successful and may not remove the need for a restorative approach • Staining <ul style="list-style-type: none"> ○ heavily stains – lesions and anything comes into contact with – use Vaseline to cover peri oral area – on skin wipe off immediately – like a henna tattoo • Temporary metallic taste – give toothpaste on tongue • Parents – attitudes to staining increased in posterior teeth and if only other option was GA
Advantages	<ul style="list-style-type: none"> • Can buy time to slow down lesion activity – acclimatise/behaviour change • Treat several lesions in one visit • Prevent pain and infection prior to primary teeth exfoliation • Used on its own or with a restoration on top – SMART – sliver modified ART or SMART Hall – no trials to support this at present • No effect on bonding of resin composite to sound dentine, however, some suggest that reduction in bond strength of GI others an increase in bond strength for GIC – advised to rinse with water following SDF when using GIC • Management of dentine hypersensitivity • Management of symptomatic MIH

Additional resources produced by BSPD (2020b)

see weblink: <https://www.bspd.co.uk/Professionals/Resources>

- Patient/Parent acceptance – Patient information leaflet - SDF treatment
- SDF Standard Operating Procedures
- Consent form
- SDF background PowerPoint
- Demonstration of application of SDF video

Proposed treatment options

lesion	Proposed treatment
Primary dentine NRCC – non-restorative cavity control – managing cavitated lesions <ul style="list-style-type: none">• Open/accessible cavity<ul style="list-style-type: none">○ Anterior eg ECC lesions○ posterior• non accessible cavity• coronal caries• unrestorable tooth - symptomless	SMART – sliver modified ART SDF Or no caries removal and SDF with/without GIC Removal of enamel to access cavity, then SDF with/without GIC SDF ? SDF

Primary and secondary enamel <ul style="list-style-type: none"> • Prevention • Fissure sealants • Dentine sensitivity /tooth wear and root caries 	Applied annually or more frequently if high caries risk Fuji Triage (no AGP's needed) SDF

Conclusion

Post COVID and the need to reduce AGP's as much as possible, but also the need to move from a conventional approach, towards a more minimally invasive restorative approach. The use of SDF would be of considerable benefit to the patients treated within the Paediatric department of LUDH. Evidence suggests it is safe to use with low toxicity and that the side effects of staining and patient/parent acceptance are acceptable, especially when the alternative is general anaesthesia and also suitable for patients with limited cooperation. Cost is comparable, if using alone as opposed to other restorative materials. Also, a move towards using an alternative to etch and sealant for prevention in permanent molars would be to use fuji triage, further reducing AGP's (see bibliography for further information).

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