

CLINICAL SUMMARY

Uses of Silver Diammine Fluoride (SDF)



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Introduction

The use of silver fluoride (SF)/silver diammine fluoride (SDF) in dentistry to treat dentine hypersensitivity and arresting caries goes back close to 50 years. Numerous *in vitro* and *in vivo* trials examining its potential efficacy in managing caries were reviewed between 1966 and 2006 and identified 99 human trials in three languages (Rosenblatt *et al*, 2009).

Recent studies by Prof Edward Lo and his research team at the University of Hong Kong concluded that **38% SDF arrests dental caries by minimising the loss of mineral and collagen destruction**. Furthermore, the high concentration of silver and fluoride ions inhibited the growth of cariogenic biofilms.

While preliminary studies demonstrated the anti-caries effect of silver fluoride, they also recognised that the use of silver fluoride/silver diammine fluoride causes black staining. The black staining comes from the reduction of silver ions to metallic silver and silver oxide. A new generation of ammoniated silver fluoride, developed in Australia, allows for the immediate application of a solution of potassium iodide. The blackening effect of the topical application of SDF solution on dentin surfaces can be reduced by an immediate application of KI (potassium iodide) solution following it (Liu B *et al* 2014).

Modern SDF systems (such as Riva Star made by SDI Ltd) provide the following two major clinical benefits:

1. Immediate relief for patients suffering from generalised dentine hypersensitivity
2. Immediate control of carious dentine

How does SDF work?

As a desensitizing agent (Craig *et al* 2012, Castillo *et al.* 2010) – the immediate application of potassium iodide (KI) to sites treated with silver diammine fluoride forms silver iodide salts which block open dentinal tubules.

As caries inhibitor – SDF/KI provides the following three active components to caries affected sites:

1 SILVER – silver compounds have been used extensively throughout recorded history for a variety of medical purposes as an anti-microbial agent and in dentistry for more than a century for caries management. There are more than 380 abstracts cited on PUBMED on the use of silver based products in dentistry to treat or control dental caries.

2 FLUORIDE - is well known for its bacteriostatic effect in dentistry to prevent the further demineralization of tooth structure.

3 IODIDE - iodine based materials are well known antiseptic materials when applied to living tissue/skin to reduce the possibility of infection, sepsis or putrefaction. Potassium iodide used in conjunction with SDF provides a powerful antimicrobial effect as well as reducing potential staining of teeth like its predecessor one part system (Fig 1 & 2).

Recent *in vitro* study at the University of Kuwait further supports the powerful antimicrobial activity of silver diammine fluoride (SDF) and potassium iodide (KI) compared to chlorhexidine (CHX) Fig 3. The study found that SDF/KI was able to completely remove *Streptococci* bacteria from teeth surfaces.

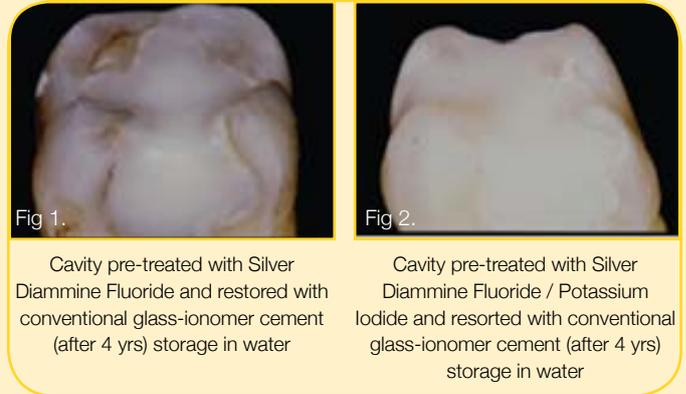


Fig 1 & 2. Images courtesy of Dr G Knight

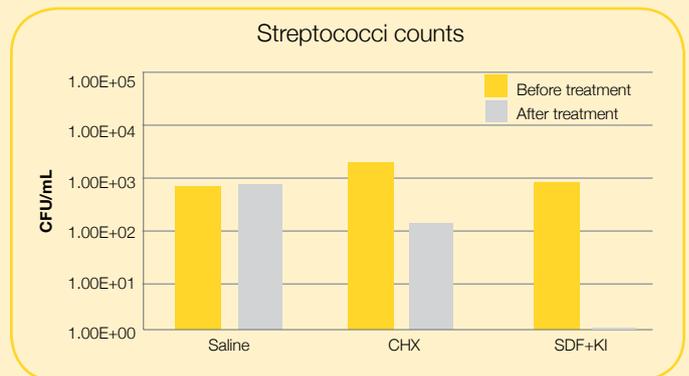


Fig 3. *In vitro* antimicrobial study. Ngo C. H. *et al* Kuwait University 2015

Examples Of Clinical Uses Cited

In Literature

- Treating dentine hypersensitivity
- Control incipient caries
- Prevention of recurrent caries following restoration
- Root canal treatment (disinfection)

Clinical Rationale For Using SDF in Modern Day Practice:

Early application of SDF systems can effectively control multiple and rampant caries (Clinical review, Rosenblatt *et al* 2009)

- Quick and efficient control of infection
- Non-invasive
- Ease and simplicity of use (paint on)
- Ideal for emergency care
- Caries prevention
- Cost effective intervention

Conclusions

Silver fluoride has the potential to play an important role in minimal intervention dentistry. The use of potassium iodide to prevent the staining of enamel and dentine associated with silver fluoride will see further clinical applications and benefits of this product.