

Compiled by
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Silver BULLET

Apart from their antibacterial properties, many heavy metals and their salts have long been known to exhibit protection against dental caries. An extensive investigation by Japanese researchers in the early 70s found that silver fluoride (AgF) was particularly beneficial for caries management. Today, this salt remains one of the most effective substances for the pharmacological management of caries.

Further to this, *in vivo* studies in primary teeth have shown that when used in deep lesions, silver fluoride application prior to placing a glass ionomer cement (GIC) restoration reduces pulpal inflammation and disruption of the odontoblasts compared to glass ionomer cement alone.

A major issue for silver fluoride is the black staining associated with its use and while there are less cultural problems with staining in Japan the use of silver fluoride in western societies has been limited to the primary dentition.

When silver fluoride is applied to a tooth, silver ions penetrate over 100 microns into sound enamel and dentine. Free silver ions then react with oral sulphides to form silver sulphide, a black precipitate staining any tooth surface exposed to silver (Fig 1).

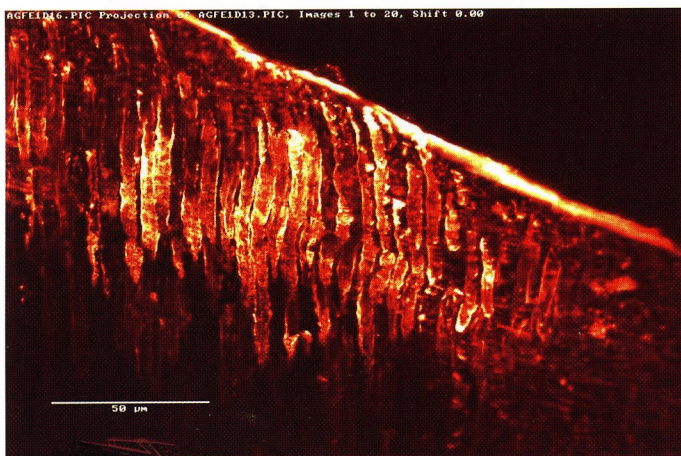


Fig 1. Confocal view showing penetration of silver fluoride over 100 microns into sound enamel.

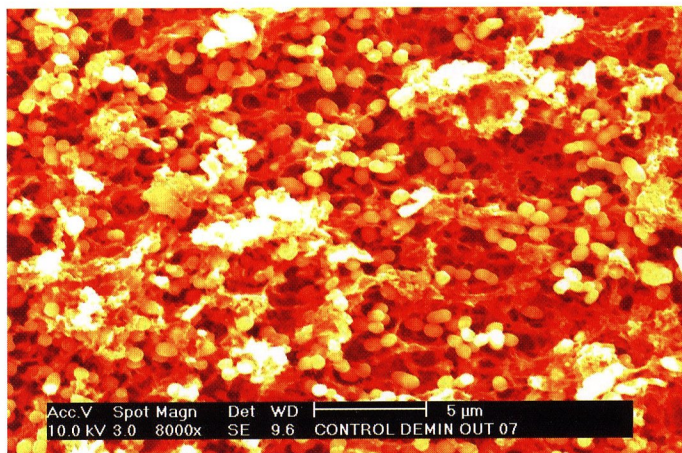


Fig 2. Biofilm *in vitro* after four weeks on control dentine specimen.

In the late 90s, Graham Craig proposed a technique to minimize stain formation by the application of potassium iodide (KI) immediately following silver fluoride treatment.* Potassium iodide reacts with free silver ions to form silver iodide before there is an opportunity for sulphides to form. Apart from being a powerful antibacterial silver iodide it is a creamy white precipitate that does not stain tooth structure.

In vitro studies have demonstrated that the application of silver fluoride/potassium iodide to dentine prior to placing an auto cure glass ionomer cement increases fluoride concentrations in adjacent tooth structure approximately 50 per cent higher and extends approximately 50 per cent further into the tooth than glass ionomer cement alone.

Silver fluoride/potassium iodide have been shown to prevent biofilm formation *in vitro* and has the potential for a wide range of clinical applications from fissure protection in newly erupted teeth to managing root caries in health compromised patients (Figs 2,3).

The application of silver fluoride/potassium iodide to tooth structure prior to placing a glass ionomer cement restoration

aesthetic update

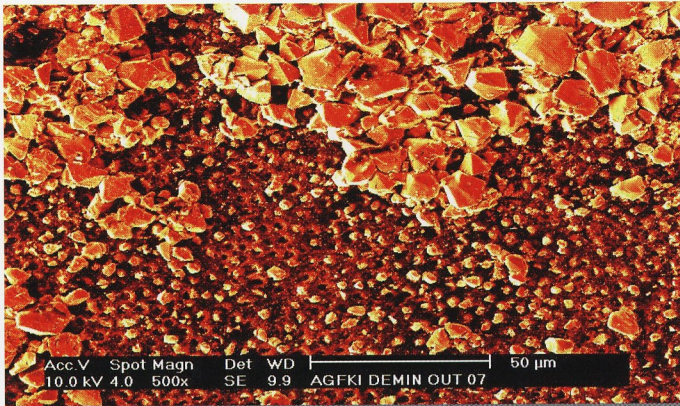


Fig 3. Inability of biofilm to form in vitro after four weeks on dentine disc treated with silver fluoride/potassium iodide.

increases the bond strength of GIC to the tooth. Silver fluoride/potassium iodide interferes with HEMA containing products so composite resin and resin modified glass ionomer cements should not be used as the first layer of a restoration, although sandwich restorations using auto cure glass ionomer cement as a base is fine.

Preliminary evaluations of the silver fluoride/potassium iodide technique indicate areas of potential use and situations where some confusion may exist as to the clinical indications and methods of application.

POTENTIAL CLINICAL INDICATIONS

FISSURE PROTECTION

For direct application to newly erupted teeth and/or longer term use beneath auto cure glass ionomer cements to enhance fissure protection.

OPEN CORONAL CARIES MANAGEMENT

The application of silver fluoride and potassium iodide may substantially arrest coronal caries in both the deciduous and permanent dentitions.

There have been issues associated with ART programmes and community based caries management programmes where unstained treated teeth have been mistaken as carious and had further clinical procedures instigated.

CLOSED CORONAL CARIES MANAGEMENT*

The application of silver fluoride and potassium iodide to residual caries remaining in a cavity preparation will change the carious dentine into a protective carious resistant base beneath the restoration. With this procedure it is advisable to prepare a moat into sound dentine with a #3 round bur around the DEJ and to advise the patient of the remineralizing nature of this treatment protocol.#

For silver fluoride/potassium iodide treated teeth, the first layer of the restoration **must** be auto cure glass ionomer cement.

ROOT CARIES

The ability to prevent biofilm formation should facilitate both preventive and management benefits when dealing with root caries on susceptible patients.

ENDODONTICS

There are indications for the use of silver fluoride and potassium iodide prior to obturation [see *News Bulletin*, No 385, March 2010].

* This treatment should not be attempted on symptomatic teeth.

Draft patient instructions may be downloaded from the author's web site www.dentalk.com.au/ seminar notes.

SUGGESTED CLINICAL APPLICATION TECHNIQUES

OPEN CORONAL AND ROOT CARIES

- Remove gross debris from the area.
- Etch with 37% phosphoric acid for five seconds (to remove plaque) wash and dry with oil free air.
- Apply silver fluoride solution with a micro brush.
- Immediately apply potassium iodide solution with a micro brush noting the white precipitate that forms.
- Continue applying potassium iodide until the white precipitate disappears.
- Do not wash.
- Dry the residual surface liquid.
- Dismiss the patient.

FISSURE PROTECTION

- Remove gross debris.
- Etch with 37% phosphoric acid five seconds, wash and dry with oil free air.
- Apply silver fluoride with a micro brush.
- Apply potassium iodide with a micro brush until white precipitate disappears.
- Dry residual liquid and dismiss the patient.

If Auto cure glass ionomer cement is to be added:

- Wash away residual liquid and dry fissures.
- Apply auto cure glass ionomer cement fissure protection.
- Dismiss patient.

CLOSED CORONAL CARIES

- On an asymptomatic tooth, prepare cavity leaving residual caries over the pulpal floor.
- Prepare a moat into healthy dentine at the DEJ with a #3 slow speed round bur.
- Etch preparation five seconds with 37% phosphoric acid.
- Wash and dry with oil free air (Fig 4).



Fig 4. Minimal intervention cavity preparation leaving residual caries. Observe moat into sound dentine at DEJ.

- Apply silver fluoride over the preparation with a micro brush.
- Immediately start applying potassium iodide with a micro brush until the white precipitate clears.
- Wash the preparation and dry with oil free air (Fig 5).



Fig 5. Specimen after treatment of silver fluoride/potassium iodide prior to auto cure GIC placement.

- Insert auto cure glass ionomer cement, either as the first layer of a sandwich restoration or to fill the preparation.
- Complete the restoration (Fig 6).



Fig 6. Completed auto cure GIC restoration.

- Furnish the patient with post operative information regarding silver fluoride remineralization treatment.
- Dismiss the patient.

ENDODONTICS

- Refer to Aesthetic update, *News Bulletin*, March 2010.

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 expands the clinical applications of this material.

DISCLOSURE

The author and Dr Craig are named on a process patent for the application of silver fluoride and potassium iodide.

REFERENCES

References are available from the author:
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