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CASE HISTORY REPORT

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Unexpected sequel to silver fluoride followed by stannous fluoride treatment of root stumps supporting an overlay denture in an aged-care patient

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Abstract

An institutionalized high care dementia patient, who is unable to maintain his own oral health, presented with five lower anterior carious root stumps supporting a lower overlay denture. Due to limited cooperation, his root stumps were treated with only silver fluoride followed by stannous fluoride applied topically on a 4-monthly cycle. Almost one and a half years after his initial application, there were unexpected calculus formations on the root stumps accompanied by marked gingival inflammation and gingival hyperplasia. At this point prognosis was considered very poor. Because the patient's cooperation was so poor, no attempt was made to remove the calculus deposits. Following continued topical applications directly to the area, there was evidence of a marked and unexpected improvement in gingival health. Some 4 years and 4 months after the initial application, the root stumps demonstrated a hard glossy surface surrounded by healthy gingival tissue. There had been no change in the patient's oral care, minor changes to medications and there had been no operative or periodontal interventions.

KEYWORDS

aged care, arrest, dementia, minimally invasive, prevention, root caries, silver fluoride with stannous fluoride, silver fluorides

In a previous article published in this journal, several case reports were presented where a technique involving the use of silver fluoride followed by stannous fluoride ($AgF+SnF_2$) was used to treat root-surface caries in aged-care patients.[1] The solutions were aqueous 40% silver fluoride and 10% stannous fluoride (Creighton Dental, NSW Australia). A recent follow-up examination of one of the patients showed some completely unexpected findings. What previously had appeared to be a very marginal case with poor prognosis showed unexpected improvement without any operative interventions or changes in oral health procedures. A similar phenomenon has not been reported previously.

This case report may be unique in that we have documented the progress of a minimal intervention approach using only periodic applications of $AgF+SnF_2$ on a dementia patient with limited ability to cooperate and unrelated minor changes to his medications for over a 4 years and 4 month period.

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The patient, now aged 84 years, continues to reside in a high-care dementia section of a residential aged-care facility. During re-examination and $AgF+SnF_2$ treatment visits,

he remained fearful and retained the previously diagnosed conditions of dementia, obsessive compulsive disorders, benzodiazepine dependence, Parkinson's disease, depression, hypertension, urinary, and fecal incontinence. The patient still has reduced mobility, limited ability to cooperate, accepts limited physical contact, exhibits challenging behaviors, and is likely to exit the dental chair without warning if threatened.

The patient is unable to maintain his own oral health and is dependent on nursing staff to carry out these tasks.

Figure 1 shows his condition as reported previously in an earlier publication.[1] The patient had a lower overlay denture covering five carious anterior root stumps (Figures 1a and b). Figure 1(c) shows the appearance of the root stumps following the first application of silver fluoride followed by stannous fluoride. Also shown previously was Figure 2(a), at 1 year and 5 months after the initial application of AgF+SnF_2, demonstrating the results of very poor oral hygiene. There were unexpected calculus-like deposits over the root stumps and marked gingival inflammation with hyperplastic gingival tissues partially covering some roots.

The patient only allows light cleaning of his root stumps with soft interproximal brushes to remove superficial plaque provided no heavy contact is made with his gingiva. Attempts at removing calculus deposits on root surfaces had to be abandoned as the patient became easily upset. Due to lack of cooperation further topical applications of AgF+SnF_2 were applied directly to the calculus and over the gingival tissue after gentle cleaning with interproximal brushes.

The patient continued to receive 4-monthly applications of AgF+SnF_2. After a further 20 months, there was some evidence of improvement in gingival health and fewer calculus deposits on the root stumps (Figure 2b). After a further 9 months, at 3 years and 10 months, the situation had improved quite markedly as the gingival health was now good (Figure 2c). A photo of the cleaned root stumps is shown in Figure 3(a).

In the period between the earlier published article and this current article, it was found necessary to remove the lower left canine and first premolar in two separate visits. Although the patient was normally quite uncooperative, his need to be out of pain and the presence of his medically trained daughter had a calming effect long enough for the extractions to be carried out under local anesthesia in the dental chair.

The reason for the unexpected initial calculus deposition and poor gingival condition followed later by an unexpected loss of this calculus and subsequent improvement in the overall status of the root stumps and the surrounding gingival tissue is a matter of conjecture as the cleanliness of his teeth and denture maintenance had not changed over this time.

Although the patient would not allow his gingival tissues to be touched, he allowed the application of the AgF+SnF_2 as long as the microbrush touched the root surfaces only.

At the time of his first AgF+SnF_2 application, the patient was taking a total of 18 prescribed medications including 2 topical steroid ointments, with an Anti-cholinergic Burden Score (ABS) of 13. Although 17 of his original medications remained the same after 4 years and 4 months, the patient's prescription list had grown to 22 medicines including 4 ointment and eye drops, with an ABS of 15.[2] It would be expected that high ABS scores over such a long time period would have increased his risk of salivary gland hypofunction and an associated increased caries risk.[3]

Some medications are known to cause gingival enlargement or inflammation.[4,5] The medications introduced to the patient during the observation period were an opioid patch for pain, medicine for reflux and Risperidone (Risperdal) with ABS score of 1 was replaced by Quetiapine (Seroquel) with ABS score of 3. None of his earlier or later drugs were included in a recent review of spontaneous-reporting-system databases on drug-induced gingival hyperplasia.[5] It is unlikely the gingival hyperplasia was drug induced as the effects of his medication would be ongoing throughout the study period.

There had been no discernible changes to his diet. It is established that silver exerts an antibacterial effect and can react with the collagen in dentine.[6] Furthermore, the fluoride moiety can enhance remineralization.[7] A laboratory study found that dentine treated with silver diamine fluoride followed by the application of potassium iodide was resistant to colonization by cariogenic bacteria.[8] An examination of the surface of the patient's treated root stumps at 3 years 10 months and 4 years and 4 months after the initial treatment, as shown in Figures 3(a) and (b), indicate evidence of a surface gloss. The possibility exists that the treatment with metal fluorides may have changed the wettability or free surface energy of the dentine and thus inhibited plaque formation. The first report of this phenomenon was in 1969 by Glantz[9] who showed that human dentine treated with stannous fluoride demonstrated reduced wettability and therefore free surface energy. The free surface energy of a surface has been shown to affect plaque formation in humans.[10] Nonetheless, as indicated previously, no logical explanation could be found for the occurrence of the gingival inflammation/hyperplasia seen in Figure 2(a). It is suggested that future studies on preventive dental treatments for aged-care patients be aware of, and report on, this phenomenon.

Currently there are two versions of silver fluoride-containing solutions for dental use both of which are a source of silver and fluoride ions. One is an ammonia-based silver diamine fluoride (SDF) and the other is water based (AgF). SDF has been shown to be an effective caries management agent in children and adolescents.[11] It has also been shown to have caries arresting properties on root surfaces in elders.[12] However, it should be noted that some form of gingival barrier is recommended when using SDF near gingival tissue.[13]

FIGURE 1 (a) Overlay denture in place. (b) Appearance of carious root stumps 11 December 2013. (c) Appearance of root stumps following first application of silver fluoride followed by stannous fluoride. These photographs and Figure 2 (a) below were published in the principal author's earlier article.[1] Reprinted with permission

FIGURE 2 (a) Appearance of root stumps 1 year and 5 months after the first application. Marked gingival inflammation with gingival hyperplasia overlying root stumps covered by calculus. (b) Appearance of root stumps after 3 years and 1 month. Calculus deposits are still present but there is a marked improvement in gingival health. The lower left first premolar has been extracted. (c) After a further 9 months, at 3 years and 10 months, previous calculus deposits are not evident and continued improvement in gingival health. The lower left canine has also been removed

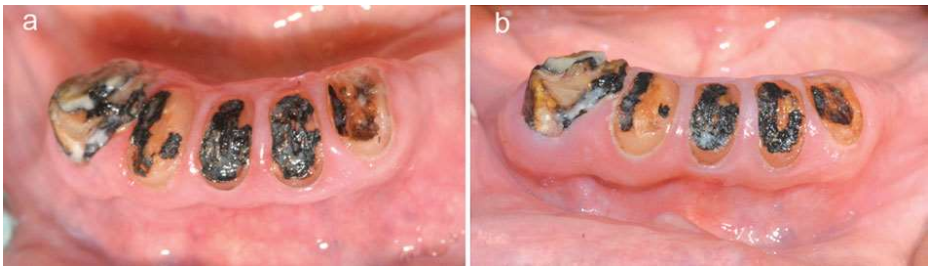

FIGURE 3 (a) Close view of root stumps at 3 years and 10 months after light cleaning. There is evidence of a gloss on the dentine surfaces. (b) View of root stumps, 14 March 2018, 4 years and 4 months after initial AgF+SnF application after light cleaning

The effective use of such a barrier would have presented a considerable challenge and not considered practical in a difficult situation such the one described.

As reported previously, the principal author has found that the higher pH of SDF, presumably due to the presence of ammonia, can cause gingival irritation or a transient chemical burn which may result in resistance to repeated frequent applications of SDF in patients showing challenging behaviors or in the elderly with thin tissue biotype.[1] In contrast, the use of AgF+SnF_2 appears not cause gingival irritation even when applied to all root surfaces over a wide area. Reapplication of SDF and AgF+SnF_2 is clinically important as there seems to be an additive caries arrest and prevention effect. Successfully treated carious surfaces will remain matte black.

However, a major difference between the two products is that AgF+SnF_2 can be applied 3-6 monthly or between visits on a weekly basis if required without causing a transient gingival burn. The principal author has found that frequent AgF+SnF_2 applications to all root surfaces even when not carious can significantly alter the management, prevention and treatment of root caries.[1]

AgF+SnF_2 will cause a temporary black precipitate on noncarious surfaces which quickly wears away or can be polished off and, as reported previously, is usually not an aesthetic concern with elderly people.[1] This is consistent with observations when SDF was used as a treatment for cervical hypersensitivity where only untreated lesions, not sound tooth surfaces, remained stained after 7 days.[14]

During his course of treatment, it was suggested that all the patient's teeth be extracted and a full lower denture constructed. After discussions with his family and nursing staff, the likelihood he may lack cooperation to make or tolerate new dentures was very high and was a major factor in deciding not to remove his remaining teeth. The reality for this patient was that he was functioning well on his existing dentures, was enjoying his food and probably has a better quality of life with his existing condition than trying to cope with extractions and a new lower denture.

This case study demonstrates the long-term results of a minimal intervention approach using frequent topical applications of AgF+SnF_2 in a dementia patient only able to give limited cooperation. It must be emphasized that the observations in this report apply to a single patient. These observations suggest that further studies be made to determine whether these results are isolated to this patient or whether they can be reproduced elsewhere when silver fluoride-based approaches, such as this one or SDF, are used as topical treatments.

CONFLICT OF INTEREST

Neither author has a conflict of interest to declare.

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