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Guest Editorial

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Achievements and Challenges: Providing 100 Years of Oral Health Services for New Zealand Children

One hundred years ago in Aotearoa New Zealand (NZ), thirty-five young women started their training to become dental nurses. The story of their career, however, is linked inextricably to the development of the NZ School Dental Service (SDS). This year, in commemorating the centenary of this unique service, not only do we acknowledge the contribution that the dental and oral health therapy professions have made to its establishment and development and, more recently, to NZ's Community Oral Health Services (COHS), but we also consider the challenges to providing oral health care to NZ children.

At the beginning of the 20th century in NZ, a new concept of childhood, in which investment in children was considered an investment in the country's future, facilitated the development of health services such as the SDS. Both voluntary and state resources were directed to the care of infants and school children through services such as the Plunket Society and the School Medical Service. These services increasingly emphasised the very poor oral health of many NZ children and lobbied for action. In addition, the New Zealand Dental Association (NZDA) kept the topic of children's oral health on the political agenda for many years. The First World War further heightened concerns about the nation's appalling state of dental health when many soldiers were rejected from service due to the state of their teeth (Moffat, 2015).

In 1917, one NZDA member, Richmond Dunn, published a paper expressing his concerns about children's oral health and recommending that a new profession of 'dental nurse' be created. The dental nurse's duties would be to advise parents of the dental needs of their children, provide appropriate dental health education, examine teeth and perform simple operations when necessary. The NZDA would perhaps get a 'better class of girl' applying for the role as there was more in the way of a 'prospect' to offer her (as opposed to a dental assisting position), and the dentists would be relieved of 'child-work' that many of them found so 'trying to the nerves' (Dunn, 1917, p. 200). Employing dental nurses also offered a solution to the problem of the shortage of dentists and dental students caused by the war. Subsequently, supported by several powerful allies, the NZDA formed a deputation which met with the Prime Minister and several other government ministers in 2018. The main thrust of the argument for treatment of school children was on maintaining national efficiency, with the President of the NZDA

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Use of a silver fluoride followed by stannous fluoride desensitisation in the treatment of hypomineralised molar teeth: Two case reports

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ABSTRACT:

Molar hypomineralisation is now believed to affect 1 in 6 children worldwide and mainly affects first permanent molars. The enamel of these teeth is more porous than normal enamel and breaks down easily. The teeth are commonly hypersensitive to thermal changes and the patient may avoid chewing on them. Treatment of hypo-mineralised teeth can be difficult for a number of reasons including patient anxiety and, if a restoration is required, problems with obtaining adequate anaesthesia and placing one that will have adequate longevity. These case reports deal with a novel graduated approach including the use of silver fluoride followed by stannous fluoride in combination with a glass-ionomer cement restoration. At the time of the last recall visit, 14 to 17 months after starting, both patients had experienced complete relief and the restorations had remained intact.

Keywords: Molar hypomineralisation, silver fluoride, stannous fluoride, glass-ionomer cement.

INTRODUCTION

The condition known as molar-incisor- hypomineralisation (MIH) is now receiving considerable attention because of its high prevalence. The molar hypomineralisation (MH) component alone is estimated to affect 1 in 6 children worldwide (Hubbard et al., 2017). It commonly occurs in first permanent molars but primary molars and second permanent molars can be affected either alone or in combination (Hubbard et al., 2017; Hubbard, 2018). A patient may present with one to four molars with MH having a clinical appearance ranging from a hardly visible demarcated opacity to marked enamel breakdown (Hubbard et al., 2017).

Recent review papers have outlined the symptoms that can be experienced by patients with the condition and the challenges for clinicians managing the condition (Almuallem et al., 2018; Ghanim et al., 2017). Teeth with MH can exhibit a degree of sensitivity which may not correlate with the degree of enamel breakdown. This can range from mild sensitivity to significant pain when eating and drinking or attempting toothbrushing. The result is often avoidance of situations where sensitivity may occur. The combination of poor oral hygiene and poorer quality tooth structure can contribute to rapid tooth breakdown. Subsequently, if operative intervention is needed, difficulty can be experienced in obtaining adequate anaesthesia. Often, because of the age of the patient and the patient's previous experience of tooth sensitivity, obtaining the necessary degree of co-operation may not be easy. In addition, there can be the problem of finding a suitable restorative treatment approach which gives the tooth adequate longer-term protection. Bonding procedures are compromised by the presence of poor-quality enamel and breakdown of enamel at the restoration margins can occur over time.

Treatment as soon as possible after tooth eruption has been recommended for teeth with MH. A useful overview of the types of surgery-based treatments that could be followed was given in a training manual for clinical surveys and practice (Ghanim A et al., 2017). Among the treatments recommended was the application of a fluoride varnish and fissure sealing with glass-ionomer cement. For home care, it was suggested that the use of a toothpaste containing at least 1,450 ppm fluoride and regular applications of a casein phosphopeptide-amorphous calcium phosphate (CPP-ACP) preparation would have a role.

Recently the use of silver diamine fluoride has been advocated for the treatment of MH (Maclean, 2018). This, as well as an earlier case report where a hypoplastic first permanent molar was successfully treated with water-based silver fluoride followed by stannous fluoride, prompted the use this combination (Craig & Powell, 2013). An additional advantage for apprehensive patients was that the silver fluoride used, unlike silver diamine fluoride preparations, had no ammonia smell as it is water based.

CASE REPORTS

Case 1.

A child aged 9.9 years with extreme sensitivity in her upper left and upper right first permanent molars. An examination showed both the affected teeth met the criteria for molar

hypomineralisation with accompanying enamel breakdown which involved between 1/3 and 2/3 of the occlusal surface. This corresponded to 4B on the MIH Treatment Need Index (MIH-TNI) (Steffen et al., 2017). The remnants, of what appeared to be a pink-coloured glass-ionomer cement, were evident at the breakdown sites. The Schiff Cold Air Sensitivity Scale can be used to quantify the degree of sensitivity of a tooth with MH (Schiff et al.,2009). However, no attempt was made to use it because the patient's apprehension was such that even a brief exposure to a slight stream of air from an air/water syringe was not tolerated. The patient exhibited anxiety regarding all aspects of the proposed treatment of these teeth and the initial photographs of the teeth were not of reproduction quality.

At the initial visit, following cotton roll isolation, and drying tooth with cotton pellet only, each affected tooth was given a three-minute application of 40% silver fluoride which was followed up with an application of 10% stannous fluoride (CSDS Kit; Creighton Dental, Sydney, Australia). The treatment site was then covered by a thin layer of fluoride varnish (Duraphat; Colgate, New York, NY, USA). After 7 days the sensitivity had decreased to moderate (2 on the Schiff Sensitivity Scale) and drying with an air syringe was accepted but the patient. A second treatment, identical to the first, was then given. By 3 weeks after the initial treatment all sensitivity had gone. The patient's co-operation had reached a point where the remnants of the pink glass-ionomer cement in the cavity could be removed without the need for local anaesthesia. This was achieved by using a sharp round bur rotating extremely slowly in a slow-speed handpiece. The margins of the cavity were smoothed using the same technique with a sharp flat-fissure bur. A glass-ionomer cement restoration was placed (Equia Forte; GC Corporation, Tokyo, Japan) following the recommended dentine conditioning. Recall examinations at 9 and 17 months after the initial placement showed the restorations to be intact and the teeth completely asymptomatic. Figure 1 shows the appearance of the teeth at 17 months. There is some residual staining at the restoration margins from the silver fluoride/stannous fluoride treatments but the restorations are intact.

Case 2.

An extremely apprehensive child, 8.1 years of age, attended the practice seeking treatment for her highly sensitive upper left and lower left first permanent molars. An examination showed the teeth corresponded very closely with those described for Case 1, namely hypomineralisation with post eruptive enamel breakdown involving more than 1/3 and less than 2/3 of the occlusal surface (4B, MIH-TNI). As with Case 1 no attempt was made to apply a stream of air to the affected teeth. In addition, it was not possible to obtain pre-treatment photographs of reproduction quality.

The treatment procedure was identical to that followed for the patient in Case 1, namely the application of silver fluoride followed by stannous fluoride and the placement of a temporary covering of fluoride varnish. At the next appointment 5 weeks later, the sensitivity on both teeth had decreased to moderate (2 on the Schiff Sensitivity Scale). The reduced sensitivity allowed air drying and a further application of the silver and stannous fluorides followed by a temporary covering of fluoride varnish. Because of patient unavailability, the next recall was not until 3 months later by which time all sensitivity had gone from her upper first permanent molar. The lower molar, which had a markedly deeper lesion, had a mild sensitivity to an air stream (1 on the Schiff Sensitivity Scale). The cavity in the upper molar was prepared, without the need for local anaesthesia, using a slowly rotating sharp round bur in a slow-speed handpiece supplemented with the judicious use of a high-speed handpiece. The cavity was cleaned with dentine conditioner and restored with Equia Forte. A repeat silver fluoride/stannous fluoride varnish treatment was given to the lower first molar. The cavity in the latter tooth was restored 3 weeks later at which time it was completely asymptomatic and again, the cavity was prepared and restored as with the upper first molar. The only additional treatment was at the 12-month stage when the lower molar had glass ionomer cement placed in a fissure that had not been previously fully sealed. By 17 months after the initial examination and treatment, both restorations, as shown in Figure 2, were intact and the teeth completely asymptomatic.

The patient was eating a regular diet and was using these teeth in normal masticatory function.

FIGURE LEGENDS

Figure 1. Appearance of glass-ionomer cement restorations in the upper right first molar (left) and upper left first molar (right) 17 months after placement in Case 1. Some residual marginal staining from the silver fluoride followed by stannous fluoride treatments is evident. Because of the patient's initial anxiety, it was not possible to obtain reproduction-quality pre-treatment photographs.

Figure 2. In Case 2 the glass-ionomer cement restorations in the upper right first molar (left) and lower right first molar (right) were intact 14 months after placement. The subsequent fissure sealant placed on the occluso-lingual groove of the upper right molar is still present. As with Case 1 the patient's level of anxiety hindered obtaining reproduction-quality, pre-treatment photographs.

DISCUSSION

Two aspects of these case reports could be of particular relevance in the treatment of molar hypomineralisation. Firstly, all the teeth treated were completely asymptomatic after 17-19 months from the initial treatment and, secondly, despite some marginal staining, there was no sign of breakdown of the glass-ionomer cement used to cover the defects.

None of the clinical studies where different approaches have been used to treat molar hypomineralisation have demonstrated a complete resolution of tooth sensitivity. A recent clinical investigation evaluated the efficacy of four treatments; fluoride varnish, fissure sealants, restorations and stainless-steel crowns (Futterer et al., 2020). With each mode of treatment, even the placement of stainless steel crowns, some hypersensitivity was still present when the treated teeth were assessed with the Schiff Cold Air Sensitivity Scale. The average follow-up time was 3 months.

The possible role the treatment of applying silver fluoride followed by stannous fluoride in reducing tooth sensitivity needs further investigation. The enamel in hypomineralised molars is more porous with wider interprismatic spaces than normal enamel as well as having a higher organic content (Elhennawy et al., 2017). Therefore, the possibility exists that one or more of the constituents in the application items may have had a blocking action and reduced the porosity of the enamel. During the silver fluoride-application step the silver ions may have acted by denaturing and precipitating proteins (PubChem Compound Summary, 2020). In addition, the fluoride moiety could have encouraged the formation of calcium fluoride deposits (Larsen & Jensen, 1994). Furthermore, with the subsequent application of stannous fluoride, any remaining free silver ions would have been reduced and resulted in them being deposited as metallic silver. The combination of these actions could have reduced the permeability of the affected enamel. The intended role of the fluoride varnish application was to allow the underlying reaction to continue to completion without any dilution from saliva. No change in the pre-treatment colour of the treated enamel was evident at the subsequent appointment.

Although not directly comparable, there is a possible analogy between the effect of silver fluoride on porous enamel and the effect of silver diamine fluoride treatments on open dentinal tubules encountered with cervical hypersensitivity. In the latter situation silver diamine fluoride has been shown to reduce hypersensitivity also presumably from some blocking effect from the release silver and fluoride ions (Castillo et al., 2011).

Another interesting finding is that there was no evidence of any breakdown of the glass-ionomer cement restorations 14 and 17 months after placement. This is consistent with the 12-month results of the product, which is a strengthened, auto-cure glass-ionomer cement, being used with the ART technique (de Aguiar Grossi et al., 2018).

A very pleasing aspect of the result is that both patients no longer had to restrict their choice of food items and could masticate comfortably on their first permanent molars. In both cases the teeth were managed in accordance with orthodontic advice.

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