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Prevention of decalcification in orthodontic patients by daily self-treatment with 0.4% SnF_2 gel

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Abstract

A total of 78 orthodontic patients participated in a study of the degree of decalcification inhibition induced by daily treatment with 0.4% SnF_2 gel. Control patients (n = 39) were managed exactly as were the test patients (n = 39) except that the latter were instructed to brush at bedtime each day with the gel. In the nongel users, 24 (64.1%) developed decalcification after 18–24 months banding; the comparable figure in the SnF_2 gel users was 10 patients (25.6%). This was the overall reduction for all patients who were instructed to use the gel daily; irregular users received very little protective benefit while daily users of the gel typically had no decalcification at all.

Introduction

Present day orthodontic treatment provides precise control over tooth movement and consistently leads to significant improvements in dental esthetics and function. Advances in controlling the decalcification often seen in patients undergoing orthodontic therapy leave much to be desired. The removal of appliances can reveal areas of decalcification either around or under orthodontic bands. The search continues for effective programs to prevent this development.

Patients undergoing orthodontic therapy are at advanced risk for enamel decalcification,[1] and a growing body of literature indicates that these patients should be given intensive fluoride treatment.[2–8] Wisth and Nord[2] reported that daily rinsing with 0.05% NaF solution provided added protection for orthodontic patients who were also brushing 3 times yearly with 0.2% NaF solution. Muhler[3] reported a significant decrease in decalcification in orthodontic patients who received a topical application of SnF_2 prior to band placement and used a SnF_2 dentifrice throughout treatment. Other investigators[4–6] have shown that patient-applied daily treatment with 0.4% SnF_2 gel reduces solubility of enamel surfaces and that this protection increases as the treatment program is extended. Stratemann and Shannon[7] studied decalcification rates in 209 orthodontic patients and found that daily use of the 0.4% SnF_2 gel reduced decalcification significantly. Another study[8] evaluated NaF and SnF_2 gels and solutions over a one-year period in orthodontic patients; a parallel laboratory study was also conducted. SnF_2 was clearly superior to NaF in both clinical and laboratory experiments.

The present study evaluates the effectiveness of water-free 0.4% SnF_2 gel in controlling decalcification induced by orthodontic treatment.

Materials and methods

Subjects were 78 orthodontic patients who were completely free of dental decalcification at the time of admission to treatment. Patients were selected by careful clinical examination from a larger group of youngsters being evaluated for possible acceptance into the program. There was an almost equal sex distribution, and the average age was 12.9 years. Patients were not on a regular systemic fluoride program, and, as Houston residents, they were drinking water from a multiple-well and surface source water supply that contained less than an optimal amount of fluoride. While plaque scores were not recorded, careful evaluation of oral hygiene status was made in each patient at intervals of approximately two weeks. The program of oral hygiene maintenance during therapy was very strict; this would be expected when such patients are being managed by graduate students in orthodontics under faculty scrutiny.

Clinical management of the 39 controls and 39 test patients was identical except that the latter were instructed to brush daily at bedtime with a water-free 0.4% SnF_2 gel. The child was instructed that after he had brushed in the evening (third brushing of the

day), he was to rinse his mouth and toothbrush well, place about ¾ of an inch of the gel on the bristles, and brush the gel onto all tooth surfaces. He was then to purse the lips and move the tongue about in an effort to force the gel into nonbrushable areas. The gel was to be held in the mouth for one minute and then expectorated. It was important that the patient did not rinse and that no food or drink be allowed after application of the gel. The patient was to retire with remnants of the gel in place on the teeth.

At the time of the pretreatment examination, each patient was completely free of clinically detectable decalcification. All patients were banded for 18–24 months. Examinations were conducted at the time of band removal, and the incidence and extent of decalcification were graded. Areas of decalcification were classified as mild, moderate, or severe with these categories representing slight change in enamel coloration in a small area, definite color change and/or a larger area of surface involvement, and perforation of enamel with loss of surface continuity.

Results

In patients not using the SnF_2 gel, identifiable decalcification was present in 24 (64.1%) of the patients (Table 1). Of the 39 youngsters who were instructed to apply the 0.4% SnF_2 gel daily at bedtime, 10 (25.6%) developed detectable decalcification during the 18–24 month treatment period. Patients who used the gel very irregularly demonstrated approximately the same rate of decalcification as in the controls; virtually all of the patients who applied the gel daily as directed remained completely free of decalcification.

Discussion

Radike *et al.*[9] found that treatment of children on school days with 0.1% SnF_2 mouth rinse provided a highly significant decrease in incidence of caries, even when both control and test children had been ingesting optimally fluoridated water throughout life. In that study, no effort was made to control oral hygiene; thus, the treatment was effective in relatively dirty mouths. The results of the present study are in accord with this report and with other observations that low concentration SnF_2 preparations are of significant preventive benefit in orthodontic patients under a strict program of oral hygiene control.[7, 8]

The overall incidence of decalcification in gel-users, 25.6%, is in agreement with our previous study in which 25.3% of 99 patients assigned to use the gel developed decalcification.[7] In that study, in patients who admitted applying the gel only once weekly or less (29 patients), the rate of decalcification did not differ significantly from the 58.2% found for the untreated controls. For 19 patients who used the gel 2–3 times weekly, the decalcification rate was 26.3%; in the 51 patients who applied the gel on a daily basis the incidence of decalcification was only 2.0%.

Adequate home-care chemical preventive procedures are available to manage the decalcification problem in orthodontic patients; the problem is one of patient compliance. We have therefore sought an office-applied fluoride procedure to meet the requirements of these low compliers. We have reported that only 18.2% of patients receiving office treatments with 0.31% F-APF followed by 0.4% SnF_2 (average interval between treatments 3.15 weeks) developed decalcification; only 7 of 550 banded teeth were involved.[10] Our practice is therefore to offer all orthodontic patients the high level of protection provided by daily applications of the 0.4% SnF_2 gel and to treat each patient with sequential APF-SnF_2 at each office visit.

Table 1. Effect of 0.4% SnF_2 gel on decalcification in orthodontic patients

Patient grouping	No. of patients	Post-treatment decalcification	
		No. of patients	Percent
Controls	39	24	64.1%
SnF_2	39*	10	25.6%

* Includes all test patients without respect to compliance.

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