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Effectiveness of sodium fluoride mouth rinse after brushing with fluoride toothpaste for the prevention of white spots on teeth during fixed orthodontic treatment: A systematic review

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Abstract

Objective: To evaluate the effectiveness of sodium fluoride mouth rinse after brushing with fluoride containing toothpaste in preventing the occurrence of white spots on the teeth during orthodontic treatment

Materials and Method

Inclusion Criteria: Articles in English or those having detailed summary in English were included. Studies published between May 1992 to 2017 were included. Study design must be a randomized control trial or clinical trials. It involved the use of a sodium fluoride mouth rinse with no use or use of a non-fluoride rinse Development of WSLs in patients using fixed orthodontic appliances. In this, only human studies were included.

Exclusion Criteria: Studies with inadequate statistics. In vitro studies and studies in which the main outcome of interest was enamel hardness rather than WSL development. Reviews, case reports, abstracts, editorials, letters and historical reviews were not included.

Results: The outcome of the review was the presence or absence of white spot lesion by patients at the end of the treatment. 89 articles were identified through electronic database searching. 1 full article was accessed for the eligibility criteria. There is some evidence that a daily use of sodium fluoride mouth rinse reduces the white spots surrounding a fixed brace.

Conclusion: The review recommends sodium fluoride mouth rinsing after tooth brushing, to prevent WSL development or progression during orthodontic treatment.

Limitations: Only full-text articles in English were included. Only 1 article was included and the majority are of limited sample size, and have short follow- ups.

Introduction

Rationale: Enamel decalcification or white spot lesion (WSL) is one of the potential complications of fixed orthodontic treatment associated with poor oral hygiene. Fejerskov et al. defined "white spot lesion" as 'the first sign of carious lesion that is visible to naked eye' and is used alongside the terms "initial" or "incipient" lesions.[1]

Fixed appliances not only make conventional oral hygiene procedures more difficult, they also increase the number of plaque retentive sites. This can lead to a rapid shift in the bacterial composition of dental plaque[3,4] and in the number of acidogenic bacteria, most notably Streptococcus mutans (S. mutans).[5] The first sign of demineralisation may be the development of white spot lesions (WSLs) on the enamel surface around the bracket margins, which if left can progress to cavitation. This whole process occurs more rapidly in orthodontic patients when compared to the developments of similar lesions in non –orthodontic patients.[6,7]

The use of fluorides to prevent carious lesions has been largely described, as the presence of fluoride interferes with demineralization and remineralization events.[9] During an acid challenge, hydroxyapatite is dissolved in a dental tissue process of demineralization, whereas when pH is reestablished (higher than 5.5) this mineral is formed on enamel surface (remineralization). In presence of Fluoride in the biofilm fluid, fluorapatite is formed at the same time that hydroxyapatite is dissolved when pH is between 4.5 and 5.5, decreasing the demineralization of enamel.[10]

Apart from the daily use of toothpastes, mouth rinses containing fluorides effective to prevent WSL development.

There are several methods of delivering fluoride to teeth in patients during orthodontic treatment. These include Topical fluorides (e.g. mouth rinse, gel, varnish, toothpaste).

Thus, the aim of this study is to perform a systematic review of literature containing clinical trials that have investigated the effects of sodium fluoride mouth rinse in orthodontic patients on the development and progression of WSLs. The null hypothesis was that the occurrence of WSL not affected when sodium fluoride mouth rinse used.

Focused Question

Whether sodium fluoride mouth rinses after brushing with fluoride –containing toothpaste are effective in preventing white spot lesions?

Objective

To evaluate the effectiveness of sodium fluoride mouth rinses after brushing with fluoride –containing

toothpaste in preventing the occurrence of white spots on the teeth during orthodontic treatment

Materials and Method

Eligibility Criteria: The following criteria were formulated prior to selection of articles for this review.

Inclusion Criteria:

- Articles in English or those having detailed summary in English.
- Studies published between May 1992 to 2017 will be included.
- Study design must be a randomized control trial or clinical trials
- Involves the use of a sodium fluoride mouth rinse with no use or use of a non-fluoride rinse
- Development of WSLs in patients using fixed orthodontic appliances.
- Only human studies will be included.

Exclusion Criteria:

1. Studies with inadequate statistics
2. In vitro studies and studies in which the main outcome of interest was enamel hardness rather than WSL development.
3. Reviews, case reports, abstracts, editorials, letters and historical reviews were not included.

P – Type of participants: patients undergoing fixed orthodontic treatment

E – Intervention: sodium fluoride mouth rinse.

C – Comparison: sodium fluoride mouth rinse V/S no sodium fluoride mouth rinse.

O – Outcome: presence or absence of white spot.

Information Sources: The National Library of Medicine (Medline PubMed) was used as the internet source of evidence for appropriate papers satisfying the study purpose. The databases were searched up to and including 1stjanuary 1992 up to march 2017using the search strategy formulated.

Keywords: Fig. 1

Orthodontics	Orthodontics or orthodontic
Mouth rinse	Mouth wash
Dental enamel solubility	Tooth demineralization, decalcification, white spot, incipient caries, white lesion
Remineralization	Recalcification
Fixed braces treatment	Fixed appliances, orthodontic treatment, fixed braces appliances, fixed orthodontic treatment

Search Strategy for PubMed:

1. White lesion, fluoride mouth rinse, orthodontic treatment, fluoride toothpaste.
2. White spot, fluoride mouth wash, fixed braces treatment.
3. Fluoride, white spot lesion, orthodontic treatment, toothpaste.
4. Fluoride, fixed braces treatment, demineralization.
5. Fluoride mouth rinse, white spot lesion, demineralization, orthodontic treatment.

Search Strategy	Number of articles	Number of Selected Article	After duplication removed
1	08	03	03
2	02	02	0
3	76	10	66
4	0	0	0
5	03	0	02
Total	89	15	08

Study Selection: preliminary screening consisted of 89 articles. 15 articles remained after duplicate removal. Further screening based on the title and the abstract led to the exclusion of articles. Full text papers were obtained for the remaining 1 article included in the final qualitative synthesis

Data Collection Process: A standard pilot form as an Excel sheet was used. All headings not applicable for the review were excluded. Data extraction was done for a single article and the form for which was reviewed by an expert. The data for the remaining articles were extracted using the same form.

Data Items: Included data items are as follows:

1. Location
2. Year of publication
3. Author
4. Sample size
5. Observer
6. Intervention/Exposure
7. Comparison
8. Conclusion

Results

1 study concluded in favor of effectiveness of sodium fluoride mouth rinse after brushing with fluoride toothpaste for the prevention of white spots on teeth during fixed orthodontic treatment.

Discussion

Summary of Evidence: The objective of this systematic review was to evaluate the effectiveness of sodium fluoride mouth rinse after brushing with fluoride containing toothpaste in preventing the occurrence of white spots on the teeth during orthodontic treatment. Fluoride is the most important agent to prevent decalcification and restrict lesions from progressing. In a recent study conducted by khoroushi in 2017 mentioned that daily use of fluoridated mouthwashes containing sodium fluoride has been shown to result in a significant decrease in the development of carious lesion around and beneath bands. Antibacterial agents have been incorporated into these mouthwashes, including chlorhexidine, triclosan,

or zinc to promote their cariostatic effects.Benson carried out a systematic review and recommended the daily use of 0.05% NaF mouthwash to prevent enamel demineralization during fixed orthodontic treatment.A daily mouthwash containing NaF (0.05% or 0.2%) and/or weekly rinse containing alpha-1- fetoprotein (1.2%) have been demonstrated to decrease the incidence of enamel demineralization during fixed orthodontic treatment.[15] In a previous clinical study carried out by Geiger in 1992 to determine if rinsing frequency with a neutral 0.05% sodium fluoride rinse influenced white spot lesion formation associated with orthodontic brackets. Each patient received home- care instructions and were told to use 10 ml of sodium fluoride rinse daily before bedtime. Compliance was measured by recording the number of bottles used by each patient. A significant dose response relationship was noted in which those who rinsed at least once every day had fewer lesions (21%) than those who rinsed less frequently (49%). It was concluded that a significant reduction in enamel white spot lesions can be achieved during orthodontic therapy through the use of a 10 ml neutral sodium fluoride rinse. Although fluoride is known to reduce solubility of enamel and to play a role in remineralization, it has also been shown to influence plaque composition, growth, and metabolism. Fluoride accumulates in plaque in much higher concentration than in saliva. It is therefore available to assist in remineralization. An alteration in plaque metabolism, particularly related to the acidogenicity, may account for the observation that white spot incidence was significantly yet were compliant with fluoride with poor oral hygiene, yet were compliant with fluoride use, i.e. rinsing with 10 ml every day.[16]

Conclusion

The use of a 0.05% sodium fluoride rinse during orthodontic treatment resulted in a statistically significant reduction of enamel white spot lesions.

The more closely patients adhered to the daily use of sodium fluoride rinse, the more likely they exhibited a decrease in the occurrence of white spot lesions.

The dose response effect between the frequency of rinsing and the incidence of white spots was evident regardless of oral hygiene status.

Future Implications

Implications for practice: There is some evidence that regular rinsing with a fluoride mouthwash is effective at reducing the severity of white spots in people undergoing fixed orthodontic treatment, but it is not very strong. Based on research carried out in non - orthodontic patients, which shows that regular supervised use of fluoride mouth rinse, in addition to a fluoridated toothpaste is associated with a reduction in caries for children and adolescents; the principle age group of orthodontic patients.

Implications for search

More evidence is required to determine the most effective way of delivering fluoride to the orthodontic patient. In particular, methods that do not require patient's compliance should be studied. Currently, no studies have been published regarding sodium fluoride mouth rinses only. Thereby indicating the need for the search.

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