

Questionnaire on White Spot Lesions to Orthodontist: Members of the British Orthodontic Society

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ABSTRACT

White spot lesions (WSLs) are a risk of fixed appliance orthodontic treatment (FAOT) with no consensus with regards to prevalence, risk factors, prevention, and treatment. The aim is to screen current clinical opinion by emailing a questionnaire to all orthodontists-members of the British Orthodontic Society. The response rate was 7.85% (115/1,464) and the fully completed questionnaires were 105/115 (91.30%). There was a big difference between the mean (43%) and median (20%) estimated risk for developing WSLs. For the majority of responders, the key factors related to WSLs are clinical examination, photographic records, fluoride, oral hygiene, diet, and duration of FAOT.

Clinical relevance: Questionnaire-based study on current clinical practice and opinion with regards to WSLs developing during FAOT.

Objective statement: There is a lack of consensus in the literature with regards to estimated risk, risk factors, prevention, and treatment of WSLs developing during FAOT. The reader will obtain a picture of the current clinical practice and opinion of orthodontists on WSLs.

Keywords: Dental enamel, Enamel caries, Enamel carious lesions, Enamel demineralization, Fixed appliance orthodontic treatment, Orthodontic treatment.

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BACKGROUND

There has been an increase in the number of new orthodontic courses of treatment by 32,000 or 0.7% in England alone during the period of March 2011–2012.¹ Enamel demineralization or white spot lesions (WSLs) is a very important risk of fixed appliance orthodontic treatment (FAOT) and both dentists and orthodontists are very much aware of this.² The increasing numbers of new cases demonstrate an increasing trend that warrants the ability to better assess and even quantify the risk of developing caries while undergoing FAOT. This step would enable us to quantify the cost for any method proven to be effective in preventing and/or repairing these lesions. Duration of FAOT can take up to 2 years to complete increasing the WSLs to occur. The start of FAOT can even be delayed if WSLs are not arrested or controlled. There is no consensus in the literature in relation to risk factors, prevalence, prevention, and treatment methods of WSLs while undergoing FAOT. It also appears that there is a lack of data from parent(s)/guardian(s) of children who had FAOT with regards to the risk of caries.³ Improving esthetics is a very important aim of FAOT for most of the patient's and their families point of view therefore an effective preventive method to avoid creating new problems would be welcomed. The study aims to screen current clinical opinion and practice in relation to diagnosis, prevention, treatment, and quantifying risk.

MATERIALS AND METHODS

A questionnaire seen in Figure 1, with nine items, was developed. The questionnaire together with a letter explaining the purpose of the study was emailed to the British Orthodontic Society (BOS) (www.bos.org.uk). None of the members of the BOS were directly emailed by the authors. All communication was undertaken via the administrative staff of the BOS and the questionnaire was twice emailed to all specialists–orthodontists who were members of the British Orthodontic Society at the time (www.bos.org.uk) with approximately 1 month interval (Figs 2 and 3).

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RESULTS

The returned questionnaires were 7.85% (115/1,464) and out of these 105/115 (91.30%) were completed fully. The mean age of responders was 48 years old and the median 47, with 55.2% of



Fig. 1: Teeth free of white spot lesion before orthodontic treatment



Fig. 2: Teeth with white spot lesion post orthodontic treatment

them being females. The median year for obtaining orthodontic qualification was 1997. The responders estimated the median risk for developing WSLs during FAOT at 20% and the mean at 42.86%. The main problems identified by responders were early termination of FAOT, followed by the need for restorative care and delayed completion of FAOT as seen in Figure 4. The prevention protocol adopted by responders included daily use of F rinse, professional plaque control, and use of toothpaste with high F content as seen in Figure 5. Identifying risk factors for developing WSLs during FAOT the most important one was poor oral hygiene, diet, and duration of FAOT. The agreement of responders with risk factors for developing WSLs as reported in the literature can be seen in Figure 6. Clinical examination and use of photographs were the most popular methods used for either diagnosis and/or severity assessment of WSLs. The most identified methods employed by responders to arrest and/or treat WSLs developing during FAOT can be seen in Figure 7.

DISCUSSION

There was a very low response rate (7.85%) to this 9-item electronic questionnaire that was emailed twice via the BOS, concerning a daily present clinical risk of FAOT. The design of the questionnaire was simple and it avoided open-ended questions so conclusions could be made. Findings from current literature were presented about risk factors, diagnosis, prevention, and treatment methods and responders were asked to state whether they would agree or not with these findings. To avoid guiding responders to a particular answer(s), there was an option to give their different answer if they wished to do so. Most responders had obtained their orthodontic qualification in 1997 (median), i.e., 5 years from the last published comprehensive review on prevalence and/or incidence of WSLs;⁴ therefore, it seems unlikely that orthodontists were not been exposed to any literature concerning the subject. The fact that the questionnaire was emailed rather than posted not only reduced cost but would also need few steps to complete and return. One cannot exclude the possibility that the email addresses may have been out of date and it may explain the low response rate.

Responders estimated the median risk for developing WSLs to be 20% and the mean risk 42.86%. The latest review reports a wide range between 2 and 96% for subjects and 0 and 24% for teeth,⁴ it is frequently quoted in other studies.

The most frequent problems reported were early termination of FAOT indicating early diagnosis and action against WSLs and the need for restorative care indicating a late diagnosis of WSLs with all the consequences thereof.

Central to the prevention of WSLs was F either in the form of a daily mouth rinse or in toothpaste, followed by professional plaque removal which can be provided by hygienists and/or therapists. The Cochrane Collaboration published in 2013 the latest up-to-date systematic review on the subject and identified three studies all published after 2005 therefore those were new studies not included in any of the previous systematic reviews and they involved $n = 458$ participants.⁵ One study with low risk of bias reported moderate evidence that when applying an F varnish (Fluor Protector® 0.1%F) every 6 weeks, the result was an almost 70% reduction in the incidence of WSLs and number needed to treat of 5.5.⁶ A high risk of bias study because there were many volunteers drop-outs, compared use of SRFGDs to daily use of an F mouth-rinse (225 ppmF) and did not show a statistically significant difference in numbers of WSLs developing during FAOT.⁷ The risk of bias in the third study was reported as unclear. The results showed an increase that was statistically significant in the mean WSL index by comparing two daily used mouth rinses. Their results showed that the mouth-rinse containing amine fluoride/stannous (140 ppmF, pH 4.5) compared to the sodium fluoride mouth-rinse group (250 ppmF).⁸ The previous Cochrane Systematic review published 10 years earlier,⁹ reported that severity of WSLs is effectively reduced by daily use of mouth-rinse containing 0.05% NaF (225 ppmF) whereas both severity and prevalence of WSLs can be reduced while using GIC for bonding of brackets. The criteria they applied were met by 15 studies and the tested methods in these studies were the use of F (as a varnish or mouth rinse as NaF, SnF₂, acid phosphate F); varnish containing CHX; F elastomeric ligatures and GIC and/or RM-GIC bonding material.

Responders identified as important factors in developing WSLs to be oral hygiene, diet, and duration of FAOT. Orthodontists do not have direct control over these factors depend on compliance and the individual's behavior but they have direct control over the duration of FAOT. Professional plaque removal can be performed by other members of the dental team.

Responders agreed with most of the risk factors reported in the literature with regards to the development of WSLs. Only a few responders believe that the age and gender of the patient play a key role. Preexisting WSLs,^{10,11} duration of FAOT,^{12,13} DMFT,¹¹ and oral hygiene^{14–16} are all risk factors that have been well documented in the literature. There is limited research investigating directly the relationship (if any) between socio-economic status and the presence of WSLs yet the majority of responders agreed that is a significant risk factor. This area may need to be investigated further as studies are reporting the different socioeconomic statuses of patients accessing orthodontic treatment.¹⁷

The diagnostic tool for diagnosis of presence and assessment of the severity of WSLs used was clinical examination with or without photographs. No specific methodology was employed. Even though many indices are found in the literature in an attempt to clinically quantify the severity of WSLs they do not appear to be in use in everyday practice.

When WSLs are present most responders reported that they would discuss the problem, offering diet, and oral hygiene advice to the patient and the parents responsible. As a next step, they would

A questionnaire regarding the effect of white spot lesions (WSLs) on fixed appliance orthodontic treatment (FAOT). We need your current clinical opinion. We do not expect you to look up references, books, etc. for the “correct” answer!

Sex : Male / Female Age : _____ years Orthodontic qualification (year and where obtained) _____

Which dental settings do you work? (Please indicate proportion of time e.g. 50% Hospital ; 50% University; 100% Community)

Hospital _____ Community _____ GDP _____ NHS Specialist Practice _____ University _____

In your opinion, what is the problem with WSLs for patients under 18 years of age who have FAOT? (Type X next to all that apply)

May lead to early termination of orthodontic treatment
May delay completion of orthodontic treatment

Need for restorative care
Other (please specify) _____

If your patient asked you to quantify the risk of developing WSLs, what percentage would you give them? _____

What is the protocol you follow to prevent WSLs additional to adult (>1,100ppm F) toothpaste? (Type X next to all that apply)

Daily fluoride mouth-rinse (225 ppmF)

Professional dental plaque removal

Weekly fluoride mouth-rinse (900 ppmF)

Professional dental plaque removal with F application

High fluoride concentration toothpaste (>1,450 ppm F)

Other (please specify) _____

Glass-ionomer based bonding materials for bonding brackets

In your opinion which are the most important risk factors for developing WSLs?

Most important _____

Second most important _____

Third most important _____

In your opinion are the following risk factors (as identified in the literature) important in developing WSLs? (Delete as appropriate)

a. Pre-existing WSLs

Yes / No

d. DMFT

Yes / No

g. Oral hygiene

Yes / No

b. Socio-Economic-Status

Yes / No

e. Age of patient

Yes / No

c. Duration of orthodontic treatment

Yes / No

f. Gender of patient

Yes / No

How do you diagnose the presence of WSLs during orthodontic treatment? (Type X next to all that apply)

Visual clinical examination

Use of specialised equipment (please name) _____

Photographs

Other (please specify) _____

How do you assess the severity of WSLs during orthodontic treatment? (Type X next to all that apply)

Visual clinical examination

Use of scoring system (please name) _____

Photographs

Use of specialised equipment (please name) _____

Other (please specify) _____

If WSLs are found during and/or after completion of treatment what is your protocol? (Type X next to all that apply)

Fluoride application - in surgery

Termination of orthodontic treatment

Microabrasion

Fluoride application - at home

Diet advice

Restorative care

Oral Hygiene Instructions

Discussion with patient/parent(s)

Other (please specify) _____

Would you consider using a simple glass bead threaded onto an orthodontic wire that continuously released fluoride, if it was proven to effectively prevent WSLs? (See attached photograph)

Yes / No

Fig. 3: Questionnaire on white spot lesions

consider ending the FAOT to allow self-healing rather than employ micro-abrasion or F application, either at home or in surgery.

CONCLUSION

- The response rate was 7.85% (115/1,464) with 105/115 (91.30%) fully completed questionnaires.

- Responders estimated the median risk for development of WSLs to be 20% and the mean risk 42.86%.
- The main problems with WSLs reported were early termination of FAOT and the need for restorative care.
- The clinical examination followed by photographs was used by most responders to diagnose and quantify the severity of WSLs.

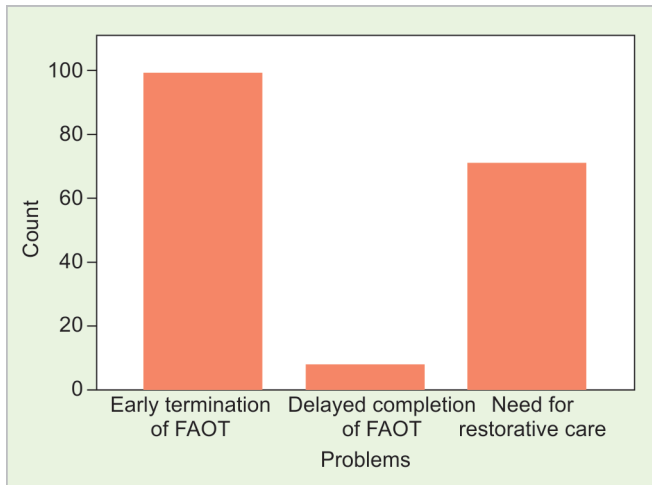


Fig. 4: Problems related to white spot lesions as identified by responders

- F was at the core of any prevention protocol adopted by responders.
- The main three risk factors that contribute to the development of WSLs were poor oral hygiene, diet, and duration of FAOT.
- Responders agreed with the following risk factors that have been reported in the literature: pre-existing WSLs, socio-economic status, duration of FAOT, DMFT, and oral hygiene.
- Responders would not agree that the age and/or gender of the patient should be considered risk factors for the development of WSLs.
- Responders reported many methods to treat and/or arrest WSLs and the most popular ones were discussion with patient/parent, oral hygiene instructions, and diet advice.

DECLARATIONS

Ethics approval and consent to participate: the questionnaire was submitted to the British Orthodontic Society for approval before distributed via email to its members.

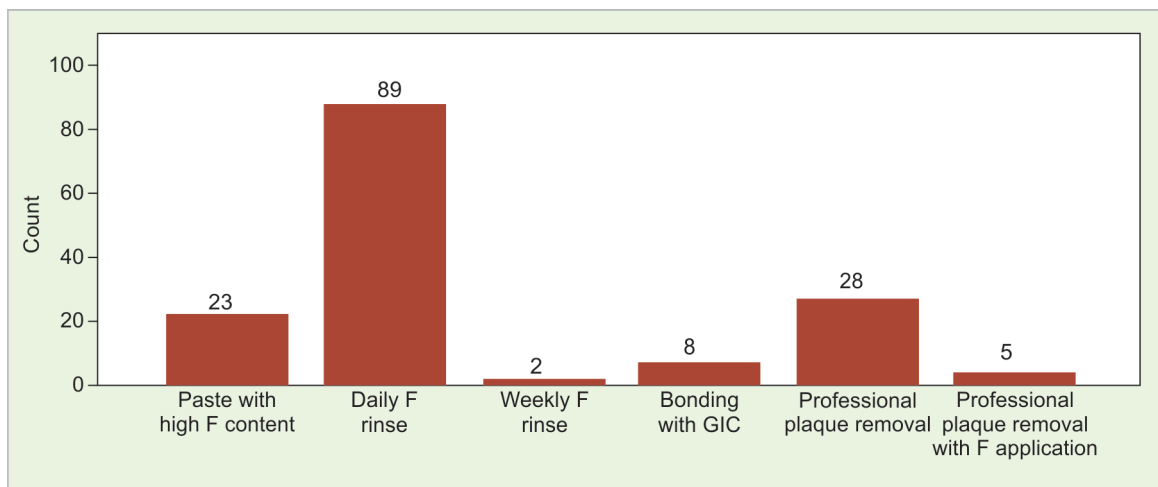


Fig. 5: Protocol followed by responders to prevent white spot lesions

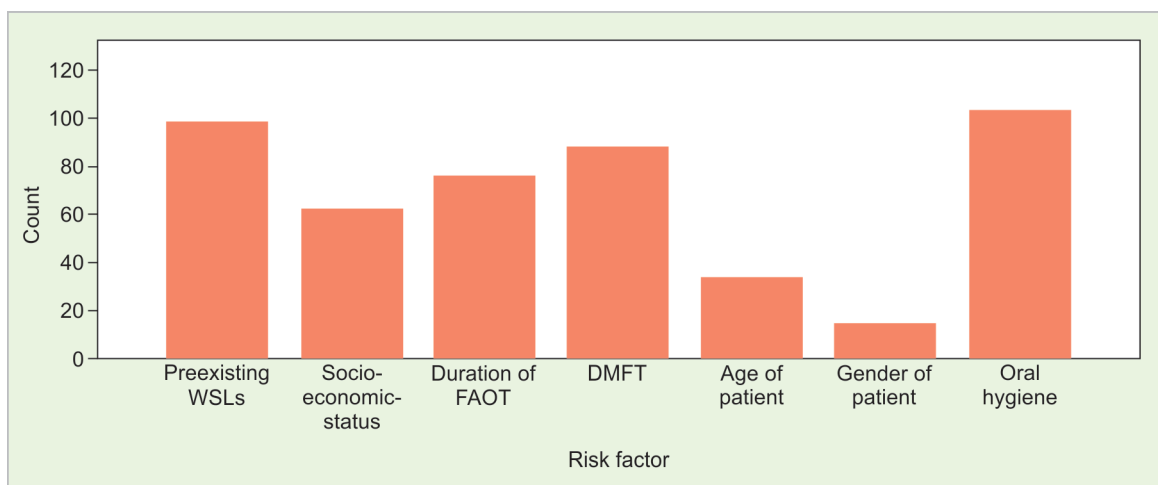


Fig. 6: Risk factors identified by responders in the development of white spot lesions

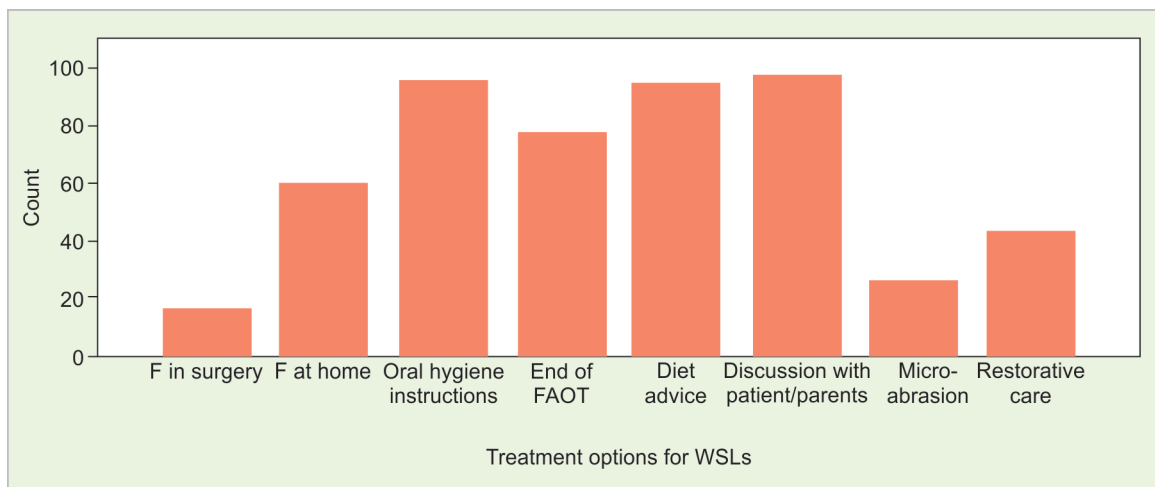


Fig. 7: Methods to treat and/or arrest white spot lesions identified by responders

AVAILABILITY OF DATA AND MATERIAL

The datasets used and analyzed during the current study are available from the corresponding author on reasonable request.

AUTHORS' CONTRIBUTIONS

CT has collected and analyzed data. KT, MS, and FL have developed the questionnaire and reported on the results. All authors read and approved the final manuscript.

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