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A prescription for orthodontic induced White Spot Lesions (WSLs) control: A stepwise approach

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Abstract: *White spot lesions (WSLs) are considered one of the most common adverse effects of orthodontic treatment. They present an esthetic problem that could progress into cavitation. The increased incidence of WSLs exposes the orthodontist to the risk of malpractice and litigation. This article represents a chart that gives a stepwise approach for WSLs control before, during and after orthodontic treatment that is based on the most recent scientific data. If the orthodontist can follow the checklist step by step, the high risk patients for WSLs can be identified before treatment and the orthodontists will be able to take the necessary measures to control WSLs. The inclusion of this checklist in the orthodontic practice could add peace of mind to orthodontists.*
Keywords–*Litigation, orthodontic treatment, prescription, prevention,white spot lesions (WSL)*

I. Introduction

White spot lesions (WSLs) are considered one of the most common adverse effects of orthodontic treatment. Fejerskov and Kidd defined WSL as the "the first sign of a carious lesion on enamel that can be detected with the naked eye." [1] Prolonged plaque retention and difficulty of oral hygiene procedures during orthodontic treatment are considered the main causative factors for the increased prevalence of WSLs during orthodontic treatment. [2].

WSLs present an esthetic problem and could progress into cavitation. Moreover, the increased incidence of WSLs exposes the orthodontist to the risk of malpractice and litigation. [3] Healthcare services users are becoming more censorious upon their treatment results, which has resulted in an increase in the number of malpractice claims against clinicians. [4] The aim of this article is to provide the orthodontist with a stepwise approach for prevention and management of WSLs before, during and after treatment. Following these steps might protect the patients from developing WSLs and protect orthodontists from malpractice lawsuits.

II. Chart For Management of WSLs

A. Before treatment				
Proper assessment of Risk factors: [5,6]				
1- Inadequate pre-treatment oral hygiene	☐	2-	High sugar diet	☐
3- Higher DMF	☐	4-	Previous orthodontic treatment	☐
5- Orthodontic treatment plans with longer treatment durations	☐	6-	Higher CCA (comprehensive clinical assessment outcome score) [7]	☐
7- Young age	☐	8-	White ancestry	☐
B. During treatment				
I. Prevention **1- Oral Hygiene protocol**				
a. Patient education	☐	b.	Initial prophylaxis (supra-gingival scaling and sub-gingival debridement)	☐
c. Nutritional counselling	☐	d.	Consistent oral hygiene instructions	☐
e. Fluoridation				☐
2- Disruption of Bacterial Biofilm [6]				
a. Tooth brushing	☐	b.	Flossing	☐
c. Electronic tooth brushes	☐	d.	Interdental brushes	☐
3- **Pit and Fissure sealants [8]**				☐
4- Fluoride Containing agents				

a. **Fluoride toothpaste** ((1,500–5,000 ppm) minimum twice daily and avoidance of eating or drinking for 2 hours) [9]	☐	**b.** **Use of Fluoride-Releasing Bonding Materials**[10]	☐
c. **Fluoride rinse:** Daily 0.5% sodium fluoride rinse [11]	☐	**d.** Application **of Fluoride varnish** around orthodontic brackets *[11]	☐
e. Use of **Fluoride releasing devices***[12,13]	☐	**f.** Use of **Elastomeric ligatures containing stannous fluoride (SnF) (**Fluor-I-Ties)*[14]	☐
* to be used only in extreme cases			
5. Other agents			
a. **Amorphous Calcium Phosphate (ACP):** MI Paste, MI Paste Plus night application after brushing [15]	☐	**b.** **Cavistat mints, Carifree** rinses to increase pH of biofilm [6]	☐
c. **Xylitol chewing gum** 3 to 5 pieces per day for at least 10 minutes per chew **(care to avoid brackets debonding)** [16]	☐	**d.** **Chlorhexidine rinse** (for 2-weeks) 30-second rinse daily after brushing before bedtime [6]	☐
e. Use of **probiotics** **[17]	☐	**f.** **Silver-platinum (Ag-Pt) coatings** application to stainless steel orthodontic brackets** [18]	☐
g. **Antibiotics, iodine and Cetylpiridiniumchloride (CPC)**incorporation into bonding composites ** [19]	☐	**h.** Incorporation of **Titanium dioxide and zinc oxide nanoparticles** in bonding composites. ** [4, 20]	☐
i. Surface modification of orthodontic wires with**photocatalytic titanium oxide** (anti-adherent and anti-bacterial properties) ** [21]			☐
****** Experimental items to be used in extreme cases with caution			
II. Management of WSLs			
1- Inform the patient and/or parent	☐	2- Reinforcement of oral hygiene instructions and more frequent recalls	☐
3- Re-evaluation of the risk factors and potential changes in lifestyle and diet	☐	4- Daily Chlorhexidine mouthwashes for at least 2 weeks	☐
5- Application of fluoride varnish at every orthodontic visit might be needed	☐	6- More intense regimen of MI Paste or MI Paste Plus	☐
7- Early removal of orthodontic appliances may be indicated in cases not responding to the preventive measures and have progressing WSLs [6]	☐	8- **Use of Argon Laser** to decrease the depth of WSLs [22,23]	☐
C. After Treatment * **			
1- Natural Resolution/ Remineralization[24]	☐	2- Salivary stimulation by chewing gum may be effective in assisting remineralization	☐
3- Casein phosphopeptide amorphous calcium phosphate remineralizing cream (CPP-ACP). [25,26]	☐	4- Bleaching [27]	☐
5- Microabrasion[28]	☐	6- Resin infiltration (Icon) [29]	☐
7- Restoration might be essential for cavitated lesions (direct/ indirect restoration)			☐
******* Fluoride **must not** be used in high concentration, as it arrests the remineralization and can lead to staining			

III. Conclusion

This chart represents a stepwise approach for WSLs control before, during and after orthodontic treatment that is based on the most recent scientific data. The reference list also represents the data base for the evidence that supports the use of the mentioned measures. If the orthodontist can follow the checklist step by step, the high risk patients for WSLs can be identified before treatment, the orthodontists will be able to take the necessary measures to control WSLs and chances for litigation will be reduced. The inclusion of this checklist in

the orthodontic practice could add peace of mind to orthodontists.

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