

Evidence-based caries preventive measures applied in orthodontic practices in Iran

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Introduction: Third molar impaction is usually related to lack of space for eruption. The aim of this study was to assess third molar angulation following extraction and non extraction orthodontic treatment.

Methods: This study was carried out on pretreatment and post treatment panoramic and cephalometric radiographs of 70 CL I malocclusion patients. Thirty-five patients (24 female and 11 male) with mean age of 16.3 ± 1.8 years had been treated with extraction of four first premolars (extraction group) and thirty-five patients (27 female and 8 male) with mean age of 16.9 ± 2.6 years had been treated without extraction (nonextraction group). In each group, upper and lower third molar angulation, on pre and post treatment radiographs were assessed. Changes in third molar angulations from pretreatment to post treatment in each group were assessed with Mann-Whitney U test. Changes in two groups were compared with Wilcoxon test.

Results: statistical analysis revealed some degree of improvement in third molar angulation in both groups. changes of upper left third molars in extraction group and upper right and lower left third molars in non extraction group were statistically significant.

The changes of third molar angulation between two groups were not statistically significant.

Conclusion: Extraction of first premolars during orthodontic treatments does not influence unerupted third molar angulation.

Key words: Angulation, Extraction, Non-Extraction, third molar.

Received 10 February 2014; accepted 4 March 2014; Published 7 June 2014

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Introduction

Fixed orthodontic treatment with brackets raise the probability of incipient caries development especially in patients with poor oral hygiene^{1,2}. Brackets and other orthodontic appliances make difficult the use of conventional oral hygiene methods leading to significant plaque accumulation around bracket bases³. In spite of broad range of studies on different preventive technologies in recent years, white spot lesion development in orthodontic treatment with fixed appliances is still regarded an unsolved clinical problem^{4,7}. There is limited evidence that these type of lesions after developing during orthodontic treatment can remineralise after appliance removal⁸. Customarily the majority of studies has focused on the primary prevention of white spot lesions but in recent years the secondary prevention of controlling and treating existing lesions after debonding have come into attention. However as these lesions may become irreversible lesions, diagnosing them as early as possible and implementing necessary procedures by orthodontists is essential⁹.

The extent of incipient caries varies from 4.9 to 84% of the tooth surface, depending on the diagnostic technique used^{5,10}. Furthermore studies have shown that in each 3 orthodontic patients there is at least one white spot lesion¹¹. Research has highlighted that a suitable guideline, creating motivation and sufficient management of patients' oral hygiene in fixed orthodontics is at all times essential¹².

Despite awareness on prevalence of incipient caries in fixed orthodontic treatments there is little knowledge existing about preventive measures applied by orthodontists in practice, apart from a study on orthodontists practicing in United Kingdom and Netherlands^{1,13}. Therefore, the purpose of this study was to assess the preventive measures used in orthodontic practices in Iran and compare them to the available evidence-based information.

Material & Methods

A cross-sectional study was conducted on orthodontists practicing in Iran and attending the 10th annual meeting of orthodontists held in Tehran, 2012. Self-administered

questionnaires were distributed among all orthodontists attending the programs. The questionnaire was based on a previous research study among orthodontists on preventive measures applied by orthodontist¹.

The questionnaire included four parts, mainly containing multiple-choice questions and four questions on background information in the end: age, sex, postgraduate school and year of graduation. Part one investigated the measures used to prevent demineralizations at the start of treatment, use of special preventive protocol and oral health status of patients. Part two assessed the aforementioned measures with additional questions on the materials used for bonding, cementing during orthodontic treatment. Part three was consisted of same questions for after treatment furthermore asking if they would take further steps to treat demineralizations and their patients had at least two teeth caries. Part four assessed the compliance and enthusiasm of patients on sticking to the ordered preventive measures and the orthodontists' views on the necessity of a preventive guideline.

The validity of questionnaire was assessed through an expert panel consisted of 10 dental faculty members (2 PhD in Community oral Health and 8 Orthodontists) and its' content validity ratio (CVI) was computed. After incorporating the proposed modifications for second time questionnaire was distributed among five reviewers and the final CVI was computed. The internal consistency reliability of the questionnaire was calculated based on a pilot study on 30 dental practitioners.

Completed questionnaires were analyzed by SPSS version 19. Descriptive statistics such as median, mean, standard deviation were calculated and furthermore differences were analyzed by Mann-Whitney U test.

Results

124 completed questionnaires were returned. Incomplete questionnaires with no data on age, gender (n = 6) and those with blank areas in parts 1 to 4 of questionnaire (n=14) were excluded. Demographic characteristics of participants are demonstrated in Table 1. Two thirds of the participants were male and their average age was 41.95±9.2 years (Min=20 & Max=73). Mean years of clinical experience were 10.3 ± 7.75.

The S-CVI of questionnaire was 0.84, indicating a satisfactory result^{14,15}. Cronbach's alpha for assessing internal consistency was 0.6 and good¹⁵. Approximately Fifty percent were practicing in private practice, nine percent in dental clinics and the rest worked in both private practice and dental clinics.

Table 1. Descriptive statistics of the present sample

1 School type is based on establishment years; new: ≤30 years, old: > 30 years.

Variable	Number	%
Sex		
Male	69	70.4
Female	29	29.6
Age (years)		
26-38	33	31.7
39-46	31	33.7
≥46	28	30.4
School Type ¹		
Overseas	11	13.4
Old	66	80.5
New	5	6.1
Clinical Orthodontic Practice (years) ¹		
≤ 6	24	36.4
6<≤13	25	37.9
≥14	17	25.8

Oral hygiene profile

About 54.8% of the orthodontists announced that in general they were frequently satisfied with their patients' oral hygiene. However 52.4% of the orthodontists mentioned that at the beginning of treatment 40% of patients had poor oral hygiene. Nonetheless 44.2% of orthodontists at the end of treatment had least frequency of patients (0-20%) with two caries.

During orthodontic treatment 37.2% of orthodontists recommended toothpaste with higher fluoride concentration (1200ppm) as part of prevention protocol (Table 2). In total about 38.6% of them said that will stop orthodontic treatment by diagnosing caries (Table 2). However male practitioners were more willing to stop their treatments comparing with female orthodontists and the difference was statistically significant $P < 0.003$.

Oral health education

Among participants, 48% were working only in private practice and 9% on public clinic while 39% were working in both private and public clinics. Oral hygiene instruction on patients own teeth was more popular in public dental clinic while in private clinic use of dental model used more frequently. (Fig 1).

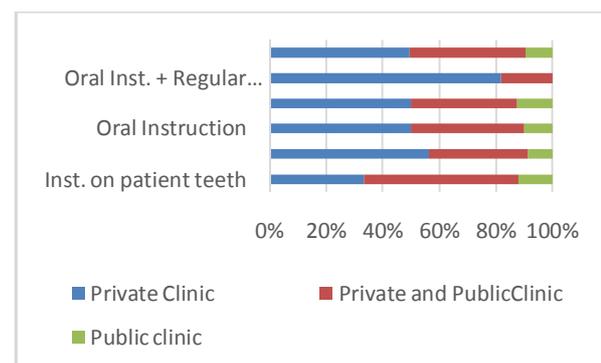


Fig 1. Different instruction used by orthodontists according to their place of practice

Brushing three times a day was advised by 78.8% of orthodontists and always 47.1% (n=49) ordered orthodontic floss and 51% orthodontic brushes (Table 2). In addition 27.9% did not recommend toothpaste with more than 1200 ppm concentration of fluoride during treatment (Table 2).

In general 31.3% considered it necessary to develop a new practice guideline to prevent development of caries on smooth enamel surface. Fluoride releasing bonding and cementing are always used by 18.3% and 56.7% of the participants respectively during treatment (Table 2).

At the start of treatment, 65.4% of orthodontists recommend fluoride mouth rinse once daily but 13% of them prescribe chlorhexidine mouthwash. During treatment fluoride varnish and fluoride gels are advised

by 38% and 56% of orthodontists respectively at least once a year. At the end of the treatment 21.2% of orthodontists would always prescribe fluoride mouth

rinses and also 13.5% of them would suggest white spot lesion polishing.

Table 2. Frequencies of use of prevention protocol measures among orthodontists during treatment with fixed appliances (No (%)).

Protocol/guideline	Never	Seldom	Sometimes	Frequently	Always	No Answer
Use fluoride releasing bonding	27 (26.2)	19 (18.3)	26 (25)	7 (6.7)	19 (18.3)	5 (4.8)
Use fluoride releasing cement	3 (2.9)	10 (9.6)	12 (11.5)	18 (17.3)	59 (56.7)	1 (1)
Recommend orthodontic tooth brush	9 (8.7)	7 (6.7)	8 (7.7)	21 (20.2)	53 (51)	5 (4.8)
Recommend orthodontic tooth floss	7 (6.7)	6 (5.8)	13 (12.5)	22 (21.2)	49 (47.1)	6 (5.8)
Recommend Toothpaste with higher fluoride concentration (1200ppm)	14 (13.5)	15 (14.4)	27 (26.6)	5 (4.8)	6 (5.8)	32 (30.8)
Stop orthodontic treatment	6 (5.8)	41 (39.4)	13 (12.5)	16 (15.4)	11 (10.6)	16 (15.4)
Use other new technologies	46 (44.2)	24 (23.1)	17 (16.3)	3 (2.9)	1 (1)	13 (12.5)

Patient motivation

Direct explanation by orthodontist was ranked highest as the most important method in motivating patients to use oral hygiene measures. 81.7%. On the other hand website was the least motivating source, ranked highest by only 9.6% of participants. 36% of orthodontists would arrange a separate session for more detailed oral health education for susceptible patient.

Discussion

In this study preventive measures used among Iranian orthodontists were assessed. This self-administered questionnaire study had limitations in providing strong evidence regarding caries prevention in orthodontic practices. However five systematic reviews conducted from 2001 to March 2014, relevant to our topics and available in English.^{4,16-20} were selected as strong evidence. The presented survey used and compared with other available evidence to prepare a preliminary guideline.

Comparison of evidence with measures for prevention as frequently applied by Iranian orthodontists the following findings were interesting. The additional use of toothpaste with a high fluoride concentration, shown to have a caries-inhibiting tendency was rarely prescribed similar to findings of Derks et al.²⁰ Fluoride mouth rinse with a low fluoride concentration was

prescribed most often by the Iranian orthodontists which was similar to Dutch orthodontists.¹ However high quality, long-term study demonstrating its caries-preventive effect in orthodontic patients are absent.^{17,21}

There were no differences between orthodontists with different years of graduation in prescribing preventive measures. In addition 55.5% stated that there is a need to develop preventive guidelines.

Orthodontists (43%) are not satisfied with their patients oral hygiene and 36% of them observed more than two carious lesion after treatment in 20-40% of their patient. While 82% of orthodontists generally believed that the most powerful measure to increase patient motivation is their own direct instruction, 22.1% applied it in their practice. Therefore, more rigorous protocol for caries prevention during orthodontic treatment is justified.

Cementing material with fluoride releasing properties was regularly used among Iranian orthodontist and the available evidence supports this decision.²² On the other hand bonding material with fluoride releasing properties or laser the enamel surface to increase its resistance against demineralization were not applied. Effectiveness of fluoride toothpaste along with a high concentration of fluoride gel (12,500 ppm) in remineralizing incipient caries has been shown but only 6% of orthodontists would recommend it always to their patients.^{23,24} This

may be due to unavailability of the product in Iran market.

In case of observing carious lesions during treatment with fixed orthodontic appliances 10.6% of orthodontists would always stop their treatment and it was the only preventive measures that was statistically different between male and female orthodontists..

It is recommended that this study be repeated by adding two more questions; “How many times each patient

brushes his/her teeth daily?” and “Whether caries risk of each individual patient at start of orthodontic treatment is estimated?”.

In conclusion regarding the current status of orthodontists opinion there is a need to develop a comprehensive and user friendly protocol to prevent caries. According to present study and considering other strong evidences we proposed a preliminary protocol for caries prevention in orthodontic patients.

Correlate these colors with the text and table below.

A	B	C	D
Recommendation based on higher levels of evidence			Recommendations based on lower levels of evidence or expert opinion
Caries Risk Assessment		Low Risk	High Risk
Oral Hygien Instruction	Regular Brochures	Dental Hygienist	Dentist or Orthodontist
Tooth Brush	Regular tooth Brush	Orthodontic tooth brush	Electric Tooth Brush
Tooth Paste	NaFtoothpaste(1400ppm)		AmF/SnF2 toothpaste(1400ppm)
Rate of Brushing	Two times/Day		Two times/Day
Fluoride Mouth Rinse	NaF(250ppm)		AmF/SnF2(250ppm)
CHX or persica Mouth Rinse	Not required		Two times/Day
Fluoride Gel	6-12 months		Every visit
Fluoride Varnish	Twice a year		Every 6 weeks
Banding Cement	Glass Inomer		Glass Inomer
Fluoride Bonding	not required		not required
CCP-ACP or MI paste	not required		Every Day
Co2 Laser	not required		Prior to Treatment

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