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ORIGINAL ARTICLE

Survey on Retention Protocols Among Turkish Orthodontists

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ABSTRACT

Objective: The purpose of this study was to identify general retention protocols practiced by Turkish orthodontist and to compare the results obtained with those of similar studies in Western countries.

Methods: The Web-based survey consisted of 29 questions: 3 to identify the demographic characteristics of the participants and 26 to examine how orthodontists manage the retention phase. Data was interpreted by descriptive statistical methods such as the median test, the Mann-Whitney U-test and logistic regression analysis.

Results: The survey return rate was 73.8%. Pretreatment malocclusion status (87%), oral hygiene status (78%), and presence of third molars (63%) were reported to be the most important factors in determining the type of retainer. Bonded retainers, either alone (29% in maxilla and 34% in mandible) or supplemented with vacuum-formed retainers (27% in maxilla and 32% in mandible) were the most commonly used type of retainer. The preference for lifelong retention varied from 7% to 19%. Female orthodontists scheduled the first appointment after debonding sooner than male orthodontists ($p<0.05$). Orthodontists working in universities scheduled first appointments later than orthodontists working in private practices ($p<0.05$).

Conclusion: Turkish orthodontists still give importance to the third molars in their retention protocols, contrary to what is suggested in the current literature, and lifetime retention is rarely preferred as compared to other countries.

Keywords: Orthodontics, retention protocol

INTRODUCTION

Over the years, lots of vital interventions which were not possible earlier have been introduced into the orthodontic realm. These include absolute anchorage and distraction of atrophied alveolar processes. However, retaining the achieved results even after a simple crowding treatment is still a challenge for orthodontists no matter how the fundamental finishing is fulfilled.

The literature (1,2) suggests that there is insufficient clinical data on which retention protocols can be based. Although there is an urgent need for high quality randomized controlled trials, the entire recurrence potential of different malocclusions cannot be determined due to ethical reasons. Therefore, attention is redirected towards prevailing approaches, revealed by questionnaires, with the assumption that commonly adopted and deep-seated protocols could be the most beneficial. This being said, widespread approaches use Hawley retainers when the arches are expanded (3-5), and use bonded retainers for non-extraction cases (5-8), alongside an increasing trend towards lifetime retention (5,6,8-10) with bonded and vacuum-formed retainers (VFR), which are gaining popularity among consultants (5-8,10). However, some parameters such as duration of retention (6,8,11), follow-up protocol (9,11), and number of hours a day that removable retainers should be worn (6,8) still vary greatly among clinicians.

Hence, the purpose of this first comprehensive survey on retention protocols among Turkish orthodontists was to identify the retention procedures used and to compare the results with those of similar studies conducted in Western countries.

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METHODS

After a thorough review of the literature, commonly used retention devices and protocols were determined, and customized protocols were not investigated in the present study. The final Web-based survey consisted of 29 questions: 3 to identify the demographic characteristics of the participants and 26 to examine how orthodontists manage the retention phase (Appendix 1). The requested information can roughly be summarized as the demographic characteristics of the respondents (gender, experience as practitioner and practice setting), most commonly used retention appliances, factors affecting the choice of retainer, adjuvant applications for retention, duration of retention and scheduling of the follow-up appoinments. The principles outlined in the Declaration of Helsinki were followed.

The study was conducted via a questionnaire whose link was e-mailed to the orthodontists registered at the Turkish Orthodontic Society. The questionnaire was e-mailed to nine hundred seventy-eight orthodontists. The questionnaire was sent three times, at approximately 3-month intervals.

Statistical Analysis

The trends in responses were described in percentages. The median test and Mann-Whitney U test were used to determine the effect of practice setting on the timing of first appointment after debonding. Also, the effect of orthodontist gender on duration of retention was investigated by the Mann-Whitney U test. Univariate and multivariate logistic regression analyses were used to evaluate the association between the predictors (gender, experience as practitioner and practice setting) and the outcomes (choice of retainer, use of supracrestal fiberotomy, consideration of third molars' presence for deciding the duration of retention). Statistical analyses were performed using the Statistical Package for Social Sciences (SPSS), version 17 (SPSS Inc.; Chicago, IL, USA). The level of statistical significance was set at $p<0.05$.

RESULTS

The response rate for the 978 e-mailed questionnaires was 73.8%. The majority of the participants were female (63%). Half of the respondents (51%) worked in private practices, followed by practitioners in universities. The orthodontists working both in universities and private practices comprised the 13% of the participants. A 9% of the respondents had 20 or more years of experience, 40% had an experience of 10–20 years, and 51% had practiced for 10 years or less (Table 1).

Pretreatment malocclusion status (87%), oral hygiene status (78%), presence of third molars (63%), and periodontal condition (62%) were found to have the highest importance in determining the type of retainer. The most commonly used retainer was the bonded retainer (29% in maxilla and 34% in mandible), followed by a combination of a bonded and vacuum-formed retainer (27% in maxilla and 32% in mandible), and finally a vacuum formed-retainer alone (Table 2). A combination of a bonded retainer and a VFR was the preferred choice of retention following treatment of diastemas, deep bite, open bite and posterior crossbite in adult cases, and when remaining overjet or root resorption occurred. VFR alone or bonded retainer alone was the preferred choice for retention in extraction cases. No statistically significant association was found between retainer preference and either gender, experience as practitioner or practice setting ($p>0.05$).

Table 1. Demographic characteristics of the participants

Variables	%
Gender	
Female	63%
Male	37%
Practice setting	
Private practices	51%
University practices	30%
University & private practices	13%
Community practices	6%
Years in practice	
<10	51%
10–20	40%
>20	9%

Table 2. Percentages of orthodontists using a special type of retainer in maxilla and mandible

	Hawley & modifications (%)	Vacuum-formed retainers (%)	Bonded retainers (%)	Vacuum-formed & bonded retainers (%)	Hawley & bonded retainers (%)
Maxilla	14	25	29	27	5
Mandible	4	27	34	32	3

Table 3. Percentages of orthodontists using adjuvant applications for retention in their protocol

Variables	%
Tooth positioners	3
Headgear	7
Intermaxillary elastic	7
Chin-cup	9
Supracrestal fiberotomy	30

The survey indicated that the incorporation of tooth positioners, headgears, intermaxillary elastics, and chin cups as adjuvant applications for retention were preferred by less than 10% of the orthodontists, whereas supracrestal fiberotomy was a more frequent option (30%) (Table 3). The effect of practice setting on the use of supracrestal fiberotomy was found to be statistically significant. The odds that the orthodontist working in universities used supracrestal fiberotomy were 2.12 and 1.26 times higher compared to orthodontists working in private and community practices, respectively.

Table 4. Most preferred durations of retention with either removable or bonded retainers

	Orthodontists (%)	
Retention time	**Bonded**	**Removable**
≤2 years	34	49
2 to 5 years	16	13
>5 years	8	2
Until the end of growth	7	12
Until extraction of the 3rd molars	17	17
Lifetime	19	7

Responses given in regards to the duration of retention showed a considerable divergence, especially for bonded retainers. When bonded retainers were used, 34% of the orthodontist ended retention within 2 years, while a greater number of orthodontists (at least 42%) continued retention for more than 2 years. The remaining 24% of the orthodontists kept the bonded retainer in place until a specific time point, such as extraction of the third molars (17%) or end of growth (7%). The most preferred duration of retention with removable appliances was between 0–2 years (49%), whereas the second most favored time point for ending retention was removal of the third molars (19%). With bonded retainers, lifelong retention was preferred by 19% of the surveyed practitioners, whereas this percentage dropped to 7% with removable appliances (Table 4). Female orthodontists differed from their male counterparts regarding the duration of retention, with a preference of significantly longer periods of retention for female protocols (p=0.037). Although not statistically significant, the odds ratios may indicate a possible trend for participants working in universities being more likely to consider the presence of third molars for deciding whether to use fixed (OD 2.17) or removable (OD 2.80) retainers compared to their colleagues working in community practices.

A 76% of participants advised their patients to wear the removable appliances on a full-time basis during the first 6 months. Between months 6–12 of the retention period, 50% of the orthodontists prescribed night-time wear with partial day-time wear, while fewer orthodontists (29%) preferred only night-time wear. After one year of follow-up, 59% of the participants recommended only night-time wear.

Following debonding, almost two thirds (69%) of the participants reported that they scheduled the first follow-up appointment after 1 to 2 months. With regard to the frequency of the appointments during the retention phase, about half of the respondents (49%) checked their patients at intervals of 2 to 4 months, whereas fewer orthodontists preferred biannual visits. Female consultants arranged the first appointment after debonding sooner than their male counterparts (p=0.044). Practice setting had a significant impact on the timing of the first appointment after debonding. Consultants working in universities arranged the first appointment later than orthodontists working in private practices (p=0.019).

DISCUSSION

Since no predetermined approaches are present for different cases based on any touchstones, retention procedures are left to clinicians' intuition and praxis. In this context, questionnaires help by providing the overall picture with the current practicing trends. Knowing which treatment protocols are favored by orthodontists allows clinicians to compare their own procedures with a reference protocol.

The survey revealed that pretreatment malocclusion status and oral hygiene status were considered to have the highest importance among factors such as periodontal status, tooth anatomy, myofunctional condition, end results, patient age, demands of the family and patient, and patient cooperation. On the other hand, gender and economic status of the patients were merely taken into account. The answers provided were compatible with those given by Irish (12), Norwegian (11), American (13), and Swiss (8) orthodontists. This consensus among orthodontists of different nationalities is backed up by the literature, which suggests that relapse can be reduced, to some extent, by taking into account the findings at the onset of treatment (14,15).

An interesting finding is that the majority of the orthodontists (63%) claimed that their choice of retainer was influenced by the condition of the third molars. This is probably a consequence of early literature (16-18) suggesting their role in crowding, despite current research suggesting that there is no such evidence (19-21). Hence, it can be said that orthodontists are still under the influence of obsolete knowledge, and are not able to abandon their old habits regarding the third molars as a threat to their achievement. Unlike Turkish orthodontists, the presence of third molars was only taken into account by less than 10% of American (13), Dutch (6), Swiss (8), and Irish (3) orthodontists.

The bonded retainer was the most commonly used type of retainer in the maxilla and mandible, closely followed by a combination of bonded retainer and VFR, and finally VFR alone. However, when asked about the type of retainer chosen under certain conditions, following retreatment or treatment of adult patients, a combination of bonded retainer and VFR was used in almost every case (intrusion of anterior or posterior teeth, correction of crossbite, diastema closure, correction of rotations, presence of residual overjet, or root resorption) in the maxilla and mandible without a sound evidence of a need for both. This is probably a safety measure adopted by orthodontists in order to prevent the workload of retreatment should a bonded retainer fail. This tendency is also observed among Swiss (8), Dutch (6), and Norwegian (11) orthodontists, although to a lesser extent. On the other hand, the majority of orthodontist in the States (9), Ireland (3), and the United Kingdom (5) prefer removable appliances in the maxillary arch, with VFR being the choice of removable appliance, except in the States. Despite the unanimity in treatment practices, the surveys indicate that additional high-quality, randomized controlled trials comparing VFR with Hawley appliances are necessary; in the literature there is no predominance of one over the other in terms of usage (22-25).

There was no statistically significant association between preference of retainer and experience as practitioner, gender, or practice setting, which is partially consistent with the results of the Singh et al. (5) survey. In that study, the only statistically significant outcome was associated with the bonded retainers, which were used more frequently in private practice settings. Additionally, our findings are not in agreement with those of other surveys, which reported that significantly more female orthodontists used a combination of maxillary fixed and removable retainers (11), or revealed that a greater number of male consultants preferred mandibular fixed lingual retainers (9).

Even though the stability following orthodontic treatment can be improved by adjuvant applications for retention (1), it was observed that orthodontists did not favor the incorporation of headgears, intermaxillary elastics, and tooth positioners, whereas supracrestal fiberotomy was used by 30% of the participants. According to the Rowland et al. (12) survey, maxillomandibular retention (activator, positioner) was used by almost 20% of Norwegian orthodontists, which was higher than the percentage reported in this survey. The probable reason for refraining from such methods could be the patients' unwillingness to cooperate in the aforementioned procedures. Furthermore, a statistically significant association was found between supracrestal fiberotomy and practice setting. Orthodontists working at universities were more likely to use suprecrestal fiberotomy compared to those working in private practices. This could be explained by the ease of referral to a colleague and convenience of communication with someone sharing the workplace.

There was no consensus among orthodontists regarding the length of retention, which was similar to the results of other surveys. However, female consultants preferred significantly longer retention periods compared to men. A bonded retention period of more than 2 years was employed by 42% of the respondents in the present study, while 34% of the Turkish orthodontists were likely to end bonded retention within 2 years, which is a higher percentage compared to that for lifelong retention preference (19%). Our results are compatible only with those obtained in surveys with Norwegian orthodontists (11), who recommended permanent retention to less than 20% of their patients, whereas permanent retention was recommended by 76–87% of Dutch (6), Swiss (8,26), American (9), Irish (3), and British (5) consultants. When removable retainers were used, about half of the surveyed orthodontists instructed their patients to use them for 0–2 years, while lifelong retention was recommended by only 7%, which is far lower than the percentage of practitioners prescribing permanent retention in the States (84.2%) (9) or in Ireland (67-78%) (3).

Lifetime retention is in fact supported by literature indicating that some relapse will occur even after years of orthodontic treatment (14,27-29). The preference of the Turkish orthodontists for limited retention could be due to the fact that patients constantly ask for the removal of the retainer and mention the feedback of calculus accumulation provided by their general dentist. Also, 37% of the orthodontists claimed observing periodontal problems due to prolonged wear, similar to the observations of Pandis et al. (30). Additionally, for longer retention periods, the number of patients under supervision will be higher, hence a heavy workload will accumulate. In countries which prefer lifetime retention, general dentists perform the regular check-ups, contrary to the procedures in Turkey.

One interesting finding is that 17% of the orthodontists advised their patients to wear removable retainers until the third molars were extracted. Although it is not statistically significant, there seems to be a tendency for participants working in universities to consider the presence of third molars as a factor for deciding whether to use fixed or removable retainers compared to their colleagues working in community practices.

In the current study, 76% of the orthodontists prescribed full-time removable retainer wear for the first 6 months. Similarly, Valiathan and Hughes (9) found that full-time retention was prescribed for 9 months by approximately 53% of the orthodontists. Among Dutch orthodontists (6) there was a tendency for using removable retainers at least 18 hours a day for the first 6 months. As yet, with regards to the most recent literature, part-time wear was found to be as effective as full-time wear (31-34). Hence, in light of the foregoing, to increase patient cooperation, a reduction in wear time can be applied to only the night-time wear regimen, which was used by only 3% of the respondents.

Following debonding, most orthodontists (69%) scheduled the first retention appointment after 1 to 2 months, whereas 26% of participants performed the first checkups after 2 to 4 months. This finding was similar to the Arnold et al. (26) survey, which reported scheduling the first check-up within the first 3 months after debonding. The frequency of appointments during the retention phase was reported to be at intervals of 2-4 months by about half of the orthodontists. Furthermore, orthodontists working in universities were found to schedule the first appointment after debonding significantly later than private practitioners. Female orthodontists arranged the first appointment after debonding significantly sooner than male consultants.

CONCLUSION

1. Opinions showed considerable divergence with regard to duration of retention and timing of scheduled appointments during retention, which is in accordance with studies from other countries.
2. Pretreatment malocclusion status was the most important parameter for determining the type of retainer. Turkish orthodontists give importance to the third molars in their retention protocol, and lifetime retention is much less preferred compared to Western countries.
3. The most commonly used retention protocol among Turkish orthodontists was fixed retention with bonded retainers. A shift was observed towards more simplified procedures abandoning the adjuvant applications for retention.
4. Female orthodontists seem to be more cautious in handling the retention process.
5. New questionnaires should be drafted to determine the reasons for the fluctuating answers given under various conditions, so as to be able to determine the most efficient retention protocol.

Ethics Committee Approval: Authors declared that the research was conducted according to the principles of the World Medical Association Declaration of Helsinki "Ethical Principles for Medical Research Involving Human Subjects", (amended in October 2013).

Informed Consent: N/A.

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APPENDIX 1. Survey questions

Q1 – What is your gender? A) Female B) Male

Q2 – Where is the institution you are currently working?
A) Private practice
B) University
C) Private practice and University together
D) General Hospital
E) Military Hospital

Q3 – How many years have you practiced orthodontics?
A) 0-5 B) 5-10 C) 10-15 D) 15-20 E) >20

Q4 – Do you use any of the following grading method before retention period?
A) PAR Index B) ICON Index C) Both of them D) I don't use E) Other

Q5 – When do you decide and how the protocol would be to retention?
A) At the beginning of the treatment
B) During treatment
C) At the end of the treatment

Q6 – Please give points to the situation for choosing the retention protocol according to the degree of importance. (1-very important, 2-important, 3-least important, 4-unimportant)

Pre-treatment situation	
Poor oral hygiene	
Periodontal tissues	
End result	
Age	
Gender	
Wish of patient/parents	
Anatomy of teeth	
Myofunctional aspects	
Third molars	
Motivation	
Financial status	

Q7-Q8 What is the most preferred retention type you use at specific situations

	Fixed	Removable	Fixed and removable	Fixed	Removable	Fixed and removable
Class 1 crowding without extraction						
Class 1 crowding with extraction						
Closing a diastema in the anterior design						
Remaining overjet						
Intrusion of the anterior teeth						
Extrusion of the anterior teeth						
Posterior cross bite						
Adult patient						
Root resorption						
Rotations						
Anterior open bite						
Re-treatment						

Q9- Please list the retention appliance according to the frequency of use most common for (1) to least for (3) for the upper jaw.
- Hawley-type retainer ( )
- Thermoplastic vacuum formed retainers ( )
- Fixed lingual retainer ( )
- Fixed lingual retainer + Thermoplastic vacuum formed retainers ( )
- Fixed lingual retainer + Hawley-type retainer ( )

Q10- Please list the retention appliance according to the frequency of use most common for (1) to least for (3) the lower jaw.
- Hawley-type retainer ( )
- Thermoplastic vacuum formed retainers ( )
- Fixed lingual retainer ( )
- Fixed lingual retainer + Thermoplastic vacuum formed retainers ( )
- Fixed lingual retainer + Hawley-type retainer ( )

Q11- How often do you use the following appliance in the retention of open bite cases?

Appliance type	Often	Sometimes	Rarely	Never
Tooth positioner				
Habit breaker				
Intermaxillary elastic				

Q12- Do you use retention appliances including both lower and upper jaw as tooth positioner?
A) Often
B) Sometimes
C) Rarely
D) Never

Q13- If your answer is positive; which cases do you use tooth positioner?

Class II div 1 cases	
Class II div 2 cases	
Open bite cases	
Other	

Q14- If you use the appliances following below for class II div 1 and Class II div 2 retention period, please evaluate them by frequency of use.

Appliance type	Often	Sometimes	Rarely	Never
Headgear				
Functional appliances				
Inclined plane Hawley appliance				
Tooth positioner				
Intermaxillary elastic				

Q15- Do you use chinup for class 3 retention period?
A) Often B) Sometimes C) Rarely D) None

Q16- Do you use supracrestal fiberotomy method for retention period?
A) Yes B) No

Q17- If your answer is yes, which following situation do you prefer?

Crowding	
Treatment of rotation	
After tooth intrusion	
After tooth extrusion	
Other	

Q18- When you use the fixed lingual retainers which teeth do you prefer the apparatus take place between?

	2-2	3-3	4-4	2-2	3-3	4-4
Non extraction treatment						
Extraction treatment						

Q19- What is your choice for fixed lingual retainers wire?
A) Round section flat SS wire
B) Multistrained flat SS wire
C) Multistrained round SS wire
D) Resin fiberglass material
E) Other……

Q20- What is your choice for fixed lingual retainers wire thickness?
A) 0,0150 inch
B) 0,0175 inch
C) 0,0200 inch
D) 0,0250 inch
E) Other……

Q21- What is your choice for fixed lingual retainer preparation?
A) Direct method in the laboratory
B) Indirect method in the laboratory
C) I prepared myself at the appointment directly
D) I prepared myself it on model and then apply to patient

Q22- What is your choice for thermoplastic vacuum formed retainer thickness?
A) 0,5 mm
B) 0,75 mm
C) 1 mm
D) 1.25 mm
E) 1,5 mm
F) Other ……..

Q23- What is the percent of patients that you can follow at the retention period?
A) 0%
B) 0-25%
C) 25-50%
D) 50-75%
F) 100%

Q24- The 1st appointment is scheduled how long after the debonding appointment?
A) After 15 days
B) After 1 month
C) Between 2-4 month
D) At 6th month
E) Between 6-12 month
F) In the presence day of any problems

Q25- How often do you give appointment to the patient at the retention period?
A) Every month
B) 2-4 month intervals
C) Once at 6 months
D) Once at 1 year
E) In the presence day of any problems

Q26- What is the residence time of retainer in the mouth after debonding?
A) 0-2 years
B) 2-5 years
C) 5-10 years
D) Until the end of growth
E) Until the extraction of 3rd molars
F) Life time retention

Q27- What is the recommended time of use for removable appliance after debonding?
A) 0-2 year
B) 2-5 years
C) 5-10 years
D) Until the end of growth

E) Until the extract of 3rd molars
F) Life time retention

Q28- How often do you suggest for your patient to use their removable appliance?

	0-6 months	6-12 months	1-3 years	>3 years
Full time (day and night)				
Partial day time- full night time				
Only night time				
Certain days of the week				

Q29- Evaluate the problems and frequency of encounter during use of fixed lingual retainer.

	Often	Sometimes	Rarely	Never
Breakage because of wire				
Breakage because of adhesive problem				
Relaps without a problem of retainer				
Periodontal problem such as gingival problems and dental calculus formation				