

Access this article online

Quick Response Code:



Website:

www.jorthodsci.org

DOI:

10.4103/jos.JOS\_36\_20

# Do orthodontists aim to decrease the duration of fixed appliance treatment?

Mushriq F. Abid, Akram F. Alhuwaizi and Ali M. Al-Attar

## Abstract:

**OBJECTIVES:** The aim of the present study was to investigate the trends in the use of fixed appliance and accelerated orthodontics to decrease the treatment duration. Further, this study aimed to assess the effect of demographic factors on the participant's choice of treatment modality.

**METHODS:** This was a cross-sectional study in the form of questionnaire-based online survey especially designed and distributed to 265 orthodontists via email. The questions aimed to collect basic information about the participants and respondents' choices for decreasing the treatment duration. The data were analyzed according to gender, level of academic education and years of clinical experience using Chi-square test.

**RESULTS:** A response rate of 85.2% was reported. Most of the orthodontists aimed to reduce the treatment duration by the biomechanical (66.8%) and surgical approaches (27.4%). The use of sliding mechanics (69.4%) and one-step retraction was more common (66.3%). MBT bracket prescription was more prevalent (51.7%), followed by Roth (41.1%). Conventional brackets were used more than self-ligating brackets, and aesthetic brackets were avoided by one third of the respondents. NiTi wires were the most commonly used wires during the alignment stage (44.2%). However, the effect of gender, years of clinical experience and specialty level of education showed some effects on the use of certain techniques and clinical practice of the respondents.

**CONCLUSIONS:** Most of the orthodontists aimed to decrease orthodontic treatment duration by using biomechanical and surgical approaches. Gender and clinical experience to a certain extent affected the participants' choice during orthodontic treatment.

## Keywords:

Acceleration, duration of treatment, fixed appliances

## Introduction

The number of patients seeking orthodontic treatment with fixed appliances has increased in the past years. However, treatment duration with fixed appliances requires a long time (2-3 years) which is a major concern for most patients.<sup>[1,2]</sup> In addition to the risk factors imposed by the prolonged treatment time such as external root resorption and white spot lesion,<sup>[3,4]</sup> the cost and patient compliance may be affected by the long duration. Therefore, acceleration of tooth movement techniques to reduce

treatment time would be quite useful and have been investigated with renewed focus recently.

To date, several techniques have been advocated to accelerate tooth movement, including vibration,<sup>[5]</sup> low-level laser,<sup>[6]</sup> corticotomy,<sup>[7]</sup> micro-osteoperforation,<sup>[8]</sup> and electromagnetic fields.<sup>[9]</sup> Beside these novel methods, there have been many improvements in biomechanical behavior of fixed appliance brackets, as well as continuous evolution in the bracket prescription, design, and material. This resulted in several low-friction systems, however, treatment time reduction is still a debatable subject.<sup>[10,11]</sup> Similarly, archwire materials, customized orthodontic brackets

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

**For reprints contact:** WKHLRPMedknow\_reprints@wolterskluwer.com

**How to cite this article:** Abid MF, Alhuwaizi AF, Al-Attar AM. Do orthodontists aim to decrease the duration of fixed appliance treatment? J Orthodont Sci 2021;10:6.

Department of  
Orthodontic, College  
of Dentistry, Baghdad  
University, Baghdad, Iraq

### Address for correspondence:

Prof. Mushriq F. Abid,  
Department of  
Orthodontic, College  
of Dentistry, Baghdad  
University, Baghdad, Iraq.  
E-mail: Mushriq.abid@  
codental.uobaghdad.  
edu.iq

Submitted: 05-Jul-2020

Revised: 17-Aug-2020

Accepted: 23-Jan-2021

Published: 19-Feb-2021

and anchorage control have been reported to be clinically evident.<sup>[12]</sup>

Combinations of surgical and biomechanical approaches have been proposed to accelerate tooth movement.<sup>[13,14]</sup> Moreover, complementary non-surgical and surgical methods have been proposed as auxiliary tools for the acceleration of tooth movement. The use of vibrational device has been advocated as an adjunctive method for accelerating the rate of tooth movement during the levelling, alignment and translation stages.<sup>[15,16]</sup>

Surgical approaches range from minimally invasive interventions such as micro-osteoperforation to more aggressive approaches such as corticision, which has been proven to accelerate tooth movement.<sup>[17,18]</sup> There has been several studies on stimulatory effects of low-energy laser therapy on bone remodeling and accelerating tooth movement.<sup>[19,20]</sup> Pharmacological approaches are based on the biological events occurring during tooth movement and involve local injections of substances such as relaxin and vitamin D. Several human and animal studies estimated the clinical performance of these medications on the rate of tooth movement.<sup>[21,22]</sup>

Surveys in the US and UK have reported the trends in clinical practice.<sup>[23,24]</sup> However, no data from Iraq have been published. This information would be of interest to clinicians, and may reveal the differences in clinical practices and allow orthodontists to compare their treatment protocols with others in the same age. For this reason, the aim of this study was set out to investigate the Iraqi orthodontists' choices with fixed appliances and its components and different methods of acceleration used. Further this study aimed to assess and relate the variation in their choice with their gender, experience, and level of education.

## Materials and Methods

### Study design

This was a cross-sectional study that utilized an online questionnaire-based survey conducted among Iraqi orthodontists. The study started from the end of January 2020 to March 2020. Google platform was used to build the questionnaire and the link was distributed via email to active members of the Iraqi Orthodontic Society and no names or personally identifiable data were collected. The questionnaires were sent to the members via emails at least three times to maximize the response rate. The study was approved by a local ethical committee in the Orthodontic Department, College of Dentistry, Baghdad University in accordance with Helsinki declaration for human research. At the beginning of the questionnaire a consent statement was included and an agreement was made prior to participation.

### Study sample

The sample size was calculated according to the following formula:

$$N = N/1 + Z^2 \times P(1-P)/E^2N$$

Where,

N: population size

Z: z score for % confidence interval

E: margin of error

P: the population proportion (0.5)

Thus, the calculated sample size was equal to 152 at 95 confidence interval and 5% margin of error. To avoid potential dropout, additional 15% (23 subject) was added to the sample, then the final sample size was rounded to 175 subjects.

### The study design

The participants were electronically surveyed using a questionnaire adapted and modified from UK and US studies.<sup>[23,24]</sup> A pilot study was conducted on 15 academics and experienced orthodontists using the same questionnaire to minimize unclear, ambiguous questions. Consequently, the questions were reviewed and modified to ensure scientific accuracy.

The questions were designed to assess the following variables:

1. Demographic data including gender of participant, specialty level of education, and duration of clinical experience.
2. The use of different methods of acceleration of tooth movement
3. Their use of different components and mechanics of fixed appliances to reduce treatment time.

### Statistical analysis

Both descriptive and inferential statistics were performed for analyzing the data. Descriptive statistics was performed to define all categorical data in the form of counts and percentages. Chi-square was used to test the significant relationship between socio-demographic factors and all other variables. All analyses were performed by using SPSS software (Version 21, IBM, USA). *P* values <0.05 were considered statistically significant.

## Results

### Response rate

Electronic questionnaire was sent to 265 active members in the Iraqi Orthodontic Society (IOS). Overall, a total of

226 had anonymously responded, producing a response rate of 85.2%. The number of the respondents was more than the calculated sample size (175); thus, it was considered satisfactorily representative for the targeted population.

### Profile of the respondents

The results revealed that more than half of the respondents were males ( $n = 122, 54\%$ ) with the remainder ( $n = 104, 46\%$ ) females. The majority of specialty level of education was Master's Degree ( $n = 186, 82.3\%$ ); followed by PhD ( $n = 24, 10.6\%$ ) and lastly by Diploma and Certificate ( $n = 16, 7.1\%$ ). Years of experience revealed that less than five years was the highest ( $n = 84, 37.2\%$ ), followed by 6-10 years ( $n = 64, 28.3\%$ ), then 10-15 years ( $n = 44, 19.5\%$ ), and lastly more than 15 years ( $n = 34, 15\%$ ).

### Treatment duration

The majority of the respondents ( $n = 142, 62.8\%$ ) aimed to decrease the treatment duration, while a very low percentage did not take it into consideration ( $n = 12, 5.31\%$ ). There was a statistically significant difference between all the groups. The majority of the males, 75.4% and those with less than five years' practice duration, 71.4%, aimed to decrease the treatment duration as shown in Table 1.

### Acceleration approach

Most of the respondents used the biomechanical approach to accelerate tooth movement ( $n = 151, 66.8\%$ ), followed by surgical approach including Corticotomy, Piezocision, and Micro-Osteoperforation, ( $n = 62, 27.4\%$ ) while the least used approaches were medication such as vitamin D<sub>3</sub>, laser, and vibration (1.3-2.2%). Preference of biomechanical, surgical, and medical approaches seemed to increase with higher educational level, while the surgical approach was more preferred by males and those with more than 10 years of practical experience. A statistically significant difference was found between the level of experience and method of acceleration [Table 2].

### Biomechanical approach

Decreasing treatment time by mechanics (sliding or loop mechanics) and auxiliaries (NiTi coil spring or special type of power chain) were more commonly used than the type of bracket or wire. There was no statistically significant difference between all the variables, Males chose treatment mechanics ( $n = 42, 34.4\%$ ) more than females (27, 25.9%). Interestingly, preference of treatment mechanics and use of auxiliaries seemed to increase with higher educational level, while type of bracket or wire increased with increasing years of practical experience [Table 3].

**Table 1: Decreasing the treatment duration**

Variable	Items	Yes n (%)	No n (%)	Sometimes n (%)	Statistical analysis	
					Chi-squared test ( $\chi^2$ )	P
Gender	Male	92 (75.41)	4 (3.28)	26 (21.31)	17.992	0.0001*
	Female	50 (48.08)	8 (7.69)	46 (44.23)		
Degree	Ph.D.	14 (58.33)	4 (16.67)	6 (25.00)	12.88	0.01*
	M.Sc.	122 (65.59)	6 (3.23)	58 (31.18)		
	Diploma/Certificate	6 (37.50)	2 (12.50)	8 (50.00)		
Practice duration	<5 years	60 (71.43)	6 (7.14)	18 (21.43)	13.025	0.042*
	6-10 years	38 (59.38)	0 (0.00)	26 (40.63)		
	11-15 years	22 (50.00)	4 (9.09)	18 (40.91)		
	>15 years	22 (64.71)	2 (5.88)	10 (29.41)		
	Total	142 (62.83%)	12 (5.31%)	72 (31.86%)		

Chi-square test/\*P <0.05

**Table 2: Methods used to accelerate tooth movement**

Variable	Items	Biomechanical n (%)	Surgical n (%)	Vibration n (%)	Laser n (%)	Medication n (%)	Statistical analysis	
							Chi-squared test ( $\chi^2$ )	P
Gender	Male	88 (65.6%)	34 (27.9%)	5 (4.1%)	3 (2.5%)	0 (0.0%)	$\chi^2=7.934$	0.09
	Female	71 (68.3%)	28 (26.9%)	0 (0.0%)	2 (1.9%)	3 (2.9%)		
Degree	Ph.D.	18 (75.0%)	6 (25.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	$\chi^2=3.224$	0.91
	M.Sc.	122 (65.6%)	51 (27.4%)	5 (2.7%)	5 (2.7%)	3 (1.6%)		
	Diploma/Certificate	11 (68.8%)	5 (31.3%)	0 (0.0%)	0 (0.0%)	0 (0.0%)		
Practice duration	<5 years	48 (57.1%)	25 (29.8%)	5 (6.0%)	3 (3.6%)	3 (3.6%)	$\chi^2=22.59$	0.03*
	6-10 years	51 (79.7%)	11 (17.2%)	0 (0.0%)	2 (3.1%)	0 (0.0%)		
	11-15 years	29 (65.9%)	15 (34.1%)	0 (0.0%)	0 (0.0%)	0 (0.0%)		
	>15 years	23 (67.6%)	11 (32.4%)	0 (0.0%)	0 (0.0%)	0 (0.0%)		
	Total	151 (66.8%)	62 (27.4%)	5 (2.2%)	5 (2.2%)	3 (1.3%)		

$\chi^2$ =Chi-square test/\*P <0.05

### Bracket prescription

The bracket prescription preferred by Iraqi orthodontists was MBT ( $n = 117, 51.7\%$ ), followed by Roth ( $n = 93, 41.1\%$ ), and a minority of them used the Damon system ( $n = 16, 7.08\%$ ). Males used the MBT system more.

Use of the MBT system increased with higher educational level, while the use of the Damon system increased with increased practice years [Table 4].

### Bracket type

The majority of the respondents equally agreed to avoid aesthetic brackets and use conventional brackets ( $n = 78, 34.5\%$ ). More males chose to avoid aesthetic brackets ( $n = 45, 36.8\%$ ) than females ( $n = 33, 31.7\%$ ). With increasing educational level, the respondents used more conventional, self-ligating, and aesthetic brackets. While, with increasing practice years, use of conventional brackets increased and self-ligating ones somewhat decreased [Table 5].

### Archwire

The majority of the respondents used super elastic NiTi wire ( $n = 100, 44.2\%$ ), followed by copper NiTi wire ( $n = 67, 29.6\%$ ) and finally heat-activated NiTi ( $n = 59, 26.1\%$ ). The use of NiTi wires to decrease

treatment time increased with increasing educational degree, while the used of heat-activated NiTi seemed to increase with more practical experience [Table 6].

### Mechanics during retraction

The overall response to this question was in favor of sliding mechanics ( $n = 157, 69.4\%$ ). Males favored sliding mechanics more than females. Diploma and certificate holders preferred sliding mechanics more than those with M.Sc. or Ph.D. Almost two-thirds of the respondents used one-step retraction ( $n = 150, 66.3\%$ ). With higher years of clinical practice, participants used one-step retraction less and two-step retraction more [Table 7].

## Discussion

Most of the Iraqi orthodontists always aim to reduce the treatment duration, using biomechanical approach and a surgical approach. The majority used treatment mechanics to decrease the treatment time (sliding mechanics and one-step retraction). The main bracket prescription used was MBT, followed by Roth. Conventional brackets were used more than self-ligating brackets and most of them try to avoid aesthetic brackets. During the alignment stage super elastic NiTi wire was mostly used.

**Table 3: Biomechanical methods used**

Variable	Items	Treatment mechanics <i>n</i> (%)	Auxiliaries <i>n</i> (%)	Type of bracket <i>n</i> (%)	Type of wire <i>n</i> (%)	Total	
						Chi-squared test ( $X^2$ )	<i>P</i>
Gender	Male	42 (34.43%)	32 (26.23%)	26 (21.31%)	22 (18.03%)	$X^2=2.9$	0.5
	Female	27 (25.96%)	33 (31.73%)	22 (21.15%)	22 (21.15%)		
Degree	Ph.D.	8 (33.33%)	8 (33.33%)	4 (16.67%)	4 (16.67%)	$X^2=2.29$	0.89
	M.Sc.	56 (30.11%)	55 (29.57%)	39 (20.97%)	36 (19.35%)		
	Diploma/Certificate	5 (31.25%)	2 (12.50%)	5 (31.25%)	4 (25.00%)		
Practice duration	<5 years	25 (29.76%)	25 (29.76%)	18 (21.43%)	16 (19.05%)	$X^2=1.145$	0.99
	6-10 years	21 (32.81%)	19 (29.69%)	12 (18.75%)	12 (18.75%)		
	11-15 years	14 (31.82%)	12 (27.27%)	10 (22.73%)	8 (18.18%)		
	>15 years	9 (26.47%)	9 (26.47%)	8 (23.53%)	8 (23.53%)		
	Total	69 (30.53%)	65 (28.76%)	48 (21.24%)	44 (19.47%)		

$X^2$ =Chi-square test

**Table 4: Bracket prescription used**

Variables	Items	MBT <i>n</i> (%)	Roth <i>n</i> (%)	Damon <i>n</i> (%)	Statistical analysis	
					Chi-squared test ( $X^2$ )	<i>P</i>
Gender	Male	65 (53.28%)	48 (39.34%)	9 (7.38%)	$X^2 = 0.36$	0.83
	Female	52 (50.00%)	45 (43.27%)	7 (6.73%)		
Degree	Ph.D.	15 (62.50%)	7 (29.17%)	2 (8.33%)	$X^2 = 3.715$	0.4
	M.Sc.	95 (51.08%)	77 (41.40%)	14 (7.53%)		
	Diploma/Certificate	7 (43.75%)	9 (56.25%)	0 (0.00%)		
Practice duration	<5 years	46 (54.76%)	35 (41.67%)	3 (3.57%)	$X^2 = 4.83$	0.56
	6-10 years	29 (45.31%)	30 (46.88%)	5 (7.81%)		
	11-15 years	25 (56.82%)	15 (34.09%)	4 (9.09%)		
	>15 years	17 (50.00%)	13 (38.24%)	4 (11.76%)		
	Total	117 (51.77%)	93 (41.15%)	16 (7.08%)		

$X^2$  = Chi-square test

**Table 5: Type of bracket used**

Variables	Items	Avoid aesthetic bracket n (%)	Conventional bracket n (%)	Self-ligating bracket n (%)	Statistical analysis	
					Chi-squared test ( $\chi^2$ )	P
Gender	Male	45 (36.89%)	39 (31.97%)	38 (31.15%)	$\chi^2=0.93$	0.6
	Female	33 (31.73%)	39 (37.50%)	32 (30.77%)		
Degree	Ph.D.	7 (29.17%)	9 (37.50%)	8 (33.33%)	$\chi^2=2.16$	0.7
	M.Sc.	64 (34.41%)	66 (35.48%)	56 (30.11%)		
	Diploma/Certificate	7 (43.75%)	3 (18.75%)	6 (37.50%)		
Practice duration	<5 years	26 (30.95%)	28 (33.33%)	30 (35.71%)	$\chi^2=2.26$	0.8
	6-10 years	23 (35.94%)	22 (34.38%)	19 (29.69%)		
	11-15 years	18 (40.91%)	15 (34.09%)	11 (25.00%)		
	>15 years	11 (32.35%)	13 (38.24%)	10 (29.41%)		
	Total	78 (34.51%)	78 (34.51%)	70 (30.97%)		

 $\chi^2$ =Chi-square test**Table 6: Type of arch wire used during alignment stage**

Variables	Items	Superelastic NiTi wire n (%)	Copper NiTi wire n (%)	Heat activated NiTi wire n (%)	Statistical analysis	
					Chi-squared test ( $\chi^2$ )	P
Gender	Male	53 (43.44%)	35 (28.69%)	34 (27.87%)	$\chi^2=0.43$	0.8
	Female	47 (45.19%)	32 (30.77%)	25 (24.04%)		
Degree	Ph.D.	13 (54.17%)	4 (16.67%)	7 (29.17%)	$\chi^2=5.15$	0.2
	M.Sc.	78 (41.94%)	61 (32.80%)	47 (25.27%)		
	Diploma/Certificate	9 (56.25%)	2 (12.50%)	5 (31.25%)		
Practice duration	<5 years	34 (40.48%)	29 (34.52%)	21 (25.00%)	$\chi^2=7.47$	0.2
	6-10 years	35 (54.69%)	14 (21.88%)	15 (23.44%)		
	11-15 years	14 (31.82%)	16 (36.36%)	14 (31.82%)		
	>15 years	17 (50.00%)	8 (23.53%)	9 (26.47%)		
	Total	100 (44.25%)	67 (29.65%)	59 (26.11%)		

 $\chi^2$ =Chi-square test**Table 7: Mechanics used during retraction stage**

Variables	Items	Sliding mechanics n (%)	Loop mechanics n (%)	Statistical analysis		One step retraction n (%)	Two step Retraction n (%)	Total	
				Chi-squared test ( $\chi^2$ )	P			Chi-squared test ( $\chi^2$ )	P
Gender	Male	88 (72.13%)	34 (27.87%)	$\chi^2=0.88$	0.34	84 (68.85%)	38 (31.15%)	$\chi^2=0.73$	0.39
	Female	69 (66.35%)	35 (33.65%)			66 (63.46%)	38 (36.54%)		
Degree	Ph.D.	17 (70.83%)	7 (29.17%)	$\chi^2=0.28$	0.86	13 (54.17%)	11 (45.83%)	$\chi^2=2.01$	0.36
	M.Sc.	128 (68.82%)	58 (31.18%)			127 (68.28%)	59 (31.72%)		
	Diploma/Certificate	12 (75.00%)	4 (25.00%)			10 (62.50%)	6 (37.50%)		
Practice duration	<5 years	59 (70.24%)	25 (29.76%)	$\chi^2=1.25$	0.7	60 (71.43%)	24 (28.57%)	$\chi^2=2.32$	0.5
	6-10 years	47 (73.44%)	17 (26.56%)			40 (62.50%)	24 (37.50%)		
	11-15 years	28 (63.64%)	16 (36.36%)			30 (68.18%)	14 (31.82%)		
	>15 years	23 (67.65%)	11 (32.35%)			20 (58.82%)	14 (41.18%)		
	Total	157 (69.47%)	69 (30.53%)			150 (66.37%)	76 (33.63%)		

 $\chi^2$ =Chi-square test

It is noteworthy to mention that there are no previous studies on the same topic. Therefore, differences and similarities with other studies should be applied with caution considering the differences in the questionnaire and the health systems in different countries. Nevertheless, certain comparisons are useful and of interest. The response rate in the present study was 85.2%. Various studies showed different response rates. Previous studies reported lower response rate such as a

UK study (66%) in which 935 questionnaires were sent,<sup>[24]</sup> Australian (44%)<sup>[25]</sup> and American studies in which 683 and 10,523 questionnaires were sent (7.7% and 7.5%).<sup>[23, 26]</sup>

This study reported that most orthodontists are aiming to reduce the treatment duration (62.8%), which accords with other studies in which 70% of US orthodontists reported their interest in reducing the treatment time.<sup>[26]</sup> Moreover, the respondents in

this study mainly used a biomechanical approach to reduce the treatment time. However, about 27.4% used the surgical approach such as corticotomy or micro-osteoperforation to accelerate tooth movement. Kim *et al.* previously recorded that 12% of Australian orthodontists used corticotomy to accelerate tooth movement.<sup>[25]</sup>

Most of the orthodontists in Iraq preferred to use MBT prescription and conventional brackets. Similarly, the same was reported by UK orthodontists; however, orthodontists in the US prefer to use a Roth prescription.<sup>[23,24]</sup> Super elastic NiTi wires were preferred and used by most of the respondents during the alignment stage, which is in accordance with the US and UK studies.<sup>[23,24]</sup> A common view among the respondents is the use of treatment mechanics to reduce the treatment time both sliding mechanics and one-step retraction (*en-masse*). Studies have reported that two-step retraction increases the treatment time and may cause side-effects such as incisor extrusion.<sup>[27,28]</sup>

Overall, both males and females were consistent and agreed in most of the questions with minimal variations in the percentages. However, what stands out from the present study is that higher percentages of males performed the surgical approach and used treatment mechanics to decrease treatment time than females which included the use of MBT and self-ligating brackets, avoiding aesthetic brackets, using heat activated NiTi, sliding mechanics and one-step retraction. Several previous studies have reported that female orthodontists work fewer days and spend fewer hours in practice, consequently fewer cases are completed.<sup>[29,30]</sup> This difference could justify the differences in the choices both sexes made.

The higher the educational level responders used mechanical approaches to decrease treatment time, including using more auxiliaries, MBT conventional and self-ligating bracket, NiTi wires and sliding mechanics. However, these differences were only mild, may be due to the fact that most of the orthodontists who graduated in Iraq gained their degree from the same teaching institution (University of Baghdad) and received similar training programs.

Interestingly, recently qualified orthodontists used contemporary treatment modalities like one-step retraction more than senior clinicians. Variations could be attributed to the training they received and refinement of the techniques brought about by increased experience. This is in accordance with Banks *et al.*, who reported that senior clinicians used traditional techniques while recently qualified clinicians used more current techniques.<sup>[24]</sup>

### Weakness and strength of the study

One of the strongest points in the study is the sample size and response rate, which indicated the study results were quite representative of the members of the Iraqi Orthodontic Society. However, the study was not comprehensive, and the questionnaire did not involve all the questions about the details in the treatment modalities and techniques because it was expected that more questions would have yielded more data but would have affected the response rate.

### Conclusions

This survey highlighted variations in the use of fixed appliances and accelerated orthodontics to reduce the treatment duration among Iraqi orthodontists.

- Most of the Iraqi orthodontists aim to reduce the treatment duration, mostly by the use of biomechanical and surgical approaches.
- The majority used sliding mechanics and one-step retraction to decrease the treatment time.
- Gender and clinician experience have minimal effect on the participant's choice of treatment modality. Interestingly, recently qualified orthodontists used contemporary treatment modalities while senior clinicians used traditional techniques.

### Financial support and sponsorship

Nil. The study was self-funded

### Conflicts of interest

There are no conflicts of interest.

### References

1. Fink D, Smith RJ. The duration of orthodontic treatment. *Am J Orthod Dentofac Orthop* 1992;102:45-51.
2. Fisher MA, Wenger RM, Hans MG. Pretreatment characteristics associated with orthodontic treatment duration. *Am J Orthod Dentofac Orthop* 2010;137:178-86.
3. Agrawal A, Kausal S, Soni U, Toshniwal N, Misal A. White spot lesions: Formation, prevention and treatment. *Int J Dent Heal Sci* 2015;2:380-4.
4. Segal GR, Schiffman PH, Tuncay OC. Meta analysis of the treatment-related factors of external apical root resorption. *Orthod Craniofac Res* 2004;7:71-8.
5. Nishimura M, Chiba M, Ohashi T, Sato M, Shimizu Y, Igarashi K, *et al.* Periodontal tissue activation by vibration: Intermittent stimulation by resonance vibration accelerates experimental tooth movement in rats. *Am J Orthod Dentofac Orthop* 2008;133:572-83.
6. Yamaguchi M, Hayashi M, Fujita S, Yoshida T, Utsunomiya T, Yamamoto H, *et al.* Low-energy laser irradiation facilitates the velocity of tooth movement and the expressions of matrix metalloproteinase-9, cathepsin K, and alpha (v) beta (3) integrin in rats. *Eur J Orthod* 2010;32:131-9.
7. Hassan AH, Al-fraidi AA, Al-saeed SH. Corticotomy-assisted orthodontic treatment: Review. *Open Dent J* 2010;4:159-64.
8. Sivarajan S, Doss JG, Papageorgiou SN, Cobourne MT, Wey MC. Mini-implant supported canine retraction with

- micro-osteoperforation: A split-mouth randomized clinical trial. *Angle Orthod* 2019;89:183-9.
9. Showkatbakhsh R, Jamilian A, Showkatbakhsh M. The effect of pulsed electromagnetic fields on the acceleration of tooth movement. *World J Orthod* 2010;11:52-6.
  10. Chen SSH, Greenlee GM, Kim JE, Smith CL, Huang GJ. Systematic review of self-ligating brackets. *Am J Orthod Dentofac Orthop* 2010;137:726.e1-18.
  11. Eberting JJ, Straja SR, Tuncay OC. Treatment time, outcome, and patient satisfaction comparisons of Damon and conventional brackets. *Orthod Craniofacial Res* 2001;4:228-34.
  12. Papageorgiou SN, Konstantinidis I, Papadopoulou K, Jäger A, Bourauel C. A systematic review and meta-analysis of experimental clinical evidence on initial aligning archwires and archwire sequences. *Orthod Craniofacial Res* 2014;17:197-215.
  13. Uzuner FD, Darendeliler N. Dentoalveolar surgery techniques combined with orthodontic treatment: A literature review. *Eur J Dent* 2013;7:257-65.
  14. Ganesh ML, Saravana Pandian K. Acceleration of tooth movement during orthodontic treatment-A frontier in orthodontics. *J Pharm Sci Res* 2017;9:741-4.
  15. Pavlin D, Anthony R, Raj V, Gakunga PT. Cyclic loading (vibration) accelerates tooth movement in orthodontic patients: A double-blind, randomized controlled trial. *Semin Orthod* 2015;21:187-94.
  16. Kau CH, Nguyen JT, English JD. The clinical evaluation of a novel cyclical force generating device in orthodontics. *Orthodontic Pract US* 2011;1:10-5.
  17. Kim SJ, Park YG, Kang SG. Effects of corticision on paradental remodeling in orthodontic tooth movement. *Angle Orthod* 2008;79:284-91.
  18. Baloul SS, Gerstenfeld LC, Morgan EF, Carvalho RS, Van Dyke TE, Kantarci A. Mechanism of action and morphologic changes in the alveolar bone in response to selective alveolar decortication-facilitated tooth movement. *Am J Orthod Dentofac Orthop* 2011;139:S83-101.
  19. Genc G, Kocadereli I, Tasar F, Kilinc K, El S, Sarkarati B. Effect of low-level laser therapy (LLLT) on orthodontic tooth movement. *Lasers Med Sci* 2013;28:41-7.
  20. Cruz DR, Kohara EK, Ribeiro MS, Wetter NU. Effects of low-intensity laser therapy on the orthodontic movement velocity of human teeth: A preliminary study. *Lasers Surg Med* 2004;35:117-20.
  21. McGorray SP, Dolce C, Kramer S, Stewart D, Wheeler TT. A randomized, placebo-controlled clinical trial on the effects of recombinant human relaxin on tooth movement and short-term stability. *Am J Orthod Dentofac Orthop* 2012;141:196-203.
  22. Liu Z, King G, Gu G, Shin J, Stewart D. Does human relaxin accelerate orthodontic tooth movement in rats? *Ann N Y Acad Sci* 2005;1041:388-94.
  23. Keim RG, Gottlieb EL, Nelson AH, Vogels DS. 2008 JCO study of orthodontic diagnosis and treatment procedures, part 1: Results and trends. *J Clin Orthod* 2008;42:625-40.
  24. Banks P, Elton V, Jones Y, Rice P, Derwent S, Odondi L. The use of fixed appliances in the UK: A survey of Specialist orthodontists. *J Orthod* 2010;37:43-55.
  25. Kim B, Dreyer CW, Sampson W. Accelerating orthodontic tooth movement with the aid of periodontal surgery--The practitioner viewpoint. *Aust Orthod J* 2014;30:201-7.
  26. Uribe F, Padala S, Allareddy V, Nanda R. Patients', parents', and orthodontists' perceptions of the need for and costs of additional procedures to reduce treatment time. *Am J Orthod Dentofac Orthop* 2014;145:S65-73.
  27. Heo W, Nahm DS, Baek SH. En masse retraction and two-step retraction of maxillary anterior teeth in adult class I women: A comparison of anchorage loss. *Angle Orthod* 2007;77:973-8.
  28. Xu TM, Zhang X, Oh HS, Boyd RL, Korn EL, Baumrind S. Randomized clinical trial comparing control of maxillary anchorage with 2 retraction techniques. *Am J Orthod Dentofac Orthop* 2010;138:544.e1-9.
  29. Blasius JJ, Pae EK. Work-pattern differences between male and female orthodontists. *Am J Orthod Dentofac Orthop* 2005;128:283-90.
  30. Murphy TC, Parkin NA, Willmot DR, Robinson PG. The feminisation of the orthodontic workforce. *Br Dent J* 2006;201:355-7.

### (Questionnaire form)

This survey is conducted to report different techniques used by the orthodontists to decrease the treatment duration when using fixed appliance.

All information of this survey will be used for academic purpose. Your responses will be anonymous and any personal information will be dealt with confidentiality. If you are willing to participate in this survey, please tick the box

**Gender of participant**

- Male  Female

**Academic degree**

- PhD  MSc.  Diploma/Certificate

**Duration of the profession practice**

- ≤5 years  6-10 years  11-15 years  >15 years

**Do you always aim to decrease the treatment duration?**

- Yes  NO  some time

**What kind of accelerated tooth movement do you use?**

- Mechanical approach  Surgical\*  vibration  laser  Medication\*\*

**What kind of biomechanical approach do you use to decrease the treatment duration?**

- Treatment mechanics  Auxiliaries\*\*  Type of bracket  Type of wire

**Bracket prescriptions you commonly use?**

- Roth  MBT  Damon

**What type of bracket do you use to decrease the treatment duration?**

- Avoid aesthetic bracket  Conventional bracket  Self-ligating bracket

**What type of arch wire do you use to decrease the treatment duration during alignment stage?**

- NT wire Copper NT wire  Heat activated NT wire

**What kind of mechanics do you use during retraction?**

- sliding mechanics  loop mechanics

**Type of retraction always use during retraction of anterior teeth?**

- One step retraction  Two step retraction

\*Corticotomy, Piezocision and Micro-Osteoperforation

\*\* Vitamin D<sub>3</sub>, Prostaglandin E1

\*\*\* Auxillaries include the use of Special type of power chain or NiTi coil spring to decrease the treatment duration.