

# A Cross-Sectional Study of Different Orthodontic Brackets Debonding Techniques Used in the Arab Region

Sarah A. Alfaqeeh<sup>1\*</sup>, Sarah S. Aljebreen<sup>2</sup>, Bashaer M. Almousa<sup>2</sup> and Eman M. Bin Saleh<sup>2</sup>

<sup>1</sup>Division of Orthodontics, Department of Pediatric Dentistry and Orthodontics, College of Dentistry, King Saud University, Riyadh, Kingdom of Saudi Arabia; <sup>2</sup>College of Dentistry, King Saud University, Riyadh, Kingdom of Saudi Arabia

## Corresponding author:

Dr. Sarah A. Alfaqeeh, BDS, MSc, PhD, Assistant Professor and Consultant, Division of Orthodontics, Department of Pediatric Dentistry and Orthodontics, College of Dentistry, King Saud University, Riyadh, Kingdom of Saudi Arabia, Email: salfaqeeh@ksa.edu.sa

## Abstract

**Objective:** This study aims to create statistical and analytical data describing different orthodontic brackets debonding techniques used in the Arab region, stating the most commonly used methods, instruments and the outcome of each method to provide sufficient information for future guidelines to improve its performance. **Materials and Methods:** An online survey was sent to members of four orthodontic societies in the Arab region (Saudi, Jordanian, Egyptian and Lebanese), the survey included five demographic data questions: (sex, age, nationality, years of experience and job description) and six epidemiological questions about bracket debonding techniques and instruments used. **Results:** A total of 252 responses were received 9% of the participants did not report any enamel changes after the debonding procedure, while 61% found some enamel damage. The majority of bracket type used was metal (86%), and the bracket remover plier was the most commonly used plier to remove the brackets (74.6%), followed by a light wire cutter (9.5%). Rotary instruments were the method of choice for eliminating residual adhesive from enamel (90.1%); tungsten carbide burs were the most common (24.6%) specifically with low-speed hand piece (24.2%) while prophylaxis paste is the most used method for polishing. The respondents (61%) found enamel esthetic changes between treated and untreated teeth while 39% did not see any changes. **Conclusion:** This study results showed the similarity between Arab orthodontists with their approach and used armamentarium of debonding and polishing. This study has also drawn a picture of the current debonding, finishing and polishing techniques used in the Arab region in comparison with the Italian study from which this study survey was adopted.

**Keywords:** Debonding; Brackets; Orthodontics; Orthodontists; Arab; Finishing; Polishing

## Introduction

Orthodontics had witnessed many developments, including the application of new adhesives, new brackets materials, curing methods and more efficient primers. <sup>[1]</sup> Bonding of the orthodontic brackets to the tooth enamel had become an accepted clinical practice in 1970. <sup>[2]</sup> After that, the focus of the orthodontic research was directed towards the mechanical and physical properties of the adhesive materials including the adhesive strength and enamel surface during and after the orthodontic treatment, in addition to evaluating the effect of variables to prevent any possible side effects in clinical situations. <sup>[3]</sup> The goal of the debonding procedure towards the end of fixed orthodontic treatment is to remove the brackets and the bonding material restoring the enamel to its original condition. <sup>[4]</sup> That is usually carried out by two steps: the first is brackets debonding, which could be done by multiple techniques including mechanical methods, chemical solvents, ultrasonic scalers and lasers. <sup>[5-7]</sup> The next step is removing the adhesive resin which could be done by various methods including hand instruments, *i.e.*, scalers and pliers, and rotary instruments, *i.e.*, sandpaper discs, diamond burs, stainless steel burs, rubbers, tungsten carbide burs at high and low speed, fiber-reinforced composite burs, kinetic removal of adhesive

remnants by intraoral sandblasting with aluminum oxide and ultrasonic clean-up. <sup>[8,9]</sup>

During debonding, many clinicians faced difficulty distinguishing between the enamel and the residual resin due to similarities in the color especially when the tooth surface is wet, and their method of choice is mechanical devices. <sup>[10,11]</sup> The implementation of the debonding procedure should be effective and careful, as there is a high risk that enamel damage might occur if the procedure is done improperly due to the micromechanical bond between the adhesive material and the enamel. <sup>[12-14]</sup> These damages include loss of enamel structure, cracks and enamel surface damage, which can occur during brackets removal and adhesive clean up. <sup>[15]</sup> Similarly, the remaining adhesive material following the debonding procedure results in a rough enamel surface hence, causing plaque biofilm accumulation facilitating the development of white spot lesions and periodontal problems. <sup>[16,17]</sup>

This is an open access article distributed under the terms of the Creative Commons Attribution-Non Commercial-Share Alike 3.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as the author is credited and the new creations are licensed under the identical terms.

**How to Cite this Article:** Alfaqeeh SA, et al. A Cross-Sectional Study of Different Orthodontic Brackets Debonding Techniques Used In the Arab Region. Ann Med Health Sci Res: 1262-1266.

Researchers had suggested various methods for resin adhesive material removal and enamel polishing; [18] emphasizing on the most crucial goal of removing the adhesive material from the tooth structure, which is to leave the enamel in its normal status. [19] Moreover, avoiding any iatrogenic damages as it might be troubling to the clinicians to prove the damages that happened is not a result of the orthodontic treatment. [20] It is noticed that most studies have mainly focused on adhesives, enamel preparation and methods of curing. On the other hand, there are not enough studies on debonding techniques. This study aims to create statistical and analytical data describing different orthodontic brackets debonding techniques used in the Arab region, stating the most commonly used methods, instruments and the outcome of each technique; to provide sufficient information for a future guideline to improve the clinical performance.

### Materials and Methods

Members of the Saudi Orthodontic Society (SOS) (1954 members), the Jordanian Orthodontic Society (JOS) (174 members), the Lebanese Orthodontic Society (151 members) and the Egyptian Orthodontic Society (EOS) (424 members) were reached out by a WhatsApp message whenever a mobile phone number is available and an electronic mail (e-mail) whenever an e-mail address is available containing the aim of the study and its significance to the field and a link which redirects the participant to a web-based questionnaire prepared using the Survey Monkey software. The survey that included five demographic data questions, *i.e.*, sex (male or female), age, nationality, professional experience (years of experience) and job description (general practitioner, post-graduate student, specialist and consultant), and six epidemiological questions with a possibility to add personal considerations [Figure 1]. [13] Besides, part of the participants was personally interviewed by the authors at the 13th Annual Conference of the Saudi Orthodontic Society and the 14th Arab Orthodontic Conference held in Jeddah in 2019 and other areas when applicable.

The protocol for this study was approved by the Institutional

Review Board of King Saud University (E-18-3281). Data were collected to an excel sheet (Microsoft Office 2017) and analyzed using Statistical Package for the Social Sciences version 24.0 (SPSS, Chicago, IL, USA) to calculate the descriptive statistics.

### Results

A total of 252 dentists took an interest in this study of various nationalities: (65.1%) were Saudis, (15.5%) Syrians, (5.6%) Jordanians, (3.6%) Egyptians, (3.2%) Lebanese, (1.6%) Yemenis, (1.6%) Kuwaitis, (1.2%) Bahrainis and (2.8%) were

University of Pavia  
 Department of Clinical, Surgical, Diagnostic and Paediatric Sciences  
 Unit of Dentistry  
 Subdivision of Orthodontics and Paediatric Dentistry

---

**Epidemiological survey**

- During your clinical practice have you found any damages in the enamel after debonding? In what percentage?
  - No
  - Yes - Specify approximate percentage: \_\_\_\_\_%
- What bracket type do you use most frequently in your clinical practice?
  - Metal
  - Ceramics
  - Polycarbonate
- What kind of plier do you use during bracket removal? \_\_\_\_\_
- How do you remove residual adhesive from enamel after debonding?
  - Hand instruments (please specify): \_\_\_\_\_
  - Rotating instruments (please specify): \_\_\_\_\_
  - Ultrasound
- What is your method of polishing the enamel after debonding? (You must specify if single or in combination)
  - Pumice
  - Abrasive discs
  - Rubber cup
  - Prophylaxis paste
  - Other (please specify): \_\_\_\_\_
- After debonding, have you found any enamel esthetic changes compared with untreated teeth?
  - No
  - Yes

Figure 1: Epidemiological part of the survey. [13]

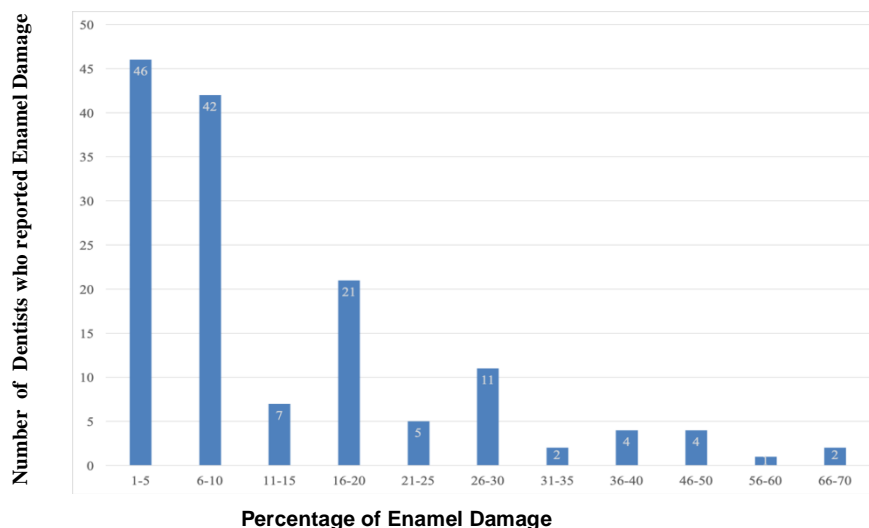


Figure 2: Percentage of enamel damages reported after debonding among treated cases.

non- Arabs. As for the sex of the participants: 61.5% of them were male and 38.5% were female. The age of the participants had a mean of 39 years old who were mostly specialists (42.1%) and consultants (32.9%). Post-graduate students and board residents (16.7%) were followed by general practitioners (8.3%). More than half (53.5%) of the dentists had an experience of more than 10 years in the dental field.

**Percentage of enamel damages after debonding**

A total of 38.9% of dentists did not report any enamel changes after the debonding procedure, while 61.1% found enamel damage, mostly in percentages below 10% as shown in Figure 2.

**Types of brackets used**

The most commonly used brackets in the clinical practice were metal brackets (86%) followed by ceramic (13%), while only 1% were using polycarbonate brackets as shown in Figure 3.

**Pliers used for brackets removal**

The bracket removing plier was the most commonly used instrument by dentists to remove the bracket (74.6%) followed by cutter (9.5%) while 4.7% reported the use of bracket removing plier in combination with different pliers and techniques. Different pliers are shown in Table 1.

**Methods of adhesive removal**

The majority of the dentists (90.1%) used rotary instruments

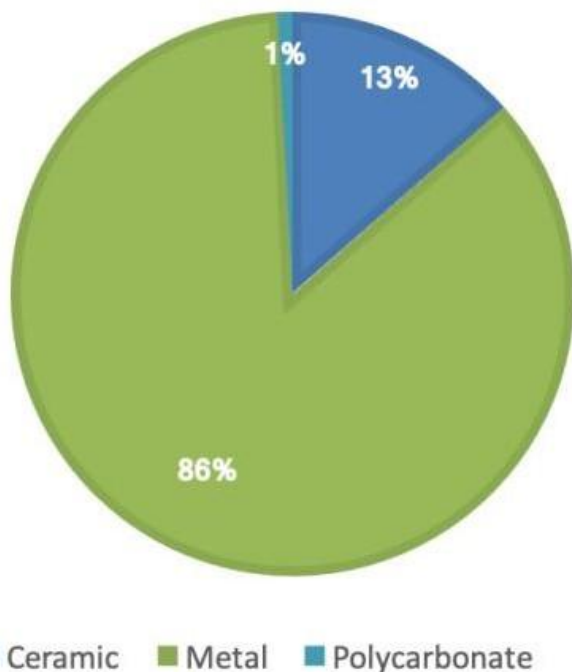


Figure 3: Percentages of different types of brackets used by participants.

Types of pliers	Subjects (%)
Bracket removal pliers	188 (74.6%)
Cutter	24 (9.5%)
Weingart	10 (4%)
Combinations	12 (4.7%)
Others	4 (1.6%)
Did not specify	14 (5.6%)

to remove residual adhesives after debonding, 6.7% used ultrasound while only 3.2% used hand instruments. More specifically, tungsten carbide burs with either high or low-speed hand piece were the most commonly used instruments for the removal of remaining adhesive. Different instruments were reported and are listed in Table 2.

**Methods of polishing the enamel after debonding**

Prophylaxis paste was the most used method by dentists to polish the enamel after.

**Enamel esthetic changes**

A total of 61% of the dentists found enamel esthetic changes between treated and untreated teeth, where 39% did not report any esthetic changes as shown in Figure 4.

Methods and instruments	Subjects (%)
Tungsten carbide burs	62 (24.6%)
Low-speed tungsten carbide burs	61 (24.2%)
High-speed tungsten carbide burs	18 (7.1%)
Whitestone	17 (6.7%)
Ultrasound	17 (6.7%)
Polishing burs	10 (4%)
Diamond	8 (3.2%)
Refer to hygienist	10 (4%)
Did not specify	49 (19.5%)

Instruments	Subjects (%)
Prophylaxis paste	80 (31.7%)
Rubber cup	65 (25.8%)
Pumice	54 (21.4%)
Abrasive disks	20 (7.9%)
Other	33 (13.2%)

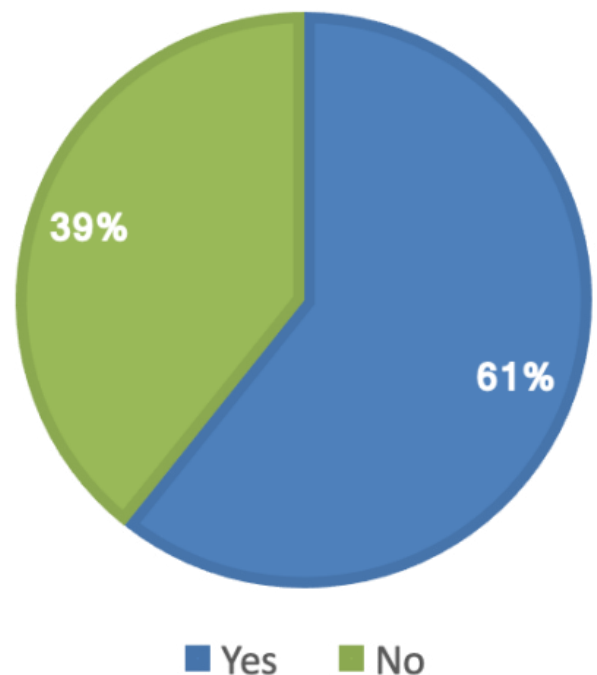


Figure 4: Percentage of participants who reported enamel esthetic changes.

## Discussion

The questionnaire used in the present study was adapted from a previous European study that aimed to conduct an epidemiological survey of the orthodontic debonding techniques in Italy and describes the most commonly used methods to remove the brackets and adhesive material from the tooth surface.<sup>[13]</sup> A total of 25 (9.5%) out of 2703 members of the four different Arab Orthodontic Societies participated in the present study. A similar response rate ( $\approx 11.28\%$ ) was noted recently in Turkey when the aim to evaluate the compliance of orthodontists to infection control procedures was investigated.<sup>[21]</sup> Both illustrate the difficulty in obtaining a high response rate solely from orthodontic societies. However, despite the quite low response rate; the sample according to the descriptive statistics has composed mainly of specialists and consultants which overload the gathered data.

A total of 38.9% of the dentists did not report any enamel damages after debonding while 61.1% found some enamel damages, among those 68.3% found significant enamel damage of more than 5% after debonding, which is way more than what Sfondrini *et al.*<sup>[13]</sup> and Campbell<sup>[22]</sup> found:  $\approx 32.17\%$  and 46.78%, respectively. Metal brackets were found to be the most commonly used brackets in clinical practice (85.7%), which is in agreement with the findings from a previous study (89.14%).<sup>[13]</sup> The popularity of metal brackets could be due to the many properties, most importantly its low cost, greater strength, higher modulus of elasticity, good formability and high corrosion resistance in the mouth.<sup>[23]</sup>

The most commonly used pliers for brackets debonding were found to be the bracket removing pliers (74.6%), followed by cutters (9.5%), as illustrated in Table 1. The opposite was found by Sfondrini *et al.*<sup>[13]</sup> cutters (37.08%) were more frequently used, and bracket removing pliers (34.83%) came after. Few variabilities have been noticed in the response as there is a lack of guidelines and many opt to use combinations of pliers as shown in Table 1. Using pliers to apply a shear or tensile force to the bracket is the most clinically convenient method of debonding.<sup>[14]</sup> Debonding instruments that use tensile force like Lift-Off Debonding Instrument and bracket removing pliers with shear-peel force through squeezing bracket wings can result in bond failure at the bracket-adhesive interface causing fewer enamel damages. On the other hand, ligature cutter which applies shear force at bracket base, How and Weingart pliers, by applying pressure force at the bracket base, are claimed to lead bond failure at the enamel-adhesive interface with more enamel damages such as cracks, fracture and splits which are irreversible.<sup>[24]</sup>

Rotary instruments were the method of choice for removing residual adhesive from enamel, used by 90.1%, and the most used instruments, as shown in Table 2, were tungsten carbide burs (24.6%) followed by low-speed tungsten carbide burs (24.2%). This finding is consistent with the results from a previous study<sup>[13]</sup> as 40.77% of the respondents were reported to use tungsten carbide burs at low speed for removing adhesive residue. Boncuk *et al.*<sup>[17]</sup> said that the use of tungsten carbide burs produces minimal damage to the enamel during the removal of adhesive residue. Also, Sigillio *et al.*<sup>[7]</sup> found that the longer time spent on removing remaining adhesive resin reduces the

roughness left on the enamel surface. Zachrisson and Artun<sup>[11]</sup> recommended using tungsten carbide burs at low speed claiming that it produces a fine scratch pattern with less enamel damage. In contrast, most enamel damages were reported to occur after the use of high-speed tungsten carbide burs or ultrasonic scalers.<sup>[10]</sup> Ultra-fine diamond burs were reported to be efficient in the removal of composite remnants, yet it was also reported to produce the roughest finished enamel surface which could be the reason behind its minimal use, 3.2% in the present study.<sup>[25]</sup>

When it came to the methods of polishing the enamel after debonding, results shown in Table 3, prophylaxis paste (31.7%) was the most commonly used method among respondents, followed by rubber cup (25.8%). Plenty of combinations between different instruments and methods were reported, whereas few orthodontists (4%), did not perform any polishing of the enamel and believe that it is sufficient to only refer the patient to the hygienist. Scarring of the enamel surface after the debonding procedure is inevitable, but it can be minimized by choosing the right protocol. Further studies are required where finishing techniques can be evaluated in the clinical setting.<sup>[26]</sup> A total of 60.7% of the respondents found enamel esthetic changes between treated and untreated teeth; on the other hand, 39.3% did not see this change. During adhesive removal, two aspects of enamel damage should be put into consideration: first enamel loss from etching, grinding during finishing, and the followed polishing, second is increased enamel roughness by scratching.<sup>[9]</sup>

Direct comparison with the study from which the survey has been adapted<sup>[13]</sup> was made along with the results of the present study. The use of the same questionnaire adds to the validity of the questions asked. The findings of Sfondrini *et al.*<sup>[13]</sup> were as quoted "This survey showed the high variability of different methods for bracket debonding, adhesive removal and tooth polishing. The collected answers indicate that most orthodontists have developed their armamentarium of debonding and polishing, basing their method on trials and errors". There are some questions regarding the attitude of debonding between the Italian Orthodontic Society and the Arab Orthodontic that were answered similarly at times. The same cause was investigated in two different contents, and we arrived at a slightly different conclusion.

This study can be considered the first step in the advancement of knowledge of different orthodontic brackets debonding techniques used in the Arab region. We hope that it will help in creating the foundation for understanding the research problem and establishing clear guidelines to minimize damages to the enamel after bracket debonding.

## Limitations

The limitations in this investigation include the low response rate; also, most of the samples are members of the Saudi Orthodontic Society, but unfortunately, the other Arab societies included had a lower response. Although the response rate was lower than expected, consultants with longer experience composed most of the sample which is a point of strength. Future studies should explore additional samples to advance the present study's findings.

## Conclusion

This study has drawn the picture of the current debonding, finishing and polishing techniques used in the Arab region. The findings of our present study revealed that the majority of Arab orthodontists had similar approach regarding the orthodontic brackets debonding techniques with some variability, although there was a lack of clear guidelines supporting their used methods. Furthermore, this data is aiming to help in establishing a future clear protocol in respect of brackets de-bonding techniques.

## Competing Interests

The authors declare that they have no competing interests. All the listed authors contributed significantly to the conception and design of study, acquisition, analysis, and interpretation of data and drafting of the manuscript, to justify authorship.

## Acknowledgements

We would like to express our gratitude and appreciation to Mr. Nassr Al.Maflehi (Bio-Statistician) for his valuable contribution into the data analysis. His willingness to give his time so generously has been very much appreciated

## References

- Karansish M. Relevance of Micro-leakage to Orthodontic Bonding - a Review. *J Dent Biomater.* 2016;3:254-260.
- Faria-Júnior ÉM, Guiraldo RD, Berger SB, Correr AB, Correr-Sobrinho L, Contreras EFR, et al. *In vivo* evaluation of the surface roughness and morphology of enamel after bracket removal and polishing by different techniques. *Am J Orthod Dentofacial Orthop.* 2015;147:324-329.
- Piccoli L, Migliau G, Besharat LK, Di Carlo S, Pompa G, Di Giorgio R. Comparison of two different debonding techniques in orthodontic treatment. *Annali di Stomatologia.* 2017;8:71-78.
- Cochrane NJ, Lo TWG, Adams GG, Schneider PM. Quantitative analysis of enamel on debonded orthodontic brackets. *Am J Orthod Dentofacial Orthop.* 2017;152:312-319.
- LEE Haewon. Effect of various residual adhesive removal methods on enamel surface after bracket debonding: a Systematic Review: Institutional Repository of Lithuanian University of Health Sciences; 2018.
- Fan XC, Chen L, Huang XF. Effects of various debonding and adhesive clearance methods on enamel surface: an in vitro study. *BMC oral health.* 2017;17:58.
- Sigiliao LC, Marquezan M, Elias CN, Ruellas AC, Sant'Anna EF. Efficiency of different protocols for enamel clean-up after bracket debonding: an in vitro study. *Dental Press J Orthod.* 2015;20:78-85.
- Herion DT, Ferracane JL, Covell DA, Jr. Porcelain surface alterations and refinishing after use of two orthodontic bonding methods. *Angle orthodon.* 2010;80:167-174.
- Janiszewska-Olszowska J, Tandecka K, Szatkiewicz T, Stepień P, Sporniak-Tutak K, Grocholewicz K. Three-dimensional analysis of enamel surface alteration resulting from orthodontic clean-up -comparison of three different tools. *BMC oral health.* 2015;15:146.
- Albuquerque GD, Vedovello Filho M, Lucato AS, Boeck EM, Degan V, Kuramae M. Evaluation of enamel roughness after ceramic bracket debonding and clean-up with different methods. *Braz J Oral Sci.* 2015;9:4.
- Zachrisson. *Orthodontics: current principles and techniques.* Vanarsdall RL GT, editor: Mosby; 1994.
- Ahangar Atashi MH, Sadr Haghighi AH, Nastarin P, Ahangar Atashi S. Variations in enamel damage after debonding of two different bracket base designs: An in vitro study. *J Dent Res Dent Clin Dent Prospects.* 2018;12:56-62.
- Sfondrini MF, Scribante A, Fraticelli D, Roncallo S, Gandini P. Epidemiological survey of different clinical techniques of orthodontic bracket debonding and enamel polishing. *J Orthod Sci.* 2015;4:123-127.
- Choudhary G, Gill V, Reddy YN, Sanadhya S, Aapaliya P, Sharma N. Comparison of the Debonding Characteristics of Conventional and New Debonding Instrument used for Ceramic, Composite and Metallic Brackets - An Invitro Study. *Journal of clinical and diagnostic research: JCDR.* 2014;8:ZC53-ZC55.
- Palmer J. MT, Tabbaa S., Al-Jewair T. Analysis of enamel surface roughness after different adhesive removal techniques for orthodontic bracket debonding. *Lasers in Dental Science.* 2018;2:95-101.
- Salomao FM, Rocha RS, Franco LM, Sundfeld RH, Bresciani E, Fagundes TC. Auxiliary UV light devices for removal of fluorescent resin residues after bracket debonding. *J Esthet Restor Dent.* 2019;31:58-63.
- Boncuk Y, Cehreli ZC, Polat-Ozsoy O. Effects of different orthodontic adhesives and resin removal techniques on enamel color alteration. *Angle Orthod.* 2014;84:634-641.
- Karan S, Kircelli BH, Tasdelen B. Enamel surface roughness after debonding. *Angle Orthod.* 2010;80:1081-1088.
- Ruiz JL, Finger WJ, Sasazaki H, Komatsu M. Removal of Invisalign retention attachments: a new minimally invasive method. *Compend Contin Educ Dent.* 2009;30:634-636.
- Naini FB, Gill DS. Tooth fracture associated with debonding a metal orthodontic bracket: a case report. *World J Orthod.* 2008;9:e32-e36.
- Celikel ADG, Ekmekcioglu H, Kulekci G, Firatli S. Evaluation of the Compliance of Orthodontists to Infection Control Procedures in Turkey. *Turk J Orthod.* 2018;31:37-49.
- Campbell PM. Enamel surfaces after orthodontic bracket debonding. *The Angle orthod.* 1995;65:103-10.
- Oh KT, Choo SU, Kim KM, Kim KN. A stainless steel bracket for orthodontic application. *Eur J Orthod.* 2005;27:237-244.
- Salehi P, Pakshir H, Naseri N, Baherimoghaddam T. The effects of composite resin types and debonding pliers on the amount of adhesive remnants and enamel damages: a stereomicroscopic evaluation. *J Dent Res Dent Clin Dent Prospects.* 2013;7:199-205.
- Hong YH, Lew KK. Quantitative and qualitative assessment of enamel surface following five composite removal methods after bracket debonding. *Eur J Orthod.* 1995;17:121-128.
- Ulusoy C. Comparison of finishing and polishing systems for residual resin removal after debonding. *J Appl Oral Sci.* 2009;17:209-215.