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Effect of Different Mobile Reminder on Bracket Failure Rates in Adolescent Orthodontic Patients: A Comparative Study

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Research Article

History

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ABSTRACT

Objective: The objective of this study was to examine the effectiveness of different types of mobile reminders in reducing bracket failure.

Materials and Methods: The study included 58 patients who received treatment at the Department of Orthodontics, Faculty of Dentistry, Afyonkarahisar Health Science University. Participants were randomly assigned to three groups: the text message group (n=19), the video message group (n=19), and the control group (n=20). The age range of the participants was 13 to 17 years, with a mean age of 13.2 ± 2.0 years. The sample consisted of 30 females (51.8%) and 28 males (48.2%). Following the bonding session, patients in the study groups received text or video/photo messages twice a week via the WhatsApp application, on Mondays and Thursdays. The number of bracket failures was recorded during sessions at T0 (6th week), T1 (12th week), and T2 (18th week). The collected data were analyzed using the Kruskal-Wallis and Friedman tests for intra- and intergroup comparisons.

Results: No significant differences were observed in the number of bracket failures among patients in the text message, video/photo message, and control groups at T0 (p = 0.400), T1 (p = 0.755), and T2 (p = 0.662). However, statistically significant differences were found in the intra-group comparisons between the text message group and the control group (p = 0.023 and p = 0.044, respectively), whereas no significant difference was observed in the video message group (p = 0.146).

Conclusion: Mobile reminders, regardless of their type, were found to be ineffective in reducing bracket failure.

Keywords: Mobile reminders, bracket failure, fixed orthodontic treatment, Whatsapp.

Ergen Ortodontik Hastalarda Farklı Mobil Hatırlatıcıların Braket Başarısızlık Oranlarına Etkisi: Karşılaştırmalı Bir Çalışma

Araştırma Makalesi

Süreç

Geliş: 31/12/2024
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ÖZ

Amaç: Bu çalışmanın amacı, çeşitli mobil hatırlatıcı türlerinin kopan braket sayısını azaltmada etkili olup olmadığını araştırmaktır.

Gereç ve Yöntem: Çalışmaya Afyonkarahisar Sağlık Bilimleri Üniversitesi Diş Hekimliği Fakültesi Ortodonti Anabilim Dalı'nda tedavi gören 58 hasta dahil edildi. Hastalar rastgele üç gruba ayrıldı: kısa mesaj grubu (n=19), video mesaj grubu (n=19) ve kontrol grubu (n=20). Katılımcıların yaşları 13 ila 17 arasında değişiyordu ve yaş ortalaması 13.2 ± 2.0 yıldı. Bireylerin cinsiyet dağılımı ise 30'u kadın (%51.8), 28'i erkek (%48.2) idi. Bağlanma seansının ardından çalışma grubu hastalarına Pazartesi ve Perşembe günleri olmak üzere haftada iki kez WhatsApp uygulaması üzerinden kısa mesaj veya video/fotoğraflı mesaj gönderildi. Kopan braket sayıları T0 (6. hafta), T1 (12. hafta) ve T2 (18. hafta) seanslarında kaydedildi. Elde edilen veriler gruplar içi ve gruplar arası Kruskal-Wallis ve Friedman testleri kullanılarak karşılaştırıldı.

Bulgular: T0 (p = 0.400), T1 (p = 0.755) ve T2 (p = 0.662)zaman diliminde kısa mesaj, video/fotoğraf mesajı ve kontrol grubundaki hastalar arasında braket başarısızlığı sayısında anlamlı fark bulunmadı. . Kısa mesaj grubu ve kontrol grubu hastalarının grup içi karşılaştırmasında istatistiksel olarak anlamlı fark bulunurken (sırasıyla p=0.023, p=0.044), video mesaj grubunda istatistiksel olarak anlamlı fark yoktu (p=0.146) .

Sonuç: Mobil hatırlatıcılar türünden bağımsız olarak kopan braket sayısını azaltmada etkisizdi.

Anahtar Kelimeler: Mobil hatırlatıcılar, braket başarısızlığı, sabit ortodontik tedavi, Whatsapp.

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Introduction

Patient cooperation plays a crucial role in orthodontic treatment.[1] Patients are instructed to maintain oral hygiene, adhere to dietary restrictions, and consistently use their elastics. A positive correlation exists between patient compliance, treatment duration, and treatment success.[2] Cooperation is influenced by various factors, including age, gender, severity of malocclusion, and type of appliance.[3,4] Cooperation is often lower among adolescent patients compared to adults.[5] However, orthodontic treatment is frequently sought by individuals during adolescence. One of the key responsibilities of orthodontists is to enhance and sustain motivation, particularly among adolescent patients. Therefore, can mobile reminders assist orthodontists in achieving this goal?

In recent years, mobile reminders have been increasingly utilized in medicine and dentistry to enhance or sustain patient cooperation.[6,7] Some researchers suggest that sending reminder messages to patients at regular intervals via mobile applications, such as WhatsApp, improves patient compliance.[8] However, other researchers contend that mobile reminders are ineffective.[9]

Mobile reminders are categorized into various types, including video, text, and image messages. However, previous studies have primarily focused on the impact of text messages on patient cooperation.[10] Only one study has investigated the effect of video reminders on patient compliance, specifically in the use of Class II elastics.[11] This raises the question: Can the type of mobile reminder influence patient motivation? In other words, are video and text messages equally effective in enhancing or sustaining patient compliance?

Bracket failure is a common occurrence during orthodontic treatment and is often linked to insufficient patient cooperation. It is influenced by various factors, including the quality of materials, the steps involved in the bonding procedure, the type of malocclusion, and patient-related factors such as oral hygiene practices and adherence to treatment protocols.[12,13] Studies have demonstrated that these factors significantly contribute to the occurrence of bracket failure, underscoring the importance of understanding patient behavior and treatment adherence in minimizing such issues.[14] However, bracket failure frequently occurs when patients fail to adhere to the dietary instructions provided by their orthodontist and consume hard foods. A key question that arises is whether patients' behavior and compliance with treatment guidelines can be enhanced through mobile active reminders. In other words, could the frequency of bracket failures be reduced if patients are reminded more regularly about dietary restrictions?

The aim of the current study was to comparatively evaluate the effectiveness of different types of mobile reminders in reducing bracket failure among adolescent orthodontic patients.

Materials and Methods

The research protocol for this study was approved by the Clinical Research Ethics Committee of Afyonkarahisar Health Science University (ID: 2022/29). Participants were selected from orthodontic patients undergoing treatment at the Department of Orthodontics, Faculty of Dentistry, Afyonkarahisar Health Science University. Sample size calculation was performed using GPower 3.1 software. The calculation (alpha = 0.05, effect size = 0.709, 1-B = power 0.80) indicated that at least 18 individuals were required in each subgroup. Informed consent forms were obtained from both the patients and their legal guardians. Sixty patients who had recently started fixed orthodontic treatment were randomly assigned to three groups: text, video, and control. One patient from the text group and one from the video group were excluded due to irregular attendance at their appointments. The same bonding materials were used, following a standardized procedure conducted by the orthodontist. Participants' ages ranged from 13 to 17 years, with a mean age of 13.2 ± 2.0 years. The gender distribution included 30 (51.8%) women and 28 (48.2%) men. Text messages or video/photo messages were sent to the patients via WhatsApp twice a week, on Mondays and Thursdays.

The contents of the messages sent to the Text group (n = 19) were as follows:

- This message serves as a reminder that your brackets may break if you consume hard foods. It is important to exercise self-control for a short period, and soon you'll be able to enjoy all your favorite foods☺
- Adhering to dietary guidelines is essential. By preventing bracket breakage, your treatment will progress smoothly, ultimately leading to a beautiful smile.
- Now is the time to be particularly mindful of your diet to achieve optimal results. Your treatment is progressing excellently.
- The success of your treatment depends on your commitment. We believe in you. Let's revisit the dietary guidelines while eating.
- Consistency is key to the success of your treatment. Avoiding hard foods is crucial. You will be able to enjoy them once your treatment is complete.
- It is essential to avoid hard foods. The success of your treatment relies on your commitment.
- Bracket breakages can prolong your treatment. Be patient a little longer, and soon you'll be able to enjoy any food you desire once your braces are removed☺

Video/Photo Group (n = 19): The videos sent to members of this group regarding bracket removal were as follows: Video 1: https://youtu.be/-W0r8ya3qNU, Video 2: https://youtu.be/FD_NeF-gWEU. In addition to the videos, final smile simulation photographs were sent using the Invisalign company's SmileView website (Figure 1). This photo message was included with the expectation that allowing patients to visualize potential final smile outcomes would enhance their cooperation and commitment to the treatment.

Control Group (n = 20): No messages were sent to members of this group.

The number of bracket failures for each patient group at T0 (6th week), T1 (12th week), and T2 (18th week) was recorded.

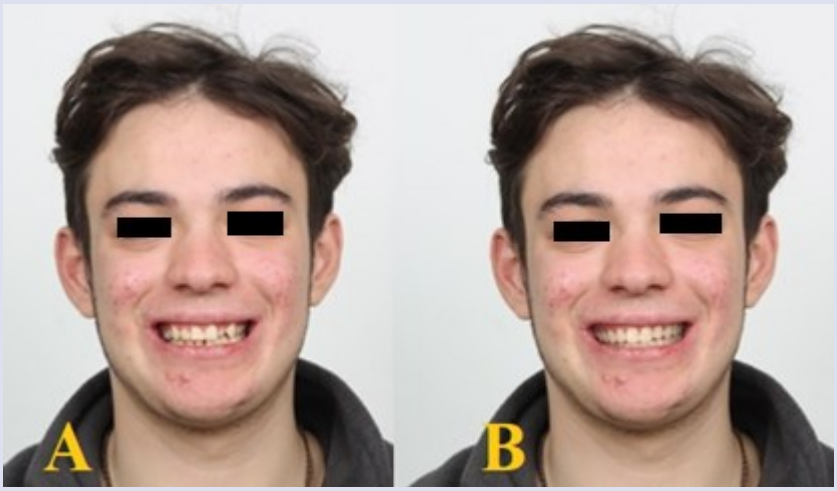

Figure 1. Smile simulation images created using Invisalign's SmileView technology: A. Pre-simulation; B. Post-simulation

Table 1. Comparison of bracket failure numbers between and within groups

	T0		T1		T2			
Groups	**Mean. ± Sd.**	**Median (Min. - Max.)**	**Mean. ± Sd.**	**Median (Min. - Max.)**	**Mean. ± Sd.**	**Median (Min. - Max.)**	**p**	**Difference between groups**
Text	.42 ± .61	.00 (0 - 2)[a]	1.16 ±1.61	1.00 (0 - 7)[b]	.32 ± .67	.00 (0 - 2)[c]	.023[e]	c<b
Video	.39 ± .85	.00 (0 - 3)	.94 ± 1.16	1.00 (0 - 4)	.61 ±1.04	.00 (0 - 3)	.146[e]	-
Control	.26 ± .73	.00 (0 - 3)	.84 ± 1.17	.00 (0 - 4)	.42 ± .84	.00 (0 - 3)	.044[e]	-
P	.400[d]		.755[d]		.662[d]			

[a]T0= 6th week, [b]T1=12th week, [c]T2=18th week
[d] Kruskal Wallis Analysis, significance level= p<0.05
[e]Friedman test, significance level= p<0.017
Sd: Standart deviation, Min: minimum, Max: maximum

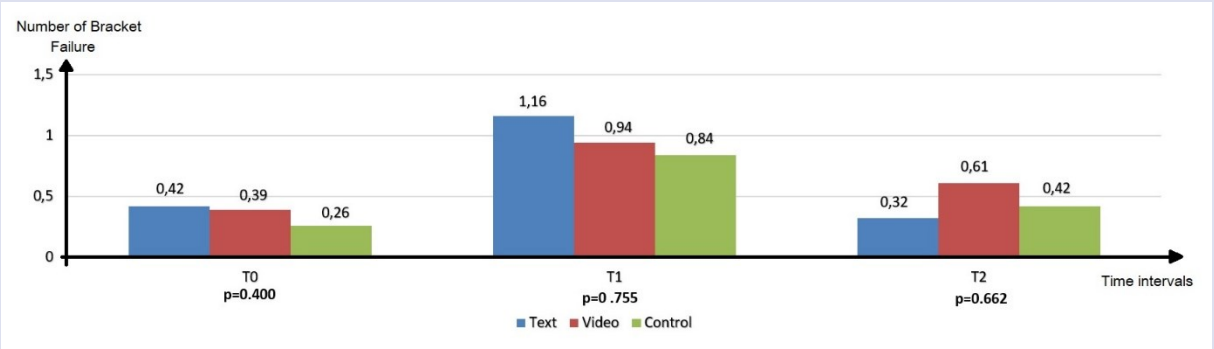

Figure 2. Graph illustrating the results of the intergroup comparison

Statistical analysis

The Kolmogorov-Smirnov test was used to assess the normality of the variables, and the mean, standard deviation, median, minimum, and maximum values were calculated. The Kruskal-Wallis test was employed for inter-group comparisons. For comparisons of data obtained at the T0-T1, T1-T2, and T0-T2 time intervals, which showed a normal distribution within the group, either one-way repeated measures ANOVA or the Friedman test was used for repeated measures. In the case of significant differences, multiple comparisons with Bonferroni correction were applied. The significance level was set at $p<0.017$ for Bonferroni-corrected multiple testing, and $p<0.05$ was considered significant for all other analyses. All statistical analyses were performed using IBM SPSS 25 software.

Results

In the intragroup comparison, no statistically significant differences were found among the groups at T0 ($p = 0.400$), T1 ($p = 0.755$), and T2 ($p = 0.662$) across all three time points (Table 1, Figure 2).

However, a significant difference in the number of bracket failures was observed in the text message group (p = 0.023). To further investigate this, multiple comparison analyses with Bonferroni correction were conducted to determine which time points contributed to this difference:

- No significant difference was found between T0 and T1 (p = 0.073).
- No significant difference was found between T0 and T2 (p = 0.713).
- A significant difference was found between T1 and T2 (p = 0.013).

In contrast, no significant difference was found in the video/photo message group (p = 0.146).

A statistically significant difference was observed in the intragroup comparison of the number of bracket failures in the control group (p = 0.044). The Bonferroni-corrected multiple comparison analysis revealed the following:

- A significant difference was found between T0 and T1 (p = 0.031).
- No significant difference was found between T0 and T2 (p = 0.546).
- No significant difference was found between T1 and T2 (p = 0.235).

Discussion

Patient cooperation is a critical factor in the success of orthodontic treatment, directly influencing patient motivation. High levels of patient compliance can significantly reduce bracket failure, a common issue in orthodontic practice, thereby preventing treatment time extensions.[9,15] Systematic reviews indicate that the incidence of bracket failure increases with factors such as higher overbite, adolescent age, lower arch position, posterior teeth, and the use of nickel-titanium wires.[16] In a study by *Barbosa et al.*[17], a correlation was reported between patient age, gender, level of cooperation, and the patient's motivation to seek treatment and bracket failure. Other studies also report an inverse relationship between patient cooperation and the incidence of bracket failure.[15,18] According to Julian Rotter's theory of "locus of control," individuals attribute events either to their own behavior (internal control), the influence of others (external control), or chance (chance control).[19] Children, who often begin orthodontic treatment at the insistence of their families (indicating an external locus of control), may also demonstrate lower treatment motivation. Motivational messages are expected to be more effective for individuals with an internal locus of control.[20,21]

In the present study, no significant difference was found between the groups regarding the effectiveness of motivational mobile reminders in increasing patient cooperation and reducing bracket failure. One possible explanation for this result could be the patients' locus of control. Given that the average age of the participants was 13.2 ± 2.0 years, it is likely that most of them started treatment under the guidance of their families, which suggests an external locus of control orientation toward treatment.

Some researchers have suggested that video content may be more effective than text messages.[22] However, in this study, no statistically significant difference was observed between the control, video, and text message groups. When examining intra-group comparisons, a significant decrease in the incidence of bracket failure was observed in the T1-T2 time interval within the text message group. However, no significant difference was found in the video/photo group between different time periods. One possible explanation for this could be that text messages are quicker and easier to consume than video content. Since watching videos requires more time, patients may not fully watch repetitive videos. Another potential explanation is the lack of guiding or suggestive text in the video content. The video messages sent to patients did not include written explanations; instead, they only described the situation, such as demonstrating how brackets could break if certain foods are consumed.

Upon reviewing the literature, it was observed that studies on mobile reminders primarily focused on oral hygiene and the use of Class II elastics in orthodontic patients. To the best of our knowledge, this study is the first to assess the impact of mobile reminders on bracket failure. Consequently, the findings of this study will be analyzed in comparison with existing research on mobile reminders aimed at motivating oral hygiene practices in orthodontic patients. Jassim et al.[23] asserted that smartphone reminders enhanced oral hygiene compliance among patients (18-22 years of age) undergoing fixed orthodontic treatment, serving both as reminders and motivators. On the other hand, Şenocak and Camcı found that mobile active reminders did not significantly improve oral hygiene in patients aged 12-20 receiving fixed orthodontic treatment; however, the reminders did motivate patients to use Class II elastics.[24] Similarly, Saxena and Gunjal suggested that WhatsApp reminders did not notably influence orthodontic patients' compliance with oral hygiene practices.[25] In contrast, Lima et al.[26], in their systematic review and meta-analysis, argued that mobile reminders could be an effective strategy for reducing plaque and gingival index scores, thereby improving bacterial plaque control in patients undergoing orthodontic treatment. However, Al-Moghrabi et al.[27], in their own systematic review and meta-analysis, concluded that mobile reminders provided low to moderate evidence in altering the behavior of orthodontic patients. The varying outcomes regarding the effectiveness of mobile active reminders on oral hygiene may be attributed to differences in the type, content, and frequency of reminders. Furthermore, factors such as the specific type of smartphone application used, as well as the age range and gender of the patients involved, are crucial elements that may influence the level of patient motivation.[28,29]

The current study had several limitations: the use of the same bonding system by six different orthodontists, no restrictions on malocclusion type, uncertainty regarding whether participants watched the video messages in their entirety, and the potential influence of different orthodontists performing routine treatments on patient cooperation.

Conclusions

Mobile reminders, regardless of type, were ineffective in reducing bracket failure. However, further research is necessary to assess the generalizability of these findings.

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