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Evaluating the Influence of Reminder Text Messages to Wear the Removable Retainers in Orthodontic Patients- A Randomized Prospective Study

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Authors' contributions

This work was carried out in collaboration among all authorsAll authors read and approved the final manuscript.

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ABSTRACT

This study was conducted to evaluate the influence and cooperation of Orthodontic patients to wear removable retainer by sending reminder text messages. 54 orthodontic patients (24 males and 30 females) aged between 18 to 25 year were enrolled for the study. Patients were randomly divided into two groups: an Experimental group (27 patients) who received timely reminder text messages and a Control group (27 patients) who did not receive any messages. Text Messages were sent thrice a week for a period of 6 months. Two measurements were calculated on plaster models i.e. Inter canine width and extraction spaces at three time intervals during the observation period. The plaster models were made at the time of insertion of retainer (T0) after 3 month of wearing the

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retainer (T2) and then after 6 months (T3). A statistically significant differences were observed in the intra- and intergroup comparisons. Group 1(Control) showed increase in both inter canine width and extraction spaces. Whereas Group 2 showed non-significant differences for both parameters. It was concluded from the results that reminder text messages had a positive influence on patient compliance regarding wearing the removable retainer after completion of fixed orthodontic treatment.

Keywords: Cooperation; compliance; retainer; text message.

1. BACKGROUND

Retention is one of the essential and controversial phase in clinical orthodontic treatment. Post treatment stability during Orthodontic treatment has been a challenge and an issue of great concern for all the orthodontist [1]. As defined by Riedel [2], retention is "the holding of teeth in ideal aesthetic and functional position. It is done in context to maintain the results for the long time achieved at the end of the fixed orthodontic mechanotherapy. This time period is necessary as it is a well-known fact that after active orthodontic therapy, additional time is required for reorganization of periodontal and gingival fibres; nevertheless, the aetiology of orthodontic relapse still remains unclear and controversial [1].

Clinical experience has shown over the years that retention can be achieved with the use of various removable and fixed retainers. To maintain and complete the retention phase, orthodontist has to depend on their patients compliance for the best end results of the treatment. In order to improve patient compliance, Orthodontists over a period of time have adopted various methods such as patient education, verbal praise, positive and negative reinforcement, charts, and rewards [3]. The reminder or instructions can be given to patients pertain to oral hygiene, maintenance of appliance to allow them to function properly, the use of elastics or headgear appliance, and punctuality in keeping appointments. When patients do not follow instructions, it compromised the treatment outcomes as well an increased time commitment may result for the patients, parent and the orthodontist [4].

Currently, there are 5.15 billion unique mobile phone users in the world [5]. In today's world, mobile communication systems have become one of the most important areas in the field of telecommunications and it is expected that within the next decade a considerable portion of our activities will become partially or completely wireless [6,7]. First time, Short Message Service (SMS), was created during the late 1980s to work with a digital technology called GSM (global system for mobile communications), which is the basis for most modern cell phones [8]. Nowadays, mobile phones became a necessity for everyone which can be used for various purposes in day to day life.

Even healthcare sector is also not untouched by the use of this technology. Different reminder such as appointment reminder, medicine reminders can be sent by mobile phone or even by various types of software [9].

Text messaging, has now became the primary mode of communication for adolescents and adults, providing a means of increasing compliance. Sending reminder text messages, firstly keep the patient aware throughout the treatment, that they are the part of study which can influence them to follow the instructions properly, given to them. Secondly, it gives an impression of extra attention and care given to them which also helps in building their trust in treatment as well in their Orthodontist.

Many studies concluded that text messages reminder system (SMS) helped to cause a positive change in behaviour in individuals for smoking cessation therapy, diabetes self-management, anti-obesity behaviour modification, asthma self-management, hypertension medication compliance [8,10] and even in maintaining Oral Hygiene [11,12] and wearing intra oral elastics [3] but the compliance of patient on wearing removable retainer is the area which need to be researched more. Thus the aim of this research was to assess the patient compliance through reminder text messages (SMS) by evaluating any change in orthodontic stability during retention phase.

2. MATERIALS AND METHODS

This randomized prospective study were comprised of 54 orthodontic patients (24 males

and 30 females) aged between 18 and 25 years. All these patients were treated with fixed mechanotherapy to correct the malocclusion, after thorough clinical evaluation and on the basis of diagnosis. After the completion of Fixed orthodontic treatment, total 80 patients were assessed for the study out of which only 54 patients were selected on the basis of inclusion criteria (Fig. 1). The inclusion criteria for the enrolment of patients was:

Patients who have completed their fixed orthodontic treatment
Patients treated with upper first premolar extraction
Patients having mobile phones
Exclusion criteria: Patients having dentoskeletal deformity or periodontal problems

All the patients were notified that they would receive three text messages in a week for the duration of the study. They were also made aware that their participation was voluntary and that they could freely withdraw at any time.

The patients were randomly and equally divided into two groups (Fig. 1): Control (Group1) and Experimental group (Group 2). Control group consisted of 27 patients (15 females & 12 males), Experimental group consisted of 27 patients (15 females & 12 males).

All these patients were treated with conventional fixed orthodontic appliance with Stainless Steel 0.018" slot MBT prescription. After completion of active phase i.e. after removal of brackets, for the retention purpose the Begg's retainer were fabricated and given to them. Begg's retainer is mainly used in extraction cases. As it does not contain any cross over wire so chances of opening of extraction spaces is very less until and unless patient wear it full time.

In the post-insertion instructions of the removable retainer all the patients were asked to wear the retainer full time even while sleeping except during eating or drinking. It was also instructed to them about the cleaning and storage of retainers and were asked to visit regularly for the follow up visits throughout the observation period. All the patients was registered with their names and phone numbers in database. The experimental group patients received simple reminder text messages (SMS) thrice in a week i.e. Monday, Wednesday and Friday morning whereas control group did not received any reminder SMS or calls or any other type of interaction.

The plaster models were obtained for measurements from patients of both experimental and control group (T0-Baseline) at the time of delivering removable Begg's retainer, (T1) after 3 months of wearing the retainer (T2) after 6 months of wearing the retainer. Patients in both the groups were scheduled for follow-up visits with the same frequency i.e. at 1 month interval.

After sending the text messages for period of 6 months, the plaster models were analysed and measurements were done by Digital Vernier calliper. Dental casts were measured to the nearest 0.01 mm with a digital calliper. All the models were blinded to ensure the anonymity and impartiality of the researcher during analysis.

Two parameters [13] were used in this study to check the occurrence of relapse. It was checked by means of calculating the following measurements for each set of casts. All measurements were linear.

1. Canine-canine width: distance between the crown tips of the right and left canines.
2. Opening of extraction spaces- it is a distance between distal contact point of canine to mesial contact point of second premolar.

The relapse was calculated by subtracting the value of T1 from T0 and T2 from T1. A positive value indicated increase in inter canine width and opening of extraction spaces whereas a negative value showed decrease in width and closure of extraction space and if there was no difference that showed no change in the canine width or in extraction space [14].

2.1 Statistical Analysis

An intra examiner evaluation was performed to check the error. 30 models out of complete sample were randomly selected and measurements were repeated after 15 days. The systematic error was examined using a t-test with a significance level of 5% ($P < 0.05$). The casual error was calculated using the Dahlberg formula. The data were tabulated and statistically analysed using SPSS statistical software, version 19, USA. Based on the mean standard deviation obtained from the two groups, the sample size of 27 participants in each group demonstrated a power of 80% to discriminate a minimum difference of 0.35 mm between the two groups. Intra-group and inter-groups differences at different time-points (T0–T1, T1–T2) were, respectively, assessed by Friedman's test (P-value≤0.05) and Mann-Whitney test.

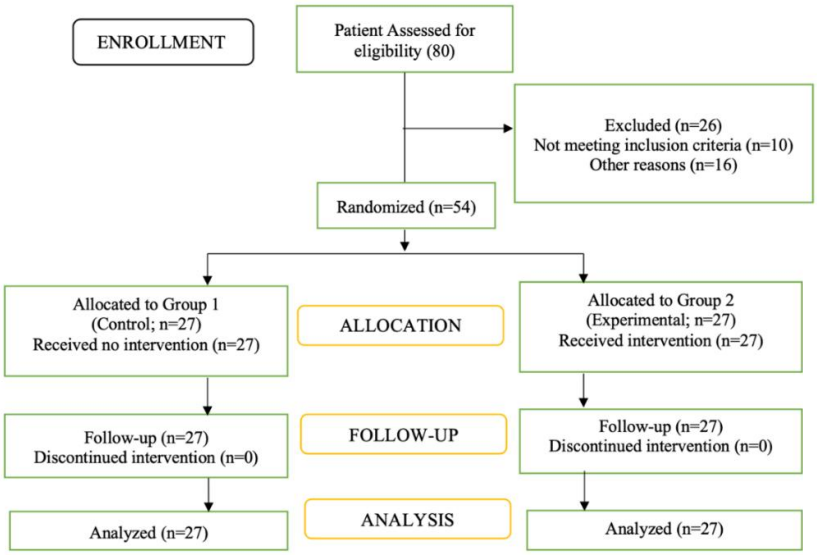

Fig. 1. Showing Patient Allocation

3. RESULTS

Table 1 shows Intra group differences in Inter canine width. In Group 1, a statistically significant difference was observed from T0 to T1 and from T1 to T2 whereas statistically non-significant difference was observed from T0 to T1 and from T1 to T2 in Group 2.

Table 2 shows Intra group differences in Extraction spaces, statistically significant difference was observed from T0 to T1 and from T1 to T2 in Group 1whereas statistically non-significant difference was observed from T0 to T1 and from T1 to T2 in Group 2.

Table 3 shows Inter group differences for Inter canine width and Extraction spaces. A statistically significant ($p<=5$) difference was observed at all time intervals in both Inter canine width and Extraction spaces in Group 1 and statistically non-significant difference was observed in Group 2 for both parameters.

Table 4 shows a cumulative difference in an Inter canine width and Extraction spaces from T0 to T2. In Group 1, the Inter canine width was found to be 0.279 mm and in Group 2 it was 0.036mm. As both groups showed a positive values thus it indicates an increase in Inter canine width. Likewise for Extraction space, 0.287mm difference was found to be in Group 1 whereas 0.105 in Group 2. As both groups showed a positive values thus it indicated an increase (opening) of extraction space.

Table 1. Intragroup differences in Inter canine width

Group 1 (Control)	Significance	Group 2 (Experimental)	Significance
T0-T1	0.020*	T0-T1	0.18
T1-T2	0.031*	T1-T2	0.28

*Significance *p<0.05*

Table 2. Intragroup differences in Extraction spaces

Group 1 (Control)	Significance	Group 2 (Experimental)	Significance
T0-T1	0.001*	T0-T1	0.25
T1-T2	0.003*	T1-T2	0.33

*Significance *p<0.05*

Table 3. Intergroup differences in Inter canine width and Extraction spaces

	Time Interval	Group 1 (Control)	Group 2 (Experimental)	Significance
Inter canine	T0-T1	0.59	0.32	0.001*
Width	T1-T2	0.64	0.47	0.036*
Extraction	T0-T1	0.82	0.63	0.001*
Spaces	T1-T2	0.94	0.47	0.036*

*Significance *p<0.05*

Table 4. Mean (mm) and SD of Inter canine width decrease and Extraction space at different time interval

Time Interval	Inter canine width		Extraction Spaces	
	Group 1	Group 2	Group 1	Group 2
T0-T1	0.137 ± 0.025	0.016 ± 0.012	0.128 ± 0.020	0.012 ± 0.010
T1-T2	0.142 ± 0.100	0.020 ± 0.030	0.159 ± 0.249	0.093 ± 0.064

*Significance *p<0.05, SD-Standard Deviation*

4. DISCUSSION

Success of orthodontic treatments involving removable retainers, heavily relies on patient compliance or cooperation which is difficult to predict. This increases the risk of relapse over long-term. Several studies in the literature have addressed the issue of patient compliance and strategies to obtain the best engagement of patients [11,15,16,17,18,19].

In the last decades, many methods have been adapted for patient screening, patient education and to motivate patients, which nowadays are being further implemented through the use of social media, phone-apps, and content sharing [16,17,19,20].

Mobile phones have become the most accessible form of mediated communication in world history, and text messaging has become one of the most frequently used forms of mobile communication. As virtually, every cellular telephone has the ability to receive a text message [11]. Text messaging is potentially a game changing communication modality for the health researchers [21].

Hence, for reminding the patients, the mode of communication used in the present study was through reminder text messages. The reasons being that text messages are reasonable, they can be send easily, quick delivery, non-disturbing to patient and moreover they does not require any internet connection. Even to send or receive text messages one does not need any special application. It is in conjugation with the study conducted by Kerrison et al [22], according to them text messages are cheap, effective, easy to implement and apart from this can be used for screening and other clinic appointments or reminders. Another study which supports this reason is by Bowen et al [11], who also preferred text messages as a mode of communication and found it as a reasonable method of communication.

The power of the spoken word, or in this instance the written word, appears invaluable when it comes to serving as a means of communicating with patients. According to them, the use of texting can help in maintaining good communication with patients, which shows that the orthodontist is still involved and concerned about the patient's well-being between follow-up appointment spans. This has been shown to be important in influencing patient satisfaction and promoting orthodontist-patient relationship [23].

In contrast to this, study conducted by Zotti et al [24] found the use of WhatsApp messages and other social media platforms as the best way of communication and sending reminders.

In the present study, the parameters taken was Inter canine width and extraction spaces for the evaluation of orthodontic stability, although a number of other parameters being described in the literature [25,26,27,28]. Both parameters were evaluated at the time difference of three months i.e. in total three times throughout the study. Any change during this period from Baseline was considered as relapse for every time interval.

The study Group 2 (Experimental) showed overall better results than the Group 1 (Control) for both parameters. A statistically significant changes was observed in inter canine width and extraction spaces in Group 1. Considerable

increase in inter canine width and in extraction spaces (opening) was observed in this Group 1which indicates the occurrence of relapse. The probable reason could be because patients did not follow the instructions given and did not wear retainers for prescribed time due to lack of motivation. It is in accordance to the study conducted by Zotti et al [24], Olive & Basford,[25] Josell [26] who found more relapse immediately after the removal of appliance. It is also in accordance to the study done by Mattew et al [17] who observed that due to lack of communication control group forgot about the study participation, allowing for a decline in their compliance.

Whereas statistically non-significant changes was observed in inter canine width and extraction spaces in Group 2 which indicates a higher compliance in wearing a retainer immediately after braces removal and after that throughout the observation period. It is in accordance to the study done by Ackerman & Thornton [16], Schott et al [29]. In literature, numerous studies was present on reminder text messages but in reference to maintenance of Oral hygiene and to wear intra-oral elastics. The findings of all these studies [3,7,8,11,12] suggested higher patient compliance in reminder groups.

In overall comparison, Group 1 showed more relapse in extraction spaces (opening) by 0.287 mm and a cumulative increase in Inter canine width by 0.279mm, whereas Group 2 showed 0.036mm increase in inter canine width and 0.105 mm of opening of extraction space. Some amount of relapse was observed in Group 2 as structures around the teeth have natural tendency to relapse a little after fixed orthodontic treatment for stabilisation. Although the results of Group 2 showed statistically non-significant differences still these observations should be correlated clinically for more clear picture.

5. CONCLUSION

The present research documents the higher compliance rate in experimental group who were reminded weekly through text messages to wear the removable retainers. This group showed low degree of change in inter canine width and extraction spaces, thus lower relapse rate. Initially, direct text messaging was used for sending the reminder for appointments, to maintain oral hygiene and for elastic wear but now it can also be used as one of the best way to remind patients about wearing of removable retainers. Nowadays, even many communication companies provides text message automated-reminder services and web-based text messages program either charged or free of charge. Thus, it can be concluded that text message is the novel way to reach many patients with very little administrative time.

CONSENT

The written consent was taken from all the patients before enrolling them in this study.

ETHICAL APPROVAL

The study was approved by Institutional Ethical Committee with Reference No.1258/2020.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Sharma N, Miglani A, Nanda M, Sonawane N, Abraham SA. Importance of retention and relapse in orthodontics- A Review. TMU J Dent. 2019;6(1):8-11.
2. Riedel RA. In: Graber TM, Swain BF. Current orthodontic concepts and techniques. Philadelphia: WB Saunders Co. 1969:875-918.
3. Vasim Pinchani, Ajit Kalia, Gaurav Gupta and Nasim Mirdehghan. Does Text Message Reminder Help Orthodontic Patients to Wear Intra- Oral Elastics During the Treatment? J Dent Oro Surg. 1(1):1- 5.
4. David D, Richter, Ram S, Nanda, Pramod K, Sinha, David W, Smith. Effect of behavior modification on patient compliance in orthodontics. Angle Orthod. 1998;68(2):123-132.
5. Available:www.gsmaintelligence.com
6. Feil PH, Grauer JS, Gadbury-Amyot CC, Kula K, McCunniff MD. Intentional use of the Hawthorne effect to improve oral hygiene compliance in orthodontic patients. J Dent Educ. 2002;66:1129-1135.
7. Roth J, Kula T, Claros A, Kula K. Effect of a Computer-Generated Telephone Reminder System on Appointment Attendance. Semin Orthod. 2004;10:190-193.

8. Hussein WI, Hasan K, Jaradat AA. Effectiveness of mobile phone short message service on diabetes mellitus management; the SMS-DM study. Diabetes Res Clin Pract. 2011;94:e24-26.
9. Zailinawati AH, Ng CJ, Nik-Sherina H. Why do patients with chronic illnesses fail to keep their appointments? A telephone interview. Asia Pac. J. Public Health. 2006;18:5-10.
10. Fjeldsoe BS, Marshall AL, Miller YD. Behavior change interventions delivered by mobile telephone short-message service. Am J Prev Med. 2009;36:165-173.
11. T. Brent Bowen, Daniel J, Rinchuse, Thomas Zullo, Mark E, De Maria. The influence of text messaging on oral hygiene effectiveness. Angle Orthod. 2015; 85(4):543-548.
12. Mike C, Ross, Phillip M, Campbell, Larry P, Tadlock, Reginald W, Taylor, Peter H, Buschang. Effect of automated messaging on oral hygiene in adolescent orthodontic patients: A randomized controlled trial. Angle Orthod. 2019;89(2):262-267.
13. Aslıhan Ertan Erdinc, Ram S. Nanda, Erdal Isiksal. Relapse of anterior crowding in patients treated with extraction and non extraction of premolars. Am J Orthod Dentofacial Orthop. 2006;129(6): 775-784.
14. Motamedi AK, Dadgar S, Teimouri F, Aslani F. Stability of changes in mandibular intermolar and intercuspid distances following ortho- dontic treatment. Dent Res J (Isfahan). 2015;12:71s–75s.
15. Wong P, Freer TJ. Patients' attitudes towards compliance with retainer wear. Aust Orthod J. 2005;21:45–53.
16. Ackerman MB, Thornton B. Posttreatment compliance with removable maxillary retention in a teenage population: A short-term randomized clinical trial. Orthodontics (Chic). 201;12:22–27.
17. Eppright M, Shroff B, Best AM, Barcoma E, Lindauer SJ. Influence of active reminders on oral hygiene compliance in orthodontic patients. Angle Orthod. 2014;84:208–213.
18. Zotti F, Dalessandri D, Salgarello S, et al. Usefulness of an app in improving oral hygiene compliance in adolescent orthodontic patients. Angle Orthod. 2016; 86:101–107.
19. Mas FG, Plass J, Kane WM, Papenfuss RL. Health education and multimedia learning: connecting theory and practice (Part 2). Health Promot Pract. 2003;4: 464–469.
20. Cozzani M, Ragazzini G, Delucchi A, et al. Oral hygiene compliance in orthodontic patients: a randomized controlled study on the effects of a post-treatment communication. Prog Orthod. 2016;17:41.
21. Scheerman JFM, van Meijel B, van Empelen P, et al. Study protocol of a randomized controlled trial to test the effect of a smartphone application on oral-health behavior and oral hygiene in adolescents with fixed orthodontic appliances. BMC Oral Health. 2018;18: 19.
22. Amanda K Hall, Heather Cole-Lewis, and Jay M. Bernhardt. Mobile Text Messaging for Health: A Systematic Review of Reviews. Annu Rev Public Health. 2015; 36:393–415
23. Kerrison, R S, Shukla, H, Cunningham, David, Oyebode, Oyinlola and Friedman, E. Text-message reminders increase uptake of routine breast screening appointments: A randomised controlled trial in a hard-to-reach population. British Journal of Cancer. 2015;112(6): 1005-1010.
24. Derks A, Kuijpers-Jagtman A, Frencken J, Van't Hof M, Katsarose C. Caries preventive measures used in ortho-dontic practices: An evidence-based decision? Am J Orthod Dentofacial Orthop. 2007; 132:165–170.
25. Francesca Zotti, Rinaldo Zotti, Massimo Albanese, Pier Francesco Nocini, Corrado Paganelli. Implementing post-orthodontic compliance among adolescents wearing removable retainers through Whatsapp: A pilot study. Dove Press Journal: Patient Preference and Adherence 2019; 13: 609–615.
26. Olive RJ, Basford KE. A longitudinal index study of orthodontic stability and relapse. Aust Orthod J. 2003;19: 47–55.
27. Josell SD. Tooth stabilization for orthodontic retention. Dent Clin North Am. 1999;43:151–165s.
28. Steinnes J, Johnsen G, Kerosuo H. Stability of orthodontic treatment outcome in relation to retention status: An 8-year follow-up. Am J Orthod Dentofac Orthop. 2017;151: 1027–1033.

29. Schott TC, Schlipf C, Glasl B, Schwarzer CL, Weber J, Ludwig B. Quantification of patient compliance with Hawley retainers and removable functional appliances during the retention phase. Am J Orthod Dentofacial Orthop. 2013;144: 533–540.

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