Does Text Message Reminder Help Orthodontic Patients to Wear Intra-Oral Elastics During the Treatment?

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Abstract

Objective: To determine if text messaging reminders regarding intra oral elastic wear have any influence on the level of compliance in an orthodontic population.

Materials & Methods: Eighty orthodontic patients were considered out of which 40 patients (20 Males & 20 Females) were assigned to a text message group (Study Group) & 40 patients (20 Males & 20 Females) were assigned to a Non-text message group (Control group), who did not receive a reminder text message. Message was sent once daily for a period of one month. The participants were given a fixed number of elastics (60 per patient) at the start of the study and were asked to collect used elastics for the period of one month and counts of these were used to assess compliance.

Results: Compliance with elastic wear had significant difference among patients. Female patients proved to be more compliant compared to males in both the groups. The study group returned more number of used elastics than the control group, suggesting increased compliance.

Conclusion: A text message reminder system explaining the importance of wearing intra-oral elastics sent to patients once daily is an effective way to improve compliance in orthodontic patients.

Keywords: Text Message Reminder; Intra-Oral Elastics; Orthodontic Population

Introduction

Amongst various orthodontic advances between the early 1800s and 1890, the major advancement was of elastics by Dr. Edward Maynard in 1843 [1]. He was the first dentist to use gum elastics as a technique to correct improper jaw relationships. An elastic material is connected to wiring in the mouth to slowly move the jaw until it is in proper alignment [2]. Elastics when hooked to the brackets, apply tensions in directions, which cannot be achieved with brackets and wires alone. They apply constant and steady pressure to align the teeth and guide them into proper occlusion.

The various reasons behind the success of orthodontic treatment include patient compliance with advice including diet, oral hygiene habits, maintenance of appliances, and adherence with adjuncts such as elastics. Pain or dysfunction, health awareness, stoic or sensitive, and self-confidence and self-assurance characteristics had some significant correlations with compliance. When asked, the most frequent reason for not wearing headgear or elastics, the participants stated pain, laziness, forgetfulness, and embarrassment most frequently [3]. Egolf et al reported that compliance with elastics and headgear, as assessed by the clinician and by patient, self-report was correlated with psychological characteristics [4]. However a few studies till date have investigated the factors predicting compliance with elastic wear or tested interventions to improve patient compliance [3,4].

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. Excellent communication and good rapport with patients are also important factors [5]. Several methods focus on changing the patients’ intentions to carry out the requested behavior because it is the most frequent predictor of compliance. However, there is an assumption that people actually do what they intend to do [6]. Among various factors that predict patients’ compliance, a limited number have been closely correlated to the demonstrated level of compliance [7]. These factors comprise of a strong internal locus of control possessed by the patient, a strong interpersonal relationship between the orthodontist and patient, documentation of improvement in oral hygiene after detailed instructions, successful school performance by the patient, and positive parental attitudes toward the treatment [8,9].

Additionally, the doctor’s expression of concern about the well-being of the patient has shown to be significant in predicting patient adherence to orthodontic treatment protocol [10]. In medicine and dentistry, active reminders have been reported to improve appointment attendance, adherence to medication schedules, and positive behavior changes [11]. Clinical capacity is poorly utilized when clients fail to attend scheduled appointments. Reminder phone calls are a common practice used to increase appointment attendance in general medicine and dentistry [12]. A 2009 systematic review of the influence of text messages on behavior changes in the medical field demonstrated positive behavior changes in 13 of the 14 studies that met the authors’ inclusion criteria, such as smoking cessation therapy, diabetes self-management, and anti-obesity behavior [13]. In medicine and dentistry, active reminders have been reported to improve appointment attendance, adherence to medication schedules, and positive behavior changes [14]. In dentistry, postal, automated telephone, and text message reminders were effective in reducing appointment no-show rates [15,16]. Similarly, Suresh et al found that keeping a flossing diary increased dental flossing and reduced plaque and bleeding scores in patients with periodontal disease in the short term [17]. In a previous study, text message follow-up sent from an orthodontic office following initial appliance placement resulted in lower levels of patient’s self-reported pain [18]. However, an influence of text message reminders on elastic wear has not yet been reported.

The aim of this study was to determine if there is a relationship between reminding patients of the importance of wearing intra-oral elastics via a text message reminder sent daily and to demonstrate the level of compliance.

Materials and Methods

For this prospective, randomized, clinical trial, subjects were required to be in active treatment at M.A. Rangoonwala College of Dental Sciences & Research Center, Department of Orthodontics, Pune, with full fixed appliances in both the arches.
An Ethical approval was not taken separately since the patients included in the study were already undergoing a fixed appliance therapy with a signed consent form prior to the beginning of the treatment & the use of intra-oral elastics was an integral part of their treatment. The Intra-oral elastics used were Class II & Class III elastics (Depending on the case) during the 'Retraction Phase' of the treatment.

Class II elastics were extended from the lower first molar hooks to the upper cuspid inter-maxillary hook of the same side. They are primarily used to cause Antero-posterior tooth changes which aid in obtaining Class I cuspid relationship from a Class II relationship. Class III Elastics were attached from the maxillary molar to mandibular canine. They promote extrusion of upper posterior teeth and upper anteriors as well as lingual tipping of the lower anteriors.

The Inclusion criteria consisted of patients:

- a. 14 to 18 years of age
- b. Undergoing 2-arch fixed appliance treatment
- c. Wearing Intra-oral elastics full-time
- d. Able to consent (or having parental assent)

The Exclusion criteria consisted of patients:

- a. Wearing extra-oral elastics (e.g. with headgear)
- b. With syndromes or any systemic conditions
- c. Undergoing orthodontic treatment in conjunction with orthognathic surgery
- d. With Physical or Psychological disorders

During the consent/assent process, patients were notified that they would receive a text message once daily for the duration of the study if they were randomly assigned to the text message group. Additionally, patients and parents were made aware that their participation was voluntary and that they could freely withdraw at any time without any penalty or loss of benefits to which they were otherwise entitled.

At the start of treatment, standardized instructions on elastic wear and a set number of elastics (60 elastics per individual) were given to the patients belonging to the Study group as well as the Control group. Mean Age for the Study group was 16.2 ± 0.81 years and for the Control group it was 16.1 ± 0.77 years. An assessment of compliance was made by counting the number of used and unused elastics. The number of elastics that would have been expected to be used was calculated based on the number of days of the study (30 days) and compliance was calculated as a percentage of actual wear compared with ideal wear.

Each patient assigned to the text message group received a text message once daily at 8 am from a cellular telephone that was used only for study text messages. Text message sent was “Consistent, continuous wear of Elastics is essential at all times except when you are eating a meal or brushing your teeth. After meals and brushing, putting a pair of elastics will result in a better orthodontic result and getting your braces off on time”. Text messages were sent using “Practo Patient Management Software” (Figure 1). Patients assigned to the control group did not receive any text messages.

**Statistical Analysis**

**Sample size calculation:** A sample size of 40 (minimum) in each group (Total sample size 80) was derived using statistical power calculation, which yielded 80.0% power [(type II error = 0.20) and
5% type I error probability ($\alpha = 0.05$) in detecting the desirable important difference of 15 to 20% in receiving the elastics between SMS and Non-SMS groups. The selected volunteers were randomly allocated to the two study groups using simple random sampling procedure (random numbers generated through on-line randomization software).

**Statistical methods used:** The data on number of elastics received is presented as Mean ± Standard Deviation (SD) across two study groups. The statistical significance of difference of mean no. of elastics received between two study groups is tested using unpaired ‘t’ test. The p-values less than 0.05 are considered to be statistically significant. All the hypotheses were formulated using two-tailed alternatives against each null hypothesis (hypothesis of no difference). The entire data was analyzed statistically using Statistical Package for Social Sciences (SPSS ver 11.5, Inc. Chicago, USA) for MS Windows.

**Results**

Eighty patients that matched the inclusion/exclusion criteria, with the consent were selected to participate in the study. Out of these 80 patients, there were 40 females & 40 males following consent/assent, 40 subjects were randomly assigned to the text message group.

Table 1 shows the average number of elastics received after 30 days was significantly higher in SMS group compared to Non-SMS group ($P < 0.001$). Table 2 shows the average number of elastics received after 30 days was significantly higher in group of females compared to group of males in SMS group ($P < 0.05$) and the average number of elastics received after 30 days was significantly higher in group of females compared to group of males in Non-SMS group ($P < 0.05$). Female patients proved to be more compliant compared to males in the Study as well as the Control group. Table 3 shows the comparison of Elastics received after 30 days in Male and Female subjects across the study groups. It reveals that the average number of elastics received is significantly higher in males in SMS group compared to males in Non-SMS group and the average number of elastics received is significantly higher in females in SMS group when compared to the females in Non-SMS group. Mean age for the subjects in Study group was $16.2 \pm 0.81$ years and the Control group it was $16.1 \pm 0.77$ years (Table 4). There were statistically significant differences between the study group and the control group; the differences were definitely in the favor of the group that received the Text message Reminders (Tables 1 and 3).

**Discussion**

Numerous barriers to wearing elastics were reported and were often associated with the availability of the elastics and the lack of cues to remembering. Most participants described pain or discomfort from wearing elastics. Those who were new to wearing elastics found them to be uncomfortable, but reported that this improved once they were used to them.

Social concerns regarding the aesthetics of their elastics were discussed, and some participants had received comments about them, but these were more in the nature of observations than negative comments. A few of the participants were concerned about their elastics breaking, and one was concerned that the elastics might cause a problem if he swallowed them.

As frequently observed, poor compliance is the most common drawback during an active orthodontic treatment. In this study, we identified most common barriers to compliance with recommendations concerning the wearing of elastics during orthodontic treatment and a method of implementation intentions to enhance compliance.

In a previous study of elastics wear, forgetfulness was cited as the most common reason for not wearing elastics or headgear by 9% of the participants [4].

**Table 1: Comparison of Used Elastics received after 30-days across two study groups ($P < 0.001$)**

<table>
<thead>
<tr>
<th>Elastics received</th>
<th>SMS Group (n=40)</th>
<th>Non SMS Group (n=40)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>%</td>
<td>No</td>
<td>%</td>
</tr>
<tr>
<td>Mean ± SD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>57.1 ± 3.5</td>
<td></td>
<td>95.2 ± 5.9</td>
<td></td>
</tr>
<tr>
<td>Min – Max</td>
<td></td>
<td>48 – 60</td>
<td>80 – 100</td>
</tr>
</tbody>
</table>

**Table 2: Comparison of Used Elastics received after 30-days across two study groups according to the gender ($P < 0.05$)**

<table>
<thead>
<tr>
<th>SMS Group (n=40)</th>
<th>Non-SMS Group (n=40)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>%</td>
<td>No</td>
</tr>
<tr>
<td>Mean ± SD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>55.9 ± 4.2</td>
<td>93.3 ± 7.1</td>
<td>19.8 ± 3.7</td>
</tr>
<tr>
<td>Min – Max</td>
<td>48 – 60</td>
<td>80 – 100</td>
</tr>
</tbody>
</table>

**Table 3: Comparison of Elastics received after 30-days in Male and Female subjects across the study groups ($P < 0.05$; "P < 0.01 by unpaired’t’ test)**

<table>
<thead>
<tr>
<th>Age (Years)</th>
<th>SMS Group (n=40)</th>
<th>Non-SMS Group (n=40)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean ± SD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16.2 ± 0.81</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Min – Max</td>
<td>14 – 18</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table 4: Age distribution of the cases studied across the study groups**
The present study was designed only to increase compliance with elastic wear and did not focus on the number of hours of elastic use, type of malocclusion or the effect of overall treatment results. The results of this study suggest that a text message reminder improves elastic wear compliance; it is possible that its effectiveness was simply caused by the extra attention provided to the text message group. Sending messages to only the text message group may have maintained their awareness that they were included in the study and influenced them to improve the consistency of elastic wear. The control group may on the other hand have forgotten about the participation in the study which accounted for a decline in their compliance.

There is a need for future studies to determine whether the content of the text message or type of reminder system plays an important role in improving compliance of elastic wear or if the extra attention provided to the text message group was the causative factor with regard to improvement in compliance.

Another limitation of our study was the parental control over younger individuals was not included which could improve patient compliance in a positive way. Directly text messaging patients to remind them to wear the elastics regularly may not be that difficult to achieve in a private practice because several communication companies already provide text message automated-reminder services, and several Web-based text message programs are available free of charge. Even though these have traditionally been meant to remind patients to attend appointments, it may sound reasonable that the text could be modified to serve other purposes as well.

Several new applications for smart phones have been developed to remind patients to brush, floss, wear retainers, maintenance oral hygiene, etc. Providing such a service may help in maintaining good communication between an orthodontist and the patient which may also show that the orthodontist is concerned about patient’s well-being. Both of these orthodontist behaviors have proven to be important in influencing patient satisfaction and orthodontist-patient relationships [10]. It is imperative, however, to be sure that parents and patients are aware of the frequency of communication so that it is not perceived as spam, which may affect the orthodontist-patient relationship in a negative way.

The results of this study indicate that a text message reminder system is an effective way of improving elastic wear compliance in orthodontic patients (Table1). Female patients proved to be more compliant compared to males in both the groups in our study (Table 2). Since the sex of the patient is one of the easiest attribute variables to assess, it is frequently reported, although it may not be the central question of the study. Of eight studies relating gender to various aspects of orthodontic cooperation, three [19-21] reported girls to be more cooperative than boys, and five [22-26] found no difference as aspects of orthodontic cooperation, three [19-21] reported girls to be more compliant compared to males in both the groups.

Use of Text messaging and recent advancements in software can enhance the success of orthodontic treatment therapy by increasing their compliance.

4. Text message reminders can increase patient co-operation.
5. Orthodontists on a routine basis should add an active reminder system of the importance of elastic wear to their typical treatment protocol.

References


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