RESEARCH ARTICLE

Comparison of different methods of controlling pain during debonding of orthodontic brackets

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Abstract

Objective: To compare the efficacy of finger pressure and plastic wafers in terms of pain control during debonding.

Method: This cross sectional study was conducted at the Department of Orthodontics, Armed Forces Institute of Dentistry, Rawalpindi, Pakistan, from January to June 2020, and comprised patients of either gender aged 13-21 years who had completed fixed orthodontic treatment with 0.022 brackets of Roth prescription and required debonding. The patients was divided into two equal groups. In group A, teeth were stabilised with finger pressure with cotton between the finger and teeth, and then debonding was done using open mouth technique. In group B, teeth were stabilised using a plastic wafer between maxillary and mandibular teeth, and then debonding was done using closed mouth technique. Pain was assessed using a visual analogue scale VAS. Data was analysed using SPSS 23.

Results: Of the 110 patients, each of the 2 groups had 55(50%) subjects. Overall, there were 35(32%) males and 75(68%) females. The mean age of the sample was 16±2.4 years. Mean pain scores among the males was 32.0±7.68 compared to 34.067±12.59 among the females ($p>0.05$). Subjects in group B had significantly less pain than those in group A ($p<0.05$).

Conclusion: Plastic wafer was found to be more effective in terms of controlling pain during debonding compared to finger pressure.

Keywords: Pain measurement, Methods of debonding, Orthodontic pain management, Finger pressure, Plastic wafer.

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Introduction

Debonding, or debanding, which refers to the removal of brackets and bands, is carried out at the end of active conventional fixed orthodontic treatment. Since this procedure is carried out without local anaesthesia and involves breaking the bond between bracket and tooth, it is associated with varying degrees of pain.[1,2] Pain creates anxiety and causes discomfort and difficulty which may prolong the procedure, making this otherwise joyful moment an unpleasant visit to the orthodontist.

Various methods are used for debonding. These methods may vary in the type of forces, like pull out, squeezing and torquing forces, with different kinds of pliers, like Hows plier, lift-off debonding plier, weingart etc.[3,4] or in the techniques used, like pliers only or supplemented with lasers, heat, chemicals and analgesics etc.[5,6] It has also been found that apically directed forces during debonding have a supportive effect on teeth and periodontium in reducing pain and discomfort.[7] Moreover, it also creates an additional sensory stimulus, which further contributes to the reduced pain sensation.[8] Thus, to reduce pain during debonding, teeth can be stabilised with the help of finger pressure, plastic wafers or other methods. Different techniques of debonding have been compared in the past, but the results of their effects on pain control have been inconclusive and even contradictory.[9,10] A study showed that pain during debonding was reduced by the application of different methods, like application of finger pressure, plastic wafers and psychological counselling, with varying and conflicting results, making it difficult to establish the most effective method of controlling pain.[11]

Pain or discomfort during debonding is a momentary phenomenon, felt during the application of pressure, and subsides afterwards. Control of pain/discomfort during debonding by utilising different debonding modalities is non-invasive and safe compared to the use of chemicals and analgesics.[12]

The current study was planned to compare the efficacy of the two simplest techniques, using finger pressure and plastic wafers, on pain control during debonding, requiring minimal armamentarium and cost.

Materials and Methods

This cross sectional study was conducted at the Department of Orthodontics, Armed Forces Institute of Dentistry, Rawalpindi, Pakistan, from January to June 2020.

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After approval from the institutional ethics review committee, the sample size was calculated using the World Health Organisation (WHO) sample size calculator by keeping alpha value 5 %, power 80%, and population standard deviation (SD) 11.25.[13] The population mean was taken as 2.5% and anticipated population mean as 8.6.[11] The sample was raised using non-probability consecutive sampling technique. Those included were patients of either gender aged 13-21 years who had completed fixed orthodontic treatment with 0.022" brackets of Roth prescription and required debonding. All brackets had been bonded using the same bonding cement (Transbond XT(3M Unitek CA United States). The patients had the finishing arch wires in place for the preceding 2 months, and had no missing teeth except those extracted for orthodontic treatment. Patients with history of taking medicines periodically or within 24 hours before debonding, those with dentofacial deformities or syndromes, who had undergone maxillofacial surgical procedure or had gingival or periodontal diseases, those with history debonded brackets and their replacements during the treatment, patients with temporary anchorage devices (TADs) placed during treatment, and with a history of tooth transplantation were excluded.

After taking informed consent from all the patients, they were divided into 2 equal groups. In group A, debonding was done by open mouth technique. All brackets were removed using the same plier; the angled direct bracket remover. Finger pressure in the apical direction was applied concomitantly to stabilise each tooth. Loose cotton was used between the thumb and the tooth during debonding. Arch wires and ligatures were not removed during debonding.

In group 2, brackets were removed in the same way with the same debonding plier as in group 1, but soft acrylic sheets folded 4 times were placed between upper and lower dentition, with the patient biting on the wafer. Wires and ligatures were left tied to the brackets during debonding.

After the procedure, patients were asked about pain using visual analogue scale (VAS), ranging 0-100.

A single operator performed complete procedure of debonding and pain recording, and, in order to reduce bias, all patients were debonded with the same plier and with wires still ligated to the brackets.

Data was analysed using SPSS 23. Mean and SD values along with median and interquartile range (IQR) were calculated for numerical variables, while frequencies and percentages were calculated for categorical variables. Data normality was checked using Shapiro-Wilk test, showing non-uniform and skewed distribution. Kruskal Wallis test was used to compare pain between the groups and between the genders. P≤0.05 was considered statistically significant.

Results

Of the 110 patients, there were 55(50%) in each of the 2 groups. Overall, there were 35(32%) males and 75(68%) females. The mean age of the sample was 16±2.4 years.

Mean pain scores among the males was 32.0±7.68 (range: 20-50) compared to 34.067±12.59 (range: 10-70) among the females.

Subjects in group B had significantly less pain than those in group A (Table 1). Besides, there was no significant difference of pain perception between males and females (Table 2)

Table-1: Mean pain levels in the study groups.

Groups	Median pain	Inter quartile range	*p*-value
Finger Pressure group	40.00	20.00	<0.001
Plastic Wafer group	30.00	10.00	

p≤ 0.05 was considered significant.

Table-2: Mean pain scores in gender terms.

Groups	Median pain	Inter quartile range	*p*-value
Males	30.00	10.00	0.535
Females	30.00	10.00	

p≤ 0.05 was considered significant.

Discussion

Pain is one of most important factors that can affect different stages of orthodontic treatment, starting from the placement of separators,[14-16] banding,[17] placing archwires[18] and activations using auxiliaries, like power chains,[19] Ni Ti coil springs etc., and ending with debonding. This in turn can affect the compliance and comfort of the patient, thus influencing treatment outcome.[20] It has been shown that initial anxiety of patients seeking orthodontic help is high, but once they get acquainted with treatment, the level of anxiety decreases.[21] Removal of braces, i.e. debonding is the ultimate desire of patients who are satisfied with the treatment, but the procedure can have some degree of discomfort that makes this event somewhat disturbing for the patients.[22] It has been found that apically directed forces applied to the teeth can reduce the level of pain and discomfort produced while removing brackets. This can be attributed to an additional sensory pathway dampening the effect of the primary painful stimulus.[8] These apical forces can be applied in several ways, like by finger, by cotton rolls, using loose cotton or by placing some rubber or acrylic sheet between the teeth.

The current study found that the use of plastic wafer between dentition while removing brackets was a more effective way to control pain during debonding. This procedure is also less time-consuming as the position of finger/cotton does not have to be changed repeatedly along the upper and lower arches. Moreover, it has the advantage of being safe in the sense that debonding is carried out using closed mouth technique which not only stabilises dentition, but also prevents any accidental inhalation of brackets and bands. Wires and brackets are not removed prior to debonding in this method, which also saves chair-side time, but brackets are distorted at the end of the process, making them unfavourable for recycling. Since this procedure is done at the end of the treatment, reuse of brackets is otherwise not needed. Plastic wafer used was in the form of soft acrylic sheets used for soft acrylic splint, and it was folded four times and adapted and cut to cover the occlusal surface of teeth sparing the labial aspect free to engagement of pliers.

In the finger pressure method, pressure is applied to teeth through finger and loose cotton, and after each bracket is debonded, the finger has to be moved to the next teeth. This is an open mouth technique, has more negative effects on bracket dimension, and can be time-consuming.

A study done in Turkey compared anxiety and pain perception during debonding in four groups; conventional method group, medication (acetoaminophen) group, soft bite wax group, and soft acrylic bite wafer group. It found no significant difference among the groups in terms of controlling pain during debonding, although greater pain was perceived on the lower left jaw and the lower left and upper right lateral incisors.[9]

Mangnall et al. compared plastic wafer group with control group, and found that the use of wafers significantly reduced perception of debonding pain, and patients who experienced more pain during treatment reported more pain during the removal of braces and perceived greater pain overall.[11]

Bavbek et al. showed that the finger pressure method, compared to elastomeric wafers, during debonding was superior to use of bite wafers. However, just relieving the stress of patient by counselling was as effective a method as any.[10]

Despite the lack of consensus regarding the most effective method of pain and discomfort control during debonding, it has been established that apically directed forces in the form of finger pressure or plastic wafer or wax are effective.[10]

It has been shown that generally orthodontic pain is experienced more by females.[23] The current study showed that pain felt during orthodontic debonding was slightly more in females, but not significant. Bavbek et al.[10] showed significant difference in the pain levels reported by females, with higher levels of pain being recorded in the lower anterior teeth while removing brackets. Other studies have also reported little difference in anxiety and pain levels between the genders.[9]

Other variables have also been investigated in the literature to assess their effects on orthodontic pain in general, like pre-treatment anxiety.[9] The current study could also have been improved by incorporating variables like the response of different teeth to debonding, pre-procedure anxiety levels or assessing pain threshold level of the patient using parameters like the pain catastrophising scale (PCS).

In future studies comparing pain and discomfort during debonding may also use different types of brackets, like ceramic brackets, which may add to the body of scientific evidence. Moreover, cultural and ethnic background and personal attitudes and traits may also affect the response to discomfort which might be investigated. Prefabricated acrylic splints may also be designed in the future to further reduce the chair-side time.

Conclusions

Plastic wafers with a closed mouth technique were found to be more effective in controlling pain during orthodontic debonding than finger pressure with open mouth technique. Besides, there was no significant difference in perception of pain between the genders during orthodontic debonding.

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