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Effectivness Of Different Methods To Reduce Pain During Debonding Of Orthodontic Brackets

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Abstract: ***Objective:*** To compare the pain score during the debonding of orthodontic brackets using three different techniques: Finger pressure versus Elastomeric wafers and stress relief-control group. Setting & Duration: Orthodontics Department, Dr. Ishrat-ul-Ebad Khan Institute of Oral Health Sciences, DUHS, Karachi from October, 2024 to April, 2025. ***Methodology:*** A total of 105 patients of either gender, aged 14–30 years, undergoing debonding after completion of fixed orthodontic treatment were included. Participants were randomly assigned into three categories (n=35 each) utilising lottery method: Group A (finger pressure), Group B (elastomeric wafer), and Group C (stress relief/control). Debonding was performed using a standardized instrument with a torquing movement, without removal of the archwire. A 100-mm VAS was utilised to gauge pain right after the surgery. SPSS version 26 was utilised to assess data. The Shapiro-Wilk test was utilised to determine normality. As needed, the mean (±SD) and median (IQR) were computed. For group comparisons, Mann-Whitney U & Kruskal-Wallis tests were employed. Statistical significance was labelled as p-value of less than 0.05.***Results:*** Baseline characteristics were comparable among all groups (p>0.05). A statistically significant deviation in pain scores was observed among (03) groups (p=0.012). Finger pressure group showed lowest median pain score (9), followed by the stress relief group (10) and elastomeric wafer group (11). Pain scores were significantly lower in the finger pressure group across most jaw regions, except in the upper posterior region where no significant difference was observed. Higher pain scores were noted in younger patients, females, and non-obese individuals; however, these differences were not statistically significant. ***Conclusion:*** Finger pressure is more effective than elastomeric wafer and stress relief techniques in reducing pain during orthodontic bracket debonding, except in posterior regions.

Keywords: Orthodontic debonding, Pain, Visual analogue scale, Finger pressure, Elastomeric wafer.

INTRODUCTION

Though dentistry has come a long way in recent years, pain and discomfort are still frequently reported after dental procedures including orthodontic treatment. Pain is a complex physiological and emotional experience influenced by age, gender, psychological state, cultural background & prior pain experiences.1 About 95% of cases undergoing orthodontic management experience some pain. Post Cause of orthodontic pain appeared first on Allentown Orthodontists.2

Debonding (debading) is defined as the process of removing orthodontic brackets and bands at the end of active therapy with fixed appliance. The adhecrash protocol (usually done without local anaesthesia) breaks the adhesive bond between bracket and tooth surface, causing variable levels of discomfort or pain.[3,4] Such discomfort may lead to anxiety, reduced patient satisfaction, and increased chairside time, making the conclusion of treatment less pleasant for patients.[5]

Various methods and resources are employed with demobilization, inducing several types of stress (tensile, shear or torsional). Frequent instruments: Howe's pliers, lift-off debonding pliers, and Weingart pliers.[6,7] Williams and Bishara were the major contributors to investigating pain during debonding process, and they found that patients tolerating stricter forces better where there is a direct relationship concerning tooth movement & pain limit.[8] Normando et al. showed that lift-off debonding devices cause significantly decrease severity of pain than wire-cutting pliers.[9] Mangnall et al. reported that use of soft acrylic bite wafers substantially reduces pain, particularly in posterior region.[10] Additionally, tooth type & patient prospects have been shown to influence pain perception during debonding.[10]

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METHODOLOGY

Over the course of six months, from October 2024 to April 2025, this prospective randomized controlled experiment was carried out at Department of Orthodontics, DIKHIOS, DUHS, Karachi. The IRB granted ethical approval (Ref No: IRB-3515/DUHS/Approval/2024/3/6 dated: October 16, 2025). Before being included in the study, each subject provided written informed consent.

A non-probability successive sampling strategy was used to recruit 105 patients in total. Based on previously published mean Visual Analogue Scale (VAS) scores of 24 ± 20.5 in the finger pressure group and 19.45 ± 14.65 in the stress relief group, the sample size was determined using OpenEpi software with a 95% confidence level and an 80% power.

Patients of either gender, aged between 14 & 30 years, who had completed fixed orthodontic management with full mouth bracket placement (MBT prescription) and were scheduled for debonding were entered. Patients with history of analgesic or corticosteroid use within previous 24 hours, abnormal tooth morphology, previous dental trauma, heavily restored teeth, root canal-treated teeth, tender teeth, root resorption greater than 1 mm, syndromic conditions, or those on medication for systemic diseases were excluded.

A lottery was used to divide the participants into three groups of 35 each. Group B (elastomeric wafer group), Group C (stress relief group/control), & Group A (finger pressure group). To reduce selection bias, allocation was carried out by a separate assistant.

In the finger pressure group, the operator used the thumb to apply finger pressure from occlusal surface in a gingival direction while debonding each bracket. To reduce the impact of occlusal morphology and standardize pressure delivery, a cotton roll was positioned beneath the thumb.

Each patient in the elastomeric wafer group received an arch-formed bite wafer made of smooth-surfaced, heavy-body silicone impression material that was about 5–6 mm thick. During the debonding process, they were told to bite firmly while wafer was positioned between the upper & lower arches.

In the stress relief group (control), routine debonding was performed. Patients were instructed to keep their mouths open & were reassured verbally to reduce anxiety and stress during the procedure.

Using same debonding tool & consistent torquing motion, all procedures were carried out by a single operator. To ensure consistency, the archwire was left in place throughout the process.

A 100-mm VAS, with 0 denoting no pain & 100 denoting terrible possible pain, was used to measure pain perception right after debonding. For both arches, total and quadrant-wise VAS values were noted. Canines and premolars were found in the posterior quadrants, whereas central and lateral incisors were found in the anterior quadrants. Additionally, the left and right quadrants were examined independently.

To reduce observer bias, VAS scores were recorded by a second orthodontist who was blinded to group allocation.
SPSS version 26 was utilised to assess data. The Shapiro-Wilk test was utilised to verify whether quantitative variables (age, BMI, and VAS ratings) were normal. For normally distributed variables, mean & SD were computed; for non-normally distributed data, median & interquartile range were provided. The three groups' pain scores were compared using the Kruskal–Wallis test, whereas normally supplied variables were compared utilizing independent t-test. The Mann-Whitney U test was utilised for post-hoc analysis. Age, gender, & BMI were taken into consideration while stratifying. Statistical significance was specified as a p-value of <0.05.

RESULTS

Three groups (n = 35 each) were equally divided from a total of 105 patients undergoing orthodontic bracket debonding. According to Table I, baseline variables such as age, gender, & obesity status were comparable among three groups & did not differ statistically significantly (p>0.05).

A statistically significant difference (p=0.012) was found when three groups' pain scores were compared. The finger pressure group had lowest median VAS score (9; IQR=3), followed by the elastomeric wafer group (11; IQR=3) and the stress relief group (10; IQR=3), as presented in Table II.

When analysed according to jaw location, the finger pressure group generally exhibited lower pain scores compared to the other groups. Statistically significant differences were observed in upper total (p=0.013), upper right (p<0.001), upper left (p=0.002), and lower anterior regions (p=0.002). However, no significant differences were observed in the upper posterior and most lower quadrant regions (p>0.05), as shown in Table III.

Stratification of pain scores with respect to demographic variables revealed no statistically significant differences based on age (p=0.560), obesity (p=0.622), or gender (p=0.260). However, comparatively higher pain scores were observed in younger patients (14–25 years), females, and non-obese individuals, as shown in Table IV.

Table I: Demographic Details of the Patients:

Demographic Details	Elastomeric wafer (n=35)	Stress relief n=35)	Finger pressure (n=35)	P-value
Age (mean ±sd)	22.23 ± 3.71	22.23 ± 3.71	21.77 ± 4.13	0.849
Obesity				
• Yes	10 (28.6%)	9 (25.7%)	9 (25.7%)	0.952
• No	25 (71.4%)	26 (74.3%)	26 (74.3%)	
Gender				
• Male	18 (51.4%)	17 (48.6%)	17 (48.6%)	0.963
• Female	17 (48.6%)	18 (51.4%)	18 (51.4%)	

Table II: Comparison of Pain Score among three Different Groups

Pain Score	Groups			P-value
	Elastomeric wafer group	Stress relief group	Finger pressure group	
Median	11	10	9	0.012
Inter quartile Range	3	3	3	

Table III: Comparison of Pain Score with respect to jaw locations among three Different Groups

Groups	Pain Score (median, IQR)			P-value
	Elastomeric wafer group	Stress relief group	Finger pressure group	
Upper Total (UT)	6 (2)	5 (2)	5 (2)	0.013
Upper Right Total (UR)	3 (1)	2 (1)	2 (0)	0.000
Upper Left Total (UL)	3 (1)	2 (1)	2 (0)	0.002
Upper Anterior (UA)	4 (1)	3 (1)	3 (1)	0.109
Upper Posterior (UP)	2 (5)	3 (5)	4 (6)	0.350
Lower Total (UT)	5 (2)	4 (1)	2 (1)	0.811
Lower Right Total (UR)	2 (1)	2 (1)	2 (1)	0.435
Lower Left Total (UL)	2 (1)	2 (1)	2 (1)	0.204
Lower Anterior (UA)	4 (1)	3 (1)	3 (1)	0.002
Lower Posterior (UP)	2 (3)	3 (6)	6 (8)	0.609

Table IV: Comparison of Pain Score with respect to Demographic Details of the Patients

Demographic Details	Pain Score (median, IQR)	P-value
Age (years)		
• **14-25**	90 (23)	0.560
• **>25**	86 (30)	
Obesity		
• Yes	81 (25)	0.622
• No	90 (22)	
Gender		
• Male	90 (24)	0.260
• Female	96.50 (30)	

DISCUSSION

Pain is a significant factor affecting various stages of orthodontic treatment, including separator placement, banding, archwire insertion, activation with auxiliaries, and ultimately debonding. This discomfort may negatively influence patient compliance, satisfaction, and overall treatment experience.[11,12]

The purpose of the current randomized controlled research was to assess how well various methods worked to lessen discomfort during orthodontic bracket debonding. The results of this investigation showed that, in comparison to elastomeric wafer and stress relief techniques, the finger pressure approach produced much lower pain scores. These findings imply that by reducing periodontal ligament stress, applying stabilizing pressures to teeth during debonding may lessen discomfort.

The findings of this study are consistent with those reported by Bavbek et al., who found that the stress relief method did not significantly reduce pain compared to other techniques, while the finger pressure method was more effective.[15] Similarly, higher pain levels were observed in posterior regions when using the finger pressure technique, which may be attributed to differences in root morphology, bone density, and force distribution in posterior teeth.

In contrast, Iqbal et al. reported that the use of plastic wafers was more effective in reducing pain during debonding.[16] This discrepancy may be due to variations in study design, sample characteristics, or the type and thickness of wafers used. Additionally, the wafer technique may provide more uniform occlusal force distribution, thereby reducing localized stress on individual teeth.

The median pain scores observed in the present study ranged from 9 to 11, which are comparable to those reported by Bavbek et al. (7–12).[15] However, Mangnall et al. reported higher VAS scores (25.9–33.6),[10] while Normando et al. observed minimal pain levels using a different scoring system.[9] These variations may be explained by differences in pain assessment scales, patient populations, operator technique, and psychological adaptation to orthodontic procedures. It has also been suggested that prior exposure to orthodontic pain may influence patient perception through central modulation mechanisms.[17]

Pain perception is subjective by nature and affected by a variety of circumstances. Females, younger patients, and non-obese people all had greater pain scores in the current study, but these differences were not statistically significant. These results are in line with other research that indicates age and gender may affect how pain is perceived because of behavioral, psychological, and hormonal aspects.[2,3,6,8,18,19]

There are several restrictions on this study. The results may not be as broadly applicable as they could be because it was done at a single location with a limited sample size. Blinding of the operator and participants was not feasible, which may introduce performance bias. Additionally, pain assessment using the Visual Analogue Scale is subjective and may be influenced by individual pain thresholds and psychological factors.

The findings of this study suggest that finger pressure is a simple, cost-effective, and easily applicable technique that can be incorporated into routine orthodontic practice to minimize patient discomfort during debonding.

Future studies should include larger, multicenter samples and evaluate additional variables such as different bracket types (e.g., ceramic brackets), psychological factors, and cultural influences on pain perception. The development of standardized prefabricated occlusal devices may also help reduce chairside time and improve patient comfort.

CONCLUSION

Finger pressure is more effective than elastomeric wafer and stress relief techniques in reducing pain during orthodontic bracket debonding, except in posterior regions. This technique may be considered a simple and practical method for minimizing patient discomfort in clinical practice.

CONFLICT OF INTEREST: NIL

FINANCIAL ASSISTANCE: NIL.

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