

# Discomfort and Pain Perceptions due to Brass Wire and Elastomeric Separators: A Cross-Sectional Study

Muneeb Shaikh<sup>1</sup>, Tipu Sultan<sup>2</sup>, Azam Shahzad<sup>3</sup>, Sajjad Ali Darvesh<sup>4</sup>, Saad Ahmed Khan<sup>5</sup>, Habib Sultan Mandokhail<sup>6</sup>

## ABSTRACT

**Aim:** This cross-sectional study aims to evaluate the patient's perception of discomfort and pain arising from brass wire and elastomeric separators used in orthodontic appliances among Pakistani adolescents.

**Materials and methods:** A total of 80 patients (40 females and 40 males) aged 18–28 years who had undergone fixed orthodontic therapy were included in this study. Details were gathered through a self-administered questionnaire provided to patients via a single investigator. The discomfort and the pain initiated by the immediate placement of separators until the seventh day were evaluated.

**Results:** Results showed that after immediate placement, brass wire separators caused the highest pain levels (88.6%) compared to elastomeric separators (2.9%). The pain perception for elastomeric separators was higher (71.4%) after 2 days of insertion than that for brass wire separators. A gradual decline in pain from both separators over 7 days was observed. Patients reported discomfort while eating and chewing. The perception of discomfort and pain between genders was not significant ( $p$  value > 0.05).

**Conclusion:** After immediate insertion, the brass wire separators caused more discomfort and pain, which lasted until 24 hours than elastomeric separators. The discomfort and the pain associated with elastomeric separators lasted until the fourth day of insertion.

**Clinical significance:** The study indicated the clinical significance of brass wire and elastomeric separators to separate the placement of orthodontic bands.

**Keywords:** Brass wire, Discomfort, Elastomeric, Pain perception, Separators.

*World Journal of Dentistry* (2020); 10.5005/jp-journals-10015-1755

## BACKGROUND AND AIMS

Pain is a crucial source of orthodontic therapy discontinuation.<sup>1</sup> Patients encounter differing degree of discomfort and pain at the primary phases of fixed orthodontic treatment that negatively affects their co-operation and compliance to continue the treatment. Due to this discomfort and pain perceptions, patients have been appeared to delay the orthodontic treatment regardless of the functional and esthetic demands.<sup>2</sup> Separation is generally the initial step in fixed appliance orthodontic therapy.<sup>3</sup> Additionally, separators should remain in its place until the bands are placed and should be easy to clean for the accurate and hygienic placement of the band to the tooth.<sup>3</sup> Patients go through a painful step during orthodontic separator placement.<sup>4</sup> These separators can be used to create space for crown restorations, make interproximal reduction of adjoining teeth safe, and dislocate partially erupted teeth.

Together with pain, discomfort is affiliated with the placement of separators and generally initiated in under 4 hours of placement. Moreover, the degree of discomfort rises across 24 hours and reduces within 7 days.<sup>5</sup> A study has reported perception of pain by two class of separators (i.e., elastomeric and spring-type steel) and concluded that both types of separators cause no significant difference in pain.<sup>6</sup> Pain is observed as a major adverse consequence of orthodontic treatment and reported during chewing and eating among all patients.<sup>7</sup> The patients' pain perception is influenced by patients' age, gender, and civilization.<sup>8</sup> Furthermore, Unruh et al. and Bergius et al. have reported higher degrees of pain in females than in males.<sup>9,10</sup> The perception of pain is also affected by the sociocultural context and the culture of patients.<sup>11</sup>

In orthodontics, various separators (e.g., latex elastics, elastomeric thread, brass wires, spring-type steel, and elastomeric

<sup>1</sup>Department of Orthodontics, DOW Dental College, DOW University of Health Sciences, Karachi, Pakistan

<sup>2</sup>Department of Periodontology, Faculty of Dentistry, University of Malaya, Kuala Lumpur, Malaysia

<sup>3</sup>Department of Dental Materials, Faculty of Dentistry, Shahida Islam Medical and Dental College, Bahawalpur, Pakistan

<sup>4</sup>Department of Operative Dentistry, Faculty of Dentistry, Jinnah Medical and Dental College, Karachi, Pakistan

<sup>5</sup>Department of Public Health, Faculty of Science, Dadabhoy Institute of Higher Education, Karachi, Pakistan

<sup>6</sup>Department of General Dentistry, Private Practice, North Nazimabad, Karachi, Pakistan

**Corresponding Author:** Tipu Sultan, Department of Periodontology, Faculty of Dentistry, University of Malaya, Kuala Lumpur, Malaysia, Phone: +923443055525, e-mail: dr.tipusultan23@gmail.com

**How to cite this article:** Shaikh M, Sultan T, Shahzad A, et al. Discomfort and Pain Perceptions due to Brass Wire and Elastomeric Separators: A Cross-Sectional Study. *World J Dent* 2020;XX(X):1–4.

**Source of support:** Nil

**Conflict of interest:** None

spacers) are used, resulting in a painful experience for nearly all patients.<sup>12</sup> Separators are generally placed in position for a few days to a week. Separators can give rise to an inevitable discomfort that can last up to a week because of occlusal interferences.<sup>13</sup> Orthodontic treatment discomfort involves pressure, tension, soreness of teeth, and pain.<sup>2</sup> Ngan et al. reported an immediate and delayed pain response; the former pain was associated with the immediate initial compression of the periodontal ligament, after

the separator placement.<sup>14</sup> The delayed response, which started a few hours later, was termed as hyperalgesia of the periodontal ligament.<sup>14</sup> Only some researches have compared the level of pain or discomfort perceived by the patients 24 hours following the placement of orthodontic treatment.<sup>2</sup> Additionally, developing nations experience additional privations when compared to the advanced countries, and hence the results of such studies conducted in a developing countries should remarkably differ from the studies conducted in the advanced regions of the world.<sup>2</sup> Moreover, no other study was found on Pakistani adolescents determining the discomfort and pain perceptions due to orthodontic separators. Therefore, this study aims to evaluate the patient's discomfort and pain perceptions during tooth separation by using the brass wire and elastomeric separators among Pakistani adolescents.

## MATERIALS AND METHODS

This cross-sectional split mouth design study was conducted at the Orthodontics Department, Dr Ishrat-ul-Ebad Institute of Oral Health Sciences, Karachi, Pakistan, from August 2018 to July 2019. The Ethical Review Committee of our institute provided an exemption prior to the commencement of the study. A total of 80 patients, including 40 females and 40 males, aged 18–28 years were recruited. Informed consent was obtained from study participant prior to the conduct of the study. The inclusion criteria comprised orthodontic patients with completely erupted upper first and second molars and compact interproximal contact areas on both upper first molars with healthy periodontal conditions. The exclusion criteria were interproximal caries or restoration, extracted or missing teeth from the upper arch, upper midline diastema, periodontally compromised teeth, and orofacial pain.

The separators used were elastomeric (Fig. 1A) and brass wire separators with diameter of 0.022 inch (Fig. 1B). The universal separator plier was used for the insertion of elastomeric separators around the mesial (anterior) and the distal (posterior) surfaces of the upper left first molar (Fig. 2A). Oral prophylaxis was performed in all patients prior to the placement of separators. The brass wire separators were placed around the upper right first molar and tightened using the Mathieu plier (Fig. 2B). Brass wire and elastomeric spacers were placed on the right and the left sides of each patient alternatively to avoid bias (Fig. 3). All separators were placed by one operator.

After the placement of the separators, the participants were instructed to fill out a self-administered questionnaire consisting of nine questions. The questionnaires were filled out using the

binary method. The questionnaire comprised different time intervals, namely, before separator placement (TB); immediately after separator insertion; after 4 and 24 hours of insertion; after 2 and 3 days of insertion; and after 4, 5, and 6 (D6) days of separator placement. The questions were answered by Yes or No, and the questionnaire was answered in written form. The patients were directed to place each questionnaire in a sealed envelope. The brass wire separators were kept static without activation during the observation period.

The questions were based on the visual analog scale (VAS) and asked to evaluate their discomfort and pain perceptions separately for the upper right and the upper left first molars (Table 1). Each patient was requested to respond to the questions on the effect of any discomfort and pain generated from the separators on their eating/chewing, school/university activities, night sleep, and social activities. The questionnaire required constant answers, and the entire duration for each patient assessment was seven days.

## Statistical Analysis

Descriptive statistics were performed using a Statistical Package for Social Sciences 20.0 (SPSS Inc., Chicago, IL, USA). The nonparametric Wilcoxon signed rank test was used to determine differences between groups and gender included in the studied sample. Frequencies were also compared. The statistically notable difference was set at the 5% level ( $p$  value < 0.05).

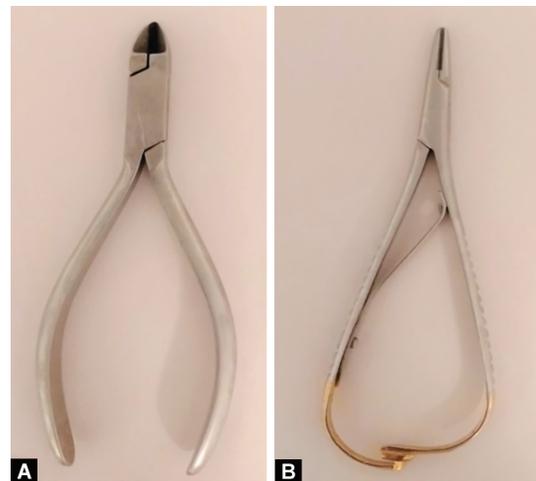
## RESULTS

Ten patients were dropped out from the study, and the questionnaire was completed by all participants until the seventh day without the loss of separators and with excellent response rate. One participant used a pain killer, and one did not complete the questionnaire. Eight patients lost their elastomeric separators. The remaining 70 patients, including 35 males and 35 females, had a mean age of  $20.1 \pm 7$  years.

The perceptions of discomfort and pain between genders were not significant. There was statistically significant dissimilarity observed ( $p < 0.05$ ) in the patient's perceptions of discomfort and pain using two varieties of separators at all time periods except TB and D6. After the immediate placement of brass wire separators, the patients experienced the highest level of mean pain score (33.33 mm, 88.6%) on the side, where the brass wire separators were



**Figs 1A and B:** (A) Elastomeric; (B) Brass wire separators



**Figs 2A and B:** (A) Universal separator; (B) Mathieu pliers

placed (Table 2). A gradual decline in pain was observed over the 7 day period from both types of separators. Patients experienced significantly less mean pain score during the immediate placement of elastomeric separators (6.75 mm, 2.9%) compared to that of

brass wire separators. Elastomeric separators caused more pain compared with brass wire separators between days 1 and 7. After 2 days of elastomeric separator insertion, patients had the highest mean pain perception (31.94 mm, 71.4%;  $p$  value < 0.05; Table 2). More than half of the patients (58.6%) reported discomfort during eating with separators. However, patients reported no significant effect of the two types of separators on their social life, night sleep, and school/university work. The comparison between brass wire and elastomeric separators is shown in Figure 4. The inferences from the data showed significant discomfort and pain associated with two different types of separators at different time periods gradually settling at day 7. Furthermore, more than half of the patients experienced discomfort during chewing with separators.



Fig. 3: Brass wire and elastomeric separators placed intraorally

Table 1: Questionnaire used among patients evaluating discomfort and pain perceptions at Dow University of Health Sciences, Karachi, Pakistan

Questions	Frequency of discomfort			
	Yes		No	
	n	%	n	%
Do the pain and discomfort from the separators have any effect on chewing?	41	58.6	29	41.4
Do the pain and discomfort from the separators have any effect on school/university work?	2	2.9	68	97.1
Do the pain and discomfort from the separators have any effect on social life?	3	4.3	67	95.7
Do the pain and discomfort from the separators have any effect on night sleep?	8	11.4	62	88.6

%, percentage; n, number of patients.

### DISCUSSION

In this study, 70 patients were instructed to completely fill out a questionnaire regarding discomfort and pain following the insertion of brass wire and elastomeric separators in the upper first molars. The pain was investigated and compared from baseline to day 7. Several studies have reported the initialization of pain after few hours of orthodontic force application and continued for around 5 days.<sup>6,13-15</sup>

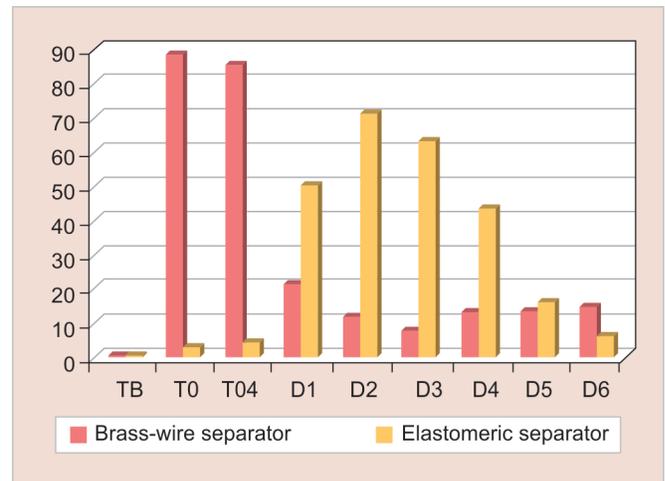


Fig. 4: Comparison between brass-wire and elastomeric separators

Table 2: Questionnaire used among patients evaluating pain at Dow University of Health Sciences, Karachi, Pakistan

Time period	Brass wire separator			No difference between pain perception (%)	Elastomeric separator		
	n	%	Mean pain intensity score		n	%	Mean pain intensity score
TB	70	0	0.00	100	70	0	0.00
T0	70	88.6	33.33	8.6	70	2.9	6.75
T04	70	85.7	33.11	10	70	4.2	9.83
D1	70	21.4	24.63	28.6	70	50	25.87
D2	70	11.4	14.25	17.1	70	71.4	31.94
D3	70	7.1	19.40	30	70	62.9	25.64
D4	70	12.9	22.9	44.3	70	42.9	19.13
D5	70	12.9	9.89	71.4	70	15.7	11.00
D6	70	14.3	8.10	80	70	5.71	6.00

TB, before separator placement; T0, immediately after separator insertion; T04, after 4 hour of insertion; D1, after 24 hour of insertion; D2, after two days of insertion; D3, after three days of insertion; D4, after four days of insertion; D5, after five days of insertion; D6, after six days of insertion; %, percentage; n, number of patients.

Initially, brass wire separators have caused higher degrees of discomfort and pain compared to elastomeric separators, but the discomfort and pain from elastomeric separators have long-term effects. The highest degree of pain was observed after 2 days of elastomeric separator insertion, and this result is in agreement with the findings of Bondemark et al. and Juneja et al.<sup>6,13</sup>

The findings of this study indicate that the discomfort and pain caused by brass wire and elastomeric separators last up to 7 days. In addition, during the initial days, the discomfort and the pain caused by the two types of separators negatively influence the chewing or eating routine in more than 50% of the total patients. A previous study has reported that the pain increases during chewing and eating, which is in agreement with the findings of the present study.<sup>1</sup> Bondemark et al. have shown that social activity and night sleep are not significantly affected after the placement of separators.<sup>6</sup>

Gender is a salient element for the dilemma of discomfort and pain during separation. In few studies, females have experienced greater degree of discomfort and pain during orthodontic treatment compared with males,<sup>9,10</sup> but a small number of studies found no significant difference in discomfort and pain perceptions between the two genders.<sup>6,13,14</sup> The variant results shown by different studies can be due to differences in the subjects' age, sample proportion, and culture. The present study has not found any correlation between gender's discomfort and pain perceptions in the two types of separators, and this result is in agreement with the findings of Bondemark et al. and Sandhu et al.<sup>6,16</sup>

In the first week, around 12% of patients have lost their elastomeric separators. Therefore, the use of brass wire separators is recommended if orthodontic banding will not be achieved in the first week. Brass wire separators produce less tooth separation and require reactivation to gain enough space compared to elastomeric separators but cause less discomfort and pain without loss. Immediately after placement, brass wire separators cause discomfort and pain, which increase over the next 20 hours and decrease within 7 days. Elastomeric separators cause discomfort and pain in patients until day 7, thereby causing negative influence especially during chewing. This result is in agreement with the findings of Sandhu et al.<sup>16</sup>

In this study, VAS is used for the assessment of discomfort and pain linked with brass wire and elastomeric separators. The VAS is a well-known technique for evaluating response to discomfort and pain and has various benefits over the descriptive rating scale developed by Sandhu et al.<sup>16</sup>

The outcomes of the current study recommend that at the time of separator insertion, analgesics should be prescribed. Moreover, patients should be advised to take non-sticky food and soft diet for the first 4 days after separator insertion, as reported by Asiry et al.<sup>1</sup> Proper oral hygiene is a crucial factor to prevent localized periodontitis and significant bacteremia caused by separators. The small sample size, comparison with other types of separators, and utilization of mandibular arch molar teeth are considered as the limitations of the current study.

## CONCLUSION

Within the limitations of this study, elastomeric separators caused more discomfort and pain, which lasted up to four days of insertion, than brass wire separators. However, the discomfort and pain caused by brass wire separators lasted up to 24 hours of insertion. Orthodontic separators should be used and compared to further assess the discomfort and pain perceptions.

## ACKNOWLEDGMENTS

This work was supported and funded by all the authors.

## REFERENCES

1. Asiry MA, Albarakati SF, Al-Marwan MS, et al. Perception of pain and discomfort from elastomeric separators in Saudi adolescents. *Saudi Med J* 2014;35(5):504–507.
2. Jawaid M, Qadeer TA, Fahim MF. Pain perception of orthodontic treatment: a cross-sectional study. *Pak J Med Sci* 2020;36(2):160.
3. Kottraba TM. Preventing separator loss. *J Clin Orthod* 1977;11(1):60.
4. Krishnan V. Orthodontic pain: from causes to management: a review. *Eur J Orthod* 2007;29(2):170–179. DOI: 10.1093/ejo/cjl081.
5. Ngan P, Wilson S, Shanfeld J, et al. The effect of ibuprofen on the level of discomfort inpatients undergoing orthodontic treatment. *Am J Orthod Dentofac* 1994;106(1):88–95. DOI: 10.1016/S0889-5406(94)70025-7.
6. Bondemark L, Fredriksson K, Ilros S. Separation effect and perception of pain and discomfort from two types of orthodontic separators. *World J Orthod* 2004;5(2):172–176.
7. Scheurer PA, Firestone AR, Bürgin WB. Perception of pain as a result of orthodontic treatment with fixed appliances. *Eur J Orthod* 1996;18(1):349–357. DOI: 10.1093/ejo/18.1.349.
8. Feinmann C, Ong M, Harvey W, et al. Psychological factors influencing post-operative pain and analgesic consumption. *Brit J Oral Max Surg* 1987;25(4):285–292. DOI: 10.1016/0266-4356(87)90067-2.
9. Bergius M, Kiliaridis S, Berggren U. Pain in orthodontics. *J Orofac Orthop* 2000;61(2):125–137. DOI: 10.1007/BF01300354.
10. Unruh AM. Gender variations in clinical pain experience. *Pain* 1996;65(2-3):123–167. DOI: 10.1016/0304-3959(95)00214-6.
11. Zaborowski M. Cultural components in response to pain. *J Soc Issues* 1952;8(4):16–30. DOI: 10.1111/j.1540-4560.1952.tb01860.x.
12. Abtahi SM, Mousavi SA, Shafae H, et al. Effect of low-level laser therapy on dental pain induced by separator force in orthodontic treatment. *Dent Res J* 2013;10(5):647.
13. Juneja A, Bagga DK, Sharma R, et al. A comparative evaluation of separation effect and perception of pain using two different orthodontic separators. *J Indian Orthod Soc* 2011;45(4):183–188. DOI: 10.1177/0974909820110405.
14. Ngan P, Kess B, Wilson S. Perception of discomfort by patients undergoing orthodontic treatment. *Am J Orthod Dentofac* 1989;96(1):47–53. DOI: 10.1016/0889-5406(89)90228-X.
15. Ertan Erdiñç AM, Diñçer B. Perception of pain during orthodontic treatment with fixed appliances. *Eur J Orthod* 2004;26(1):79–85. DOI: 10.1093/ejo/26.1.79.
16. Sandhu GPS, Kanase A, Naik C, et al. Separation effect and perception of pain and discomfort from three types of orthodontic separators. *J Indian Orthod Soc* 2013;47(1):6–9. DOI: 10.1177/0974909820130102.