

Clinical Evaluation of Self-Secured Spring Separator

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ABSTRACT

Introductin: To examine two types of orthodontic separators, focusing on the separating effect, loss of separators and patients' perception of pain and discomfort.

Materials and Methods: The separators tested were Kansal separators and elastomeric separators. Thirty patients participated, and all were scheduled for treatment with a fixed orthodontic appliance. Two Kansal and 4 elastomeric separator were placed alternately in the left or the right quadrant. After a separation period of 5 days, the amount of separation was measured with a leaf gauge. Discomfort evaluated with questionnaires.

Results: The mean separation was 0.33 mm for the spring-type and 0.47 mm for the elastomeric separators ($P < .05$). The Kansal were considered less painful than the elastomerics, but the difference was not statistically significant. Loss of separator was less with Kansal separators.

Conclusions: The separation effect of the two separators was considered clinically equivalent and since pain of moderate intensity occurs during the separation period.

Keywords: Leaf gauge, Nickel titanium, Orthodontic separators, Kansal Separators

INTRODUCTION

Orthodontic separators are devices, which used to create a space between adjacent teeth, to facilitate the accurate placement of the orthodontic bands. Separators are inserted so it can force or wedge the teeth apart and kept there for a period of time for a initial tooth movement to be occurred. That a gap or space is created between them to enable the banding procedure^{1,2}

Elastomeric separators have proven their wide range of efficiencies, such as banding the molars for fixed orthodontic treatment.^{1,2} in the induction of the eruption of partially impacted mandibular second molars.^{3,4} before the interproximal reduction of adjacent teeth and cases were malposed molars required space for crown restoration.^{5,6}

For successful banding in Orthodontics, adequate separation of teeth is required. For separation of teeth various commonly practiced methods such as metal separators, elastomeric separators, brass wire and newly introduced Self-Secured Spring Separator, etc. The inherent disadvantage of all these commonly used modalities is the frequent dislodgement of these separating devices. A dislodged separator may be troublesome if ingested metal separators especially, or it may get

wedged between the adjacent teeth causing acute localized periodontitis.⁷ On the day of banding appointment, failure of the tooth separation is a constant source of frustration for the orthodontist. To overcome these clinical problems of conventional separators, the Kansal Self-Secured Spring Separator was conceptualized.^{1,2}

The mechanism behind the separator loss is a progressive reduction of contact point tightness which permits separator loss before banding appointment. Which eventually disrupts the treatment progress, as well as increased discomfort experienced by the patient from second-time separator placement, Hence protocol of separation, should be evaluated for newly introduced Self-Secured Spring Separator along with elastomeric separators.

The study was designed for assessing the pain, discomfort and amount of separation of two types of separators (i.e. Elastomeric and Self-Secured Spring Separator) and also the percentage of loss of these separators.

MATERIAL AND METHODS

A sample of thirty patients, including 15 males and 15 females with a mean age of 15.23 years (standard deviation, 2.43 years), from the Department of Orthodontics and Dentofacial Orthopaedics at Saraswati Dhanwantari Dental College and Hospital, Parbhani, were participated. To be included in the study, the patients seeking treatment with a fixed orthodontic appliance in the both maxillary and mandibular arch, also had to have bilaterally approximal contacts, mesially and distally, at the first permanent molars. All patient with the previous history of orthodontic treatment, Dental caries and restoration on the proximal surface permanent molars, and evidence of a periodontal or gingival problem excluded.

All patients were informed that their participation in the

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study was confidential with a voluntary basis. Signed informed consent from all the patients were obtained before initiating the study. The separators used were Kansal steel separators (Custom made)⁸ and elastomeric separators made of polyurethane and with radiographic opacity (D-Tech, USA) (Figure 1). The Kansal Separators were applied with light-wire pliers and the elastomeric Separators with Separator placing plier. For each patient, The 2 Kansal Separators and four elastomeric separators were applied alternately on the right or the left side of the maxilla and mandible to avoid side bias (Figure 2).

Measuring the separating effect

All the patients were recalled when the separators had been in place for five days, the number and types of separators lost were recorded. With the day, separators were lost also recorded. The elastomerics and springs were removed with a curved probe and bird beak pillar, respectively. All first molars were air dried with air-spray. Then the leaf gauge is used to measure the amount of separation on a mesial and distal aspect of each first molars (Figure 3).

Investigation of patient perception of pain or discomfort

Perception regarding of pain/discomfort was recorded using the series of 5 questionnaires. The patients were instructed orally and written in the local language, with an explanation of how to attend questionnaires. For baseline perception of pain and discomfort, an initial survey was carried out before separator placement. Then, a questionnaire was completed once a day at home for the following three days.

3 Questionnaires were to be completed at home at the same time every day, and the patient was instructed to put fully completed the questionnaire in the enclosed envelopes provided by the Department of Orthodontic and Dentofacial Orthopaedics and seal it so that he or she would not be influenced by the answers on the day before. Finally, one remaining questionnaires were completed at the clinic on day 5, at the time of removal of the separators.

The questionnaires consisted of nine questions describing pain and discomfort. Four questions used a visual analog scale (VAS), each being 10 cm in length with graphically represent the two ends of descriptive terminology, as “no pain” versus “pain as bad as it could be barred.”⁹ Patient instructed to select a graphically represented point that indicated patients perception of pain severity and the linear distance was measured from the end of the scale to a graphical point. This distance indirectly represents the severity of pain. Calculation of VAS scored achieved by measuring the distance from the vertical mark placed by the patient as a response to each question to the point left-hand end of VAS scale.

1. “Do your upper molars hurt when you chew on the right side?”
2. “Do your upper molars hurt when you chew on the left side?”



Figure-1: Separators Used study.



Figure-2: Intra Oral view of separators



Figure-3: Leaf gauge

3. “Do your upper molars hurt at rest on the right side?”

4. “Do your upper molars hurt at rest on the left side?”

Each questionnaire had five question that to be answered by choosing “yes” or “no”:

1. “Has it hurt so much that you have changed your food habits to soft food like yogurt, banana, etc.?”
2. “Has it hurt so much that your leisure activities were influenced, e.g., music, sports, time with friends?”
3. “Has it hurt so much that your schoolwork was influenced?”
4. “Has it hurt so much that you have been awake in the

night?"

5. "Has it hurt so much that you have had to take pain-killers?"

STATISTICAL ANALYSIS

For each study groups, descriptive statistical analysis with means and standard deviations were calculated. Along with the percentage of separator loss against time were evaluated. ANOVA test with repeated measurement was performed. With these, a comparison of the pain discomfort due to the separator over duration calculated. Other factors (1) the amount of separation at separator removal, (2) the time at which the separator loosed and (3) No of separator present at 5th day. Post-hoc Bonferroni adjustments showed significant differences between all groups ($P < .05$).

Wilcoxon's matched-pairs signed-rank test was used for qualitative variables, eg, whether there was any significant difference in the amount of pain reported due to the separators.

RESULTS

Comparison of the separation effect of individual separators after five days evaluated. The separation effect of both separators were compared individually at 5th day and observed that the difference of separation produced by both types of separators was the statistically less significant. Among separators, elastomeric separators produced the consistently greater amount of separation on 5th days. [Table 1].

Seven elastomeric separators were lost and 2 Self-Secured Spring Separator, at day 2. (Table 1). In one case, due to mastication, a Self-Secured Spring Separator, was distorted subsequently removed by the patient himself. In other case, a particular reason for dislodgement was not found. The mean amount of separation for Self-Secured Spring Separator was 0.33 mm and while the elastomerics Separator shows 0.47 mm and the difference in effect was less significant.

Pain and discomfort

All 30 subjects attended the whole study, and all subjects completed all questions on all questionnaires Hence, the response rate was excellent. None of the patients had pain before separator placement.

Pain with moderate intensity was observed with 13 Self-Secured Spring Separator and 21 elastomeric separators at the mandibular first molar during eating and mild pain at rest during the 1st day. 11 Self-Secured Spring Separator and 17 elastomeric separators reported pain in maxillary first molar during first three days. The patients noted the elastomerics as a little more painful as compared to the Self-Secured Spring Separator, but the difference was not statistically significant after insertion, the pain gradually increased with both separators, and peaked on the day 3.

The pain started to subside on the fourth day and, by day 5,

	Days	Self-Secured Spring Separator (n=60)		Elastomeric Separator (n=120)	
Separator loss and percentage	Day 1	60	0%	120	0%
	Day 2	58	4%	113	6%
	Day 3	58	4%	104	14%
	Day 4	56	7%	99	18%
	Day 5	56	7%	92	24%
Separation Effects		Mean	SD	Mean	SD
	5 th Day	0.33	0.25	0.47	0.29

Table-1: Percentage of separator loss and separators effect

the pain was almost absent for elastomeric separators. During 4th and 5th-day, a side with elastomeric separators, were less painful but side with Self-Secured Spring Separator had pain higher than elastomeric separators.

Thirteen of the 30 patients, none of the patients had severe pain that they needed analgesics. 17 patients had changed their food habits shift to the side with Self-Secured Spring Separator were placed during initial three days. Two patients had been awake at night because of the pain, and one stated that the separation influenced his leisure activities. None of the 30 patients had had such severe pain or discomfort that their school work was influenced.

DISCUSSION

The orthodontic band and band materials available in a variety of size and shape such as preformed band or in material band spool. With specific dimension for different tooth such as on anteriors: 0.004 X 0.125 inch or 0.003 X 0.125 inch, on bicuspid: 0.005X0.15 inch; or 0.004X0.15 inch; and on molars: 0.006 X 0.18 inch; or 0.006 X 0.20 inch. Insufficient separation cause, the band setting pressure that result in pain and discomfort to the patient during and after banding procedures apart from causing improper seating of bands.⁸

The difference in separation effect between Self-Secured Spring Separator and elastomerics was small, statistically less significant, and the two separators were considered clinically relevant. The space necessary for banding is approximately 0.25 mm; i.e., the amount of separation, 0.33 and 0.47 mm for Self-Secured Spring Separator and elastomerics, respectively, was near twice the thickness of a molar band. The amount of separation produced by Self-Secured Spring Separator was less as compared to an elastomeric separator that might be the due to the difference in force generated by two separators. Elastomeric separator provides rapid separation while Self-Secured Spring Separator having slow separation. Orthodontic literature supports varying the degree of individual pain and discomfort to orthodontic forces^{11,12} and this tends to be observed in this study. Another factor that affects varying the degree of response is elastomeric separator having rapid separation effect that provoke pain with higher intensity during initial three days, the pain starts subsiding as separation occurred, or elastomeric separators were loosed. On another aspect, Self-Secured Spring Separator remained at their placed and generated light and continuous separating force with continue till the end of the study. Pain aggression

during the 4th and 5th day may be due to the relative reduction of associated with elastomeric separators.

It was observed that daily activities of the patients not affected severely expect, eating food choices were fairly considerable since 17 of 30 patients had changed to soft food. The influence on leisure activities (sports o social life), as well as interference with schoolwork, was considered small or negligible.

For evaluation of pain and discomfort intensity, Visual analog scale is most commonly implemented tool. Its simplicity makes application and scoring easier.hense in this study the VAS used to assess pain and discomfort. Validity and reliability of VAS for measurement of discrete pain and small discrimination in intensity changes has been established.¹³ Furthermore, In the assessment of pain and discomfort VAS rarely fails after the age of 5.¹⁴ Previously recorded studies shown that VAS was effective to differentiate between the pain and discomfort in the anterior segment and posterior segment teeth after placement of initial archwire.¹⁵ Hence, in this study the patients had no problems in discriminating between pain/discomfort in right and left posterior teeth.

CONCLUSION

Both separators showed a significant amount of separation between the molars and premolar on 5th days. Elastomeric separators proved to produce the faster separation effect among separators, with a mean separation of 0.47 ± 0.29 mm after five days of separator placement. The highest percentage of loss of these separators was recorded with Elastomeric separators that were 24%, and least was seen with Self-Secured Spring Separator with 3% of these separating Springs for five days. Pain with Mild to moderate intensity was observed with both types of separators, with the Self-Secured Spring Separator considered less painful about the elastomers, but the difference found was less statistically significant. The pain was increased after three days and had subsided almost entirely by the fifth day. While pain continues with Self-Secured Spring Separator. Kansal Self-Secured Spring Separator is a good alternative for conventional separators with proven Self-Secured action by comparatively less loss of separators during this study.

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