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## Comparison between efficacies of four different types of orthodontic separators

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### Abstract

To evaluate the amount of separation produced by four types of orthodontic separators viz. the Elastomeric separator, Kesling separator, Kansal separator and Dumbbell separator. The patient was evaluated for 5 days for amount of separation. Time taken for adequate separation was significant in all the 4 separators; dumbbell being the fastest followed by elastomeric separator. There was no significant difference between kesling and kansal separator in time taken to achieve adequate separation.

**Keywords:** Reproximation, hyalinised, ANOVA, NEET, Efficacy

### Introduction

In the dental practice separators are used to create a space between molars to placement of orthodontic bands. They are also useful in eruption of partially impacted teeth especially second molars and make reproximation of adjacent teeth easier.

Tightness of contact point decreases due to eating or brushing. This can lead to loss of separator and movement of tooth to its initial position. This can affect the treatment thus a protocol to know adequate time for separation needs to be determined<sup>1</sup>. Different separators vary in the amount of pain caused during separation, their efficacy and maintenance of separation. Some can irritate the mucosa like brass wire and spring separators, where as some tend to loosen easily. A band should be seated after required separation otherwise hyalinised areas can be created in the periodontal ligament which can cause pain<sup>2</sup>. Pain and discomfort due to separator placement is the most common chief complaint of the patients and one of the reasons for avoiding orthodontic treatment<sup>[3, 4]</sup>.

### Aims and Objectives

The aims and objectives of our study were

- 1) To evaluate the amount of separation produced by four types of orthodontic separators viz. the elastomeric separator, Kesling separator, Kansal separator and Dumbbell separator.
- 2) To evaluate the time taken to achieve adequate separation

### Materials and Methods

The study population consisted of 40 subjects (20 girls and 20 boys) in the age range of 12-16 years. The subjects were randomly selected from patients visiting the Department of Orthodontics and Dentofacial Orthopedics Mahatma Gandhi Dental College & Hospital, Jaipur, Rajasthan. The ethical clearance for the study was obtained from Institutional Ethical Committee of Mahatma Gandhi Dental College and Hospital, Jaipur.

### Inclusion Criteria

- 1) Healthy patients requiring fixed orthodontic treatment in maxillary and mandibular arches with no systemic disease.
- 2) Patients with bilaterally tight contact between 2<sup>nd</sup> premolar, 1<sup>st</sup> molar and 2<sup>nd</sup> molar.
- 3) Healthy periodontium
- 4) Fully erupted mandibular second molar

**Exclusion Criteria**

- 1) Patients with gingival and periodontal problems
- 2) Root Canal Treated teeth in the arch
- 3) Patients undergoing orthodontic treatment
- 4) Presence of inter-proximal caries or restorations
- 5) Presence of inter-dental spaces

**Apparatus used in this study (Fig-1 and Fig-2)**

1. Elastomeric separator
2. Kesling separator
3. Kansal separator
4. Dumbbell separator
5. Separator placing plier
6. Straight howe plier
7. Light wire plier
8. Leaf gauge



**Fig. 1:** Different separators and separator placing plier



**Fig. 2:** Leaf gauge

**Method of collection of Data**

The above mentioned four separators were placed alternately in four different quadrants in each patient to avoid right and left and maxillary and mandibular bias. Kansal and Kesling separators were placed using a light wire plier, Elastomeric and Dumbbell separator were placed using a separator placing plier and straight howe plier (Fig-3 and fig-4). The patient was evaluated for 5 days for amount of separation, in each quadrant. After air-spray drying of the maxillary molars, the amount of separation of each maxillary first molar, was measured mesially and distally with a leaf gauge (sensitivity 5/100mm).



**Fig. 3:** Separators placement: **A.** Kansal separator in maxillary right side, **B.** Dumbbell separator in maxillary left side, **C.** Elastomeric separator in mandibular right side, **D.** Kesling separator in mandibular left side.



**Fig 4:** After separators placed in: **A.** Maxillary arch (Right and Left side) **B.** Mandibular arch (Right and Left side)

**Measuring the separating effect**

The Kansal and Kesling were removed with light wire plier, elastomerics were removed with a curved probe, and dumbbell separator were removed with straight howe plier. After removal of separators, air-spray drying was done and the amount of separation of each maxillary and mandibular first molar was measured mesially and distally with a leaf gauge (Fig-5). The duration to achieve required separation (0.2 mm) was also noted.



**Fig 5:** Amount of separation measurement with leaf gauge

**Results**

Table 1 and 2 shows amount of separation in different types of separators.

**Table 1:** Shows amount of separation in different types of separators

S.N	Name of separator	N	Mean±SD	P
1.	Dumbbell	40	.3663±.07106	.000
2.	Kesling	40	.2188±.05739	
3.	Kansal	40	.1525±.03387	
4.	Elastomeric	40	.2250±.05189	

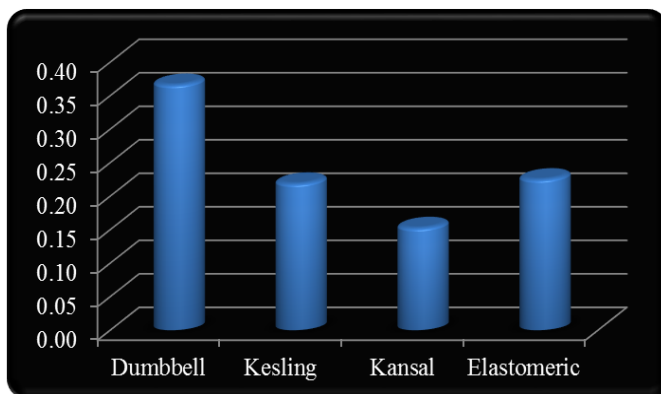
\*. The mean difference is significant at the 0.05 level.

**Table 2:** Multiple Comparisons in amount of separation in different types of separators

		Mean	P
Dumbbell	Kesling	.14750*	.000
	Kansal	.21375*	.000
	Elastomeric	.14125*	.000
Kesling	Dumbbell	-.14750*	.000
	Kansal	.06625*	.000
	Elastomeric	-.00625	.957
Kansal	Dumbbell	-.21375*	.000
	Kesling	-.06625*	.000
	Elastomeric	-.07250*	.000
Elastomeric	Dumbbell	-.14125*	.000
	Kesling	.00625	.957
	Kansal	.07250*	.000

\*. The mean difference is significant at the 0.05 level.

The results show that the amount of separation was significantly different between four type of separators - dumbbell, kesling, kansal and elastomeric. The mean separation was 0.36 mm for dumbbell, 0.21 for kesling, 0.15 mm for kansal and 0.22 for elastomeric (Table-1). There was no statistically significant difference between elastomeric and kesling (Table-2) (Graph-1).



**Graph 1:** Shows amount of separation in different types of separators

Table 3 and 4 show time taken for adequate separation in different types of separation.

**Table 3:** Show time taken for adequate separation in different types of separators

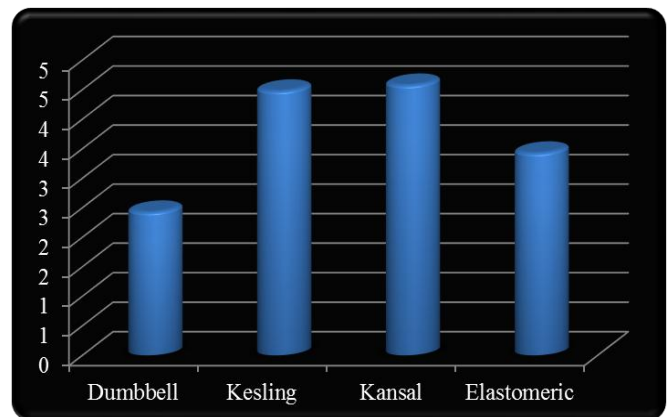
S. NO	Name of separator	N	Mean±SD	P
1.	Dumbbell	40	2.425±.5006	.000
2.	Kesling	40	4.475±.5057	
3.	Kansal	40	4.575±.5006	
4.	Elastomeric	40	3.425±.5006	

**Table 4:** Show Multiple Comparisons in time taken for adequate separation in different types of separators

		Mean	P
Dumbbell	Kesling	-2.0500*	.000
	Kansal	-2.1500*	.000
	Elastomeric	-1.0000*	.000
Kesling	Dumbbell	2.0500*	.000
	Kansal	-.1000	.810
	Elastomeric	1.0500*	.000
Kansal	Dumbbell	2.1500*	.000
	Kesling	.1000	.810
	Elastomeric	1.1500*	.000
Elastomeric	Dumbbell	1.0000*	.000
	Kesling	-1.0500*	.000
	Kansal	-1.1500*	.000

\*. The mean difference is significant at the 0.05 level.

Adequate separation was considered 0.2 mm because molar band material thickness is .005 inch /0.127 mm. It was found that the time taken for adequate separation was significant in all the 4 separators; dumbbell being the fastest followed by elastomeric separator. There was no significant difference between kesling and kansal separator. The mean of time take for adequate separation was 2.4 days for dumbbell, 4.4 days for kesling, 4.5 days for kansal and 3.4 days for elastomeric separator (Table-3, 4) (Graph-2).



**Graph 2:** Shows time taken for adequate separation (days) in different types of separators

**Discussion**

Separation is one of the most important process for fixed orthodontic treatment. Pain and discomfort are most common chief complaint of patient during separation period. It was found that the amount of separation by dumbbell separator was significant at day 1 to day 5 compared to three other separators. This was in agreement with the study done by Malagan *et al* [1] where a significant difference was observed between four type of separators; elastomeric, kesling, dumbbell and NEET spring on day 1,2 and 3. In our study the amount of separation of elastomeric separator was 0.2 mm. This separation value is more than the earlier study done by Hoffmann [5]. Our result also showed statistically significant difference between the separation effect of elastomeric, Dumbbell, kesling and kansal separator. Elastomeric separators also showed statistically significant amount of separation in comparison with kesling and kansal on all five days which was similar to previous study done by Cureton and Ronald [6].

In the present study, Dumbbell separators provided fastest and greater amount of separation than the elastomeric, kesling and kansal separator. However, 20% of dumbbell separators were lost which was very high compared to other separators. This was in agreement with the study done by Malagan M *et al* <sup>[1]</sup>. In this study the dumbbell separator provided fastest and more amount of separation than the other 4 types of separators and frequency of loss of separator was 16%, which was highest among other separators.

In our study, adequate separation of elastomeric separation was 3.4 days but in a previous study done by Juneja *et al* <sup>[7]</sup>, the adequate separation of elastomeric separation was 2 days after placement of separator.

In the present study the separation and discomfort caused by elastomeric was more than the kesling separator and similar result are shown in a previous study done by Sandhu G P <sup>[8]</sup>. A study conducted by Bothra *et al* <sup>[9]</sup> shows that the loss of “elastomeric” separator is significantly higher than the “kansal” separators. Similarly, in the present study, the Elastomeric separators were lost significantly more than kansal separators.

In our study the pain associated with separators started after placement and peaked at 2 and 3 day and subsided on fifth day. This result is similar to previous study done by Asiry, M A *et al* <sup>[10]</sup> where the pain associated with orthodontic separation started and peaked within 4-48 hours from separator placement, then started to decline to reach the lowest level on fifth day. According to our study, adequate separation was achieved in 2.4 days for dumbbell, 4.4 days for kesling, 4.5 days for kansal and 3.4 days for elastomeric separator. Thus, according to this study, molar band fits easily at least 4 day after placement of separator. Eating was most affected during the separation period, thus, patients had to change to the soft food, like yogurt, banana etc. These finding are same as Scheurer *et al* <sup>[11]</sup> study.

Thus, the dumbbell separator and short duration to achieve adequate separation than kesling, kansal and elastomeric separator.

## Conclusions

The following conclusions can be drawn from the present study:

1. All four separators showed significant amount of separation on days 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup> and 5<sup>th</sup> day respectively.
2. The time taken for adequate separation was 2.4 days for dumbbell, 4.4 days for kesling, 4.5 days for kansal and 3.4 days for elastomeric separator.

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