

## A comparative study of separation effect of four different types of separators

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### Abstract

**Objective:** The objective of this study was to evaluate and compare the amount of separation achieved by four different types of separators: elastic separator, kesling separator, Kansal separator and Dumbbell separator.

**Materials and Methods:** 50 patients (25 males and 25 females) were randomly selected for the study that came to the department of orthodontics and dentofacial orthopaedics for fixed orthodontic treatment. All four types of separators namely Elastomeric, Kesling, Kansal and Dumbbell separators were placed in each and every patient in all the four quadrants. Amount of separation was checked after 5 days of separator placement with the help of a feeler gauge. Data thus obtained was subjected to statistical analysis.

**Result:** Result of the study showed that dumbbell separator was most efficient in separating the teeth followed by elastomeric separator. Dumbbell separator was found to be the fastest followed by elastomeric separator in separating the teeth. Kesling and kansal separator almost took same time to achieve adequate separation.

**Keywords:** Separators, Kesling, Dumbbell separator, Kansal separator, Efficacy.

### Introduction

Separation of teeth is needed for banding of the molars in the very beginning of orthodontic therapy. Separation is mainly required because of the presence of tight contact inter proximally. Without separation, placement of band is almost impossible. Therefore, separation of teeth is required for the placement of orthodontic bands.<sup>1</sup>

Separation is usually achieved by placement of various types of separators. These orthodontic separators when inserted between adjacent teeth exhibits an increase in compressive force between adjacent teeth in the oral environment. To start orthodontic treatment, separators are placed so that banding of teeth can be done in the next appointment. So separators should be capable of providing rapid and good amount of separation that also without giving much discomfort to the patient.

The average thickness of orthodontic band is 0.16 mm,<sup>2</sup> which requires a separation of 0.25mm.<sup>3</sup> There are various types of separators like Kesling separator, C separator, brass wire, elastic ring separator, dumbbell shaped separator, NiTi spring separator, Kansal separator, etc<sup>4</sup> Separators should be easy to place, easy to clean, radio-opaque and should not be lost or dislodged.<sup>5</sup>

The main disadvantage of placing a separator is that they tend to get dislodged from their place and may create a potential risk of getting swallowed or aspirated. Elastomeric and spring separators are the separators which are commonly used today. Elastomeric are easily available and spring separators can be easily fabricated in the clinic. Kansal and dumbbell separators are also used but not as commonly as the elastic and kesling separators because of more discomfort produced by dumbbell separator and less efficacy of kansal separator as given in the literature. Because of lesser use of dumbbell and kansal separators, their efficacies have not been discussed much in the

literature. Hence this study aimed to evaluate the efficacy of these four types of separators.

### Materials and Methods

The study was done on 50 patients (25 males and 25 females) between the ages of 12-18 years. The patients were randomly selected from patients visiting the Department of Orthodontics and Dentofacial Orthopedics, Patna dental college and hospital, Patna. The inclusion criteria included no history of previous orthodontic treatment and presence of all the permanent teeth in both the arches, except third molars. An informed consent was obtained from all the patients. Four types of separators, Elastomeric separators, Kesling separators, Kansal separators and dumbbell separators were used for separation before placement of orthodontic bands.

All the four separators were placed in four different quadrants in each patient. Readymade elastomeric separators (Fig 1) were placed with the help of separator placing plier. Dumbell separators (Fig 2) also known as Maxian separators<sup>6</sup> are just like a wide rubber band with thick, rolled edges). They are usually available in strips. Operator is required to cut it to the size for proper placement. These dumbbell separators are stretched apart, and are inserted into the interproximal area. Both Kesling (Fig 3), and Kansal separators (Fig 4), were made by the same operator. Kesling separator was made up of 0.016-in Australian wire as shown in the figure 3. Kansal separator was also fabricated using the same 0.016-in Australian wire. Using bird beak plier, the separator was placed from buccal aspect, and the connecting wire was pulled lingually. Patients and their respective parents were already informed about the possibility of pain and discomfort due to separator placement. All the patients were recalled daily for 5 days and time taken to achieve required separation was noted.

After a gap of 5 days after separator placement, amount of separation achieved was also recorded.

**Statistical analysis**

The amount of separation achieved by each separator was measured with a feeler gauge. The amount of separation was recorded and the duration to achieve required separation (0.2 mm) was also noted. Data thus obtained was subjected to statistical analysis. P<0.05 was considered to be statistically significant. Statistical analysis was done using SPSS software (SPSS Inc., version 15.0, Chicago, IL, USA).



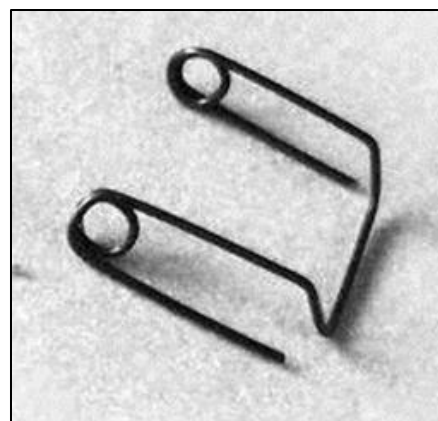
**Fig. 1:** Elastomeric separator



**Fig. 2:** Dumbbell separator



**Fig. 3:** Kesling separator



**Fig. 4:** Kansal separator

**Result**

**Table 1:** Amount of separation in different types of separators

S. No.	Separator Type	N	Mean±SD (mm)	P value
1	ELASTOMERIC	50	0.25 ± 0.72	P<0.05
2	DUMBELL	50	0.33 ± 0.80	
3	KESLING	50	0.24 ± 0.66	
4	KANSAL	50	0.16 ± 0.32	

**Table 2:** Time taken for adequate separation with different types of separators

S. No.	Separator Type	N	Mean±SD (days)	P value
1	ELASTOMERIC	50	3.51± 0.60	P<0.05
2	DUMBELL	50	2.39 ± 0.51	
3	KESLING	50	4.62 ±0.51	
4	KANSAL	50	4.71 ± 0.50	

The greatest amount of separation was seen with the dumbbell separator while the smallest separation was observed with Kansal separator (Table 1), and both were statistically significant (p<0.05). The result of the study showed that the amount of separation was significantly different between four type of separators - dumbbell, kesling, kansal and elastomeric. The mean separation was 0.33 mm for dumbbell, 0.25 for elastomeric, 0.24 for kesling and 0.16 mm for kansal (Table1). As molar band used has usually a thickness of 0.127 mm, 0.2 mm separation was decided to be optimal for placement of band. It was found that the time taken for required amount of separation was significant in all the 4 separators; dumbbell being the fastest followed by elastomeric separator. The mean of time taken for required separation was 2.39 days for dumbbell, 3.51 days for elastomeric separator 4.62 days for kesling and 4.71 days for kansal (Table 2).

**Discussion**

For placement of band over the teeth, separation of teeth is required. Not only for banding, the separation of teeth and hence placement of separator is also required to slice the

deciduous teeth to facilitate the eruption of partially impacted permanent teeth, to slice the teeth as a part of space gaining procedure, and also to provide restoration on a tooth which is positioned incorrectly in the arch.<sup>7</sup> Orthodontic separators works on wedge principal for separating teeth. Separation can be painful for some patient whereas no to mild pain are reported by some other

In the present study the amount of separation of elastomeric separator was 0.25 mm. This separation value is more than the earlier study done by Hoffmann.<sup>8</sup> 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. The result of present study was found to be similar to previous study done by Cureton and Ronald.<sup>9</sup>

In the present study, Dumbbell separators provided fastest and greater amount of separation than the elastomeric, kesling and kansal separator. However, dislodgment of dumbbell separators was found to be a big problem as compared to other separators. This was in agreement with the study done by Malagan M et al.<sup>10</sup> In the study, he found that the dumbbell separator provided fastest and more amount of separation than the other 4 types of separators. In our study, required amount of separation was achieved using elastomeric separator in 3.5 days but in a previous study done by Juneja et al<sup>11</sup>, elastomeric separator took 2 days after placement of separator for providing required amount of separation.

Elastomeric separator was second one in creating separation, Dumbbell being the first followed by the Kesling and Kansal separators, respectively. This finding was similar with the results of previous studies.<sup>12,13</sup>

Some of the previous studies<sup>14,15</sup> showed that amount of separation for band placement would be 0.25 mm at the contact area. Results of the present study showed that Elastomeric separators created adequate separation of 0.25 mm, while the Kansal separator showed inadequate separation (0.16 mm); on the other hand, the separation produced by the Kesling separators was found to be adequate (0.24 mm).

Both the Kesling and Kansal separators are usually made of same gauge of wire and their action is based on same principle of spring action. In spite of that kesling separator produced more separation than kansal which indicated that it is the design of kansal separator which is responsible for producing less amount of separation. The design of Kesling separator makes it more flexible and hence more separation is achieved with the use of kesling separator.

## Conclusion

Dumbbell separator showed maximum separation followed by elastomeric and kesling separators. Kansal separator

showed least amount of separation as compared to other three types of separators. On comparing time taken by all four separators for adequate separation, dumbbell separator took minimum time, followed by elastomeric and kesling separators. Kansal separator took maximum time among all four separators in the present study.

Further studies for evaluation of separation effects of different types of separators may be conducted taking into account other factors like gender, periodontal status and dietary pattern, for more objective assessment.

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