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Research Article

Assessment of Tip Surface of Gutta-Percha After Cutting with Various Techniques

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Abstract

Aim: The aim of this study was to analyze the tip surface of gutta-percha after clipping it with various techniques.

Materials and Methods: A total of 45 standardized gutta-percha cone size 25 were used in this study. The gutta-percha cones were divided into three groups of 15 samples each according to the cutting methods. In group I- scissor, Group II- Scalpel blade against glass slab, Group III- Tipsnip were used to cut off the segments. After cutting, the tip surface is examined under stereomicroscope for topographic deformity.

Results: According to the results, significant deformities in the topographic surface of gutta-percha standardized cones were found with scissor and sharp surgical blade whereas Tipsnip allowed the formation of smooth gutta-percha cone surface.

Conclusions: Results of this study recommended that the Tipsnips were the best method to cut gutta-percha cones efficiently than scalpel blade and scissor.

Keywords: Gutta-Percha; Clipped; Cones; Root Canal; Filling Materials; Tip Surface

Introduction

The most common approach used to obturate cleaned and shaped root canal include the use of solid cone of gutta-percha that are adapted into prepared area of the canal along with endodontic sealer cement [1,2].

The goal of endodontic root canal filling is to establish an acceptable fluid tight seal along the whole length of root canal system from coronal opening to apical terminus [3,4].

The filling material of root canal system must exploit the entire space of prepared root canal, developing an appropriate sealing coronally, laterally and apically. The obturation of the root canal system eradicate free space ensuring the status of disinfection obtained after canal preparation and declining the risk of re-infection [5,6].

Ingle recommended that instruments and root canal filling materials should be standardized, so that a cone manufactured to same size as last fitted instrument would then more closely approximate the canal wall. An absence of consistency and certainty in gutta-percha cones was also recorded by Mayne., *et al*. [1,7].

The ideal utilization of standardization would be to enlarge a root canal to a particular size and then select a corresponding size of gutta-percha point which would fit apically to become the perfect master cone [7,8].

In clinical applications, it has been observed that a few gutta-percha points come close to this ideal, while others does not. The possible reasoning for this deviation could be 1) that a desired size of gutta-percha points is unavailable in manufactured spectrum of

size 2) the points are not manufactured to proper size 3) points are not consistent within same size [7,8].

The design of gutta-percha is based on having similar size and taper as end file. There are variation existing between various brands of cone and disparities in the diameter of instrument and gutta-percha points of same size. Thus fitting of master cone is obtained after cutting the segment off the standardized gutta-percha points [5,9,10].

Gutta-percha cones with uneven cut may result in an improper master cone fit which leads to the prevention in the attainment of perfect apical seal. Cones are usually cut off using scissor, sharp surgical instruments, razor blade and the recent one being the Tipsnip [5,3].

This study aims at investigating gutta-percha cones tip surface after cutting them with three different methods.

Materials and Methodology

Forty-five gutta-percha standardized cones (Dentsply, Petropolis, Brazil) size 25 were used in this experiment.

Gutta-percha Cones were divided into three groups of fifteen samples each according to the cutting method. In Group I, the clipping of Gutta-percha cones were done at 5 mm from the tip by the use of a sharp surgical scissors. (Waldent, japan). In Group II, Gutta-percha cones were clipped at 5 mm from the tip with a sharp scalpel blade (Asculap, GermanyNo.15, against a glass slab (B D Iran).

In Group III, Gutta-percha cones were cut using Tipsnip (Sybronendo) ISO diameter 30 following manufacturer's instructions.

A stereomicroscope (Leica MZ75, Wetzlar, Germany) is used to assess the cut surface, where the cones were evaluated by three endodontists, according to the following criteria. The evaluations of cut surfaces were given by scores of 1 to 2, with 1 being the superior.

Cutting surface

- One plane present
- Two planes present

Flange

- Absence of flanges
- Appearance of one or more flanges

Burs

- Absence of burs
- Presence of burs

Results

The standardized gutta-percha cones were evaluated after three different cutting techniques exhibited different features. In group-I, the samples with cut surfaces of all samples showed two planes, one or more than one convergent flanges and burs (Figure 1). In group- II, gutta-percha cones showed one plane, flanges and burs (Figure 2). In group- III, Only One Plane and there was Absence of Flanges and Absence of Burs (Figure 3).

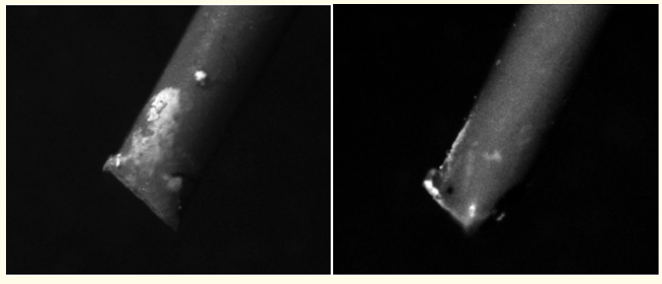

Figure 1: Stereomiroscopic images of Guttapercha cone Clipped using scissor.

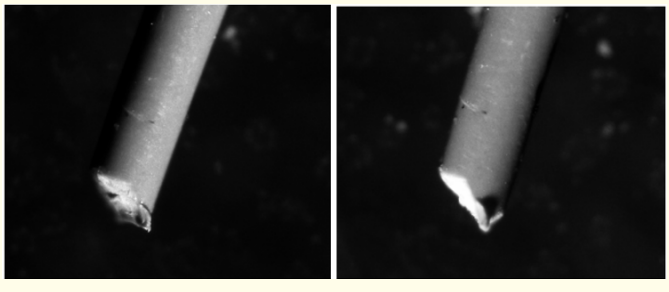

Figure 2: Stereomiroscopic images of Guttapercha cone clipped using scalpel blade against glass slab.

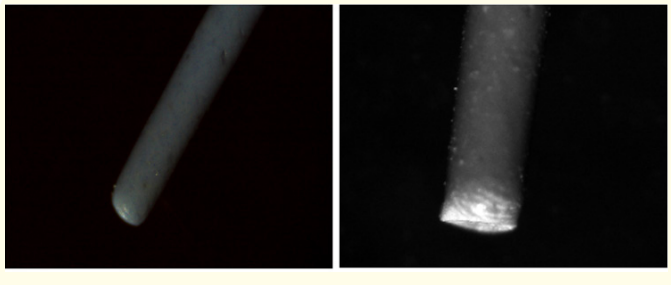

Figure 3: Stereomicroscopic images of Guttapercha cone clipped using Tipsnip.

Statistical Analysis

		Plane				F value	P Value
		Mean	Standard Deviation	Minimum	Maximum		
Group	Group 1	1.80	.42	1.00	2.00	9.439	0.001
	Group 2	1.20	.42	1.00	2.00		
	Group 3	1.10	.32	1.00	2.00		

Table 1: Means and standard deviations of various groups of planes.

		Flanges				F value	P Value
		Mean	Standard Deviation	Minimum	Maximum		
Group	Group 1	1.90	.32	1.00	2.00	15.088	< 0.001
	Group 2	1.80	.42	1.00	2.00		
	Group 3	1.10	.32	1.00	2.00		

Table 2: Means and standard deviations of various groups of flanges.

		Burs				F value	P Value
		Mean	Standard Deviation	Minimum	Maximum		
Group	Group 1	2.00	.00	2.00	2.00	36	< 0.001
	Group 2	2.00	.00	2.00	2.00		
	Group 3	1.20	.42	1.00	2.00		

Table 3: Means and standard deviations of various groups of burs.

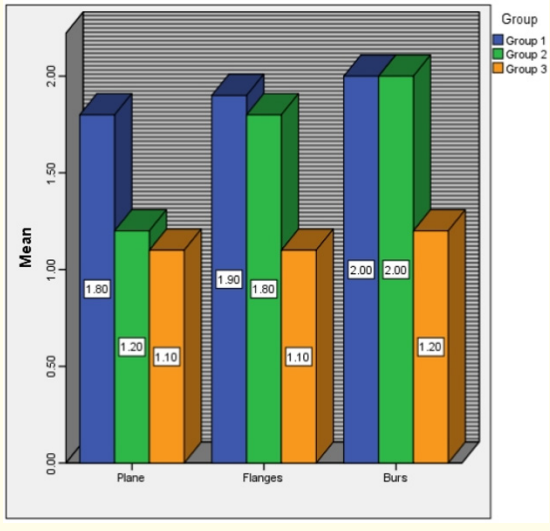

Figure 4: Means and standard deviations of various groups among planes, flanges and burs.

Discussion

Endodontic treatment is highly expensive and time taking procedure. Clinically, while selecting gutta-percha cones for obturation procedure, deviations can occur unexpectedly in tip diameter of the gutta-percha cone which can lead to frustration and time-consuming delays [1].

Clipping of gutta-percha cones is commonly essential during the master cone-fitting procedure. Discrepancies produced in the tip of the cone after clipping may apparently disrupt a better adaptation in the apical third of the root canal. As a result, compromised apical seal occurs with improper master cone adaptation in the root canal obturation [5].

The gutta-percha cones can be cut with various different technique, generally with the help of a calibrating device. Gauge is one of the various available devices in the market which demands an accessory appliance to make the calibrated cone cut. Scissors, scalpel blades and razor blades are the most commonly used appliance used to cut the gutta-percha cones. One of the modern devices which both calibrates and cuts the cone at the same time is the Tip-snip [3,11,12].

The shear stress in the transverse section of the cone makes the cut of gutta-percha cones and elastic compression of the material occurs as a result of the cutting process. Adjacent to the cut surface, fibers of the gutta-percha cones bend in a same direction as the movement applied to the cutting instrument. The cone is detached in two parts only when the applied pressure exceeds the elastic resistance of the material. While cutting, cone fiber bends causing plastic deformation in the entire cross-section [3,12].

This study showed significant differences in tip surfaces of cone after cutting with three different methods. In group- I which is cut by scissors, the cut surfaces of all samples showed two plane, one or more than one convergent flanges and burs. The shape of the scissor and plasticity of the cone are the factors that determine the degree of cone deformation during clipping. The most appreciable irregularities on the cone surfaces were observed in cut surface produced by scissors, with two converging planes in apical direction. Two different inclined planes are produced as the cone passes through the two blade surface of the scissors by the increase in load. Similar results have been reported, contraindicating the use of this method to cut the cones [12,13].

In group II, there was one Plane with the appearance of Flanges and Burs present. The plane surface of the glass slab decreased the plastic deformation of the cone while cutting with sharp surgical

instrument which forms shear stress in the cross section of gutta-percha. Hence, a plane surface cut produced by the sharp surgical blade against glass slab by the stress tension which is perpendicular to the direction of displacement of the instrument used to cut. This procedure is also recommended by other investigators. All detected samples showed an irregular cone surface formed by single cut of the cone using scalpel blade against the glass slab. While moving to edge of the cut with scalpel blade, the irregularity found to be more prominent; with the excess of gutta-percha associated between the cut surface of the blade and the glass slab [5,12,14].

In group III, there was Only One Plane and there was Absence of Flanges and Absence of Burs. The outcome of this study indicated that TipSnip is the finest method of cutting which obtains comparatively more regular tip surface on the gutta-percha cone after the cut. Rounding of the cone surface in the area where the cut was initiated while the opposite surface, where the cut is completed, is straight was also observed in samples cut with Tipsnip. However, there were no irregularities found at the tip surface and they were comparatively smooth. The only disadvantage of this method is the extra expenditure of this device.

Conclusion

The results of this study lead to the inference that, TipSnip, scalpel blade against glass slab and scissors are variable device which can be used for cutting off standardized gutta-percha cones. Thus, while selecting the best method for cutting tip surface of gutta-percha cones, professionals should consider the results, execution time, expenditure and practicality.

Conflict of Interest

The authors deny any conflicts of interest

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