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ORIGINAL RESEARCH

Comparative assessment of fracture resistance of teeth obturated with Gutta percha and Resilon

Sachin Chadgal[1], Tusev Thapa[2]

[1]Lecturer, Department of Conservative dentistry and Endodontics, Dental college Azamgarh (UP)
[2]Dental surgeon, Private practitioner, Jammu (J&K)

ABSTRACT:
Background: Root canal instrumentation followed by three dimensional obturation influences the success of endodontic treatment. Recently, a new filling material named Resilon was introduced. The present study was conducted with the aim of assessing and comparing the fracture resistance of teeth obturated with Gutta percha and Resilon. **Materials & methods:** A total of 50 freshly extracted mandibular first premolars were included in the present study. Cleaning of the extracted samples was done followed by storing in normal saline. All the specimens were divided into two groups with 25 specimens in each group as follows: Group GP: Canals were obturated with gutta percha and AH-plus sealer, and Group R: Canals obturated with Resilon points and Resilon sealer. The apical root ends were embedded individually in copper moulds with acrylic resin leaving behind the root end exposed. The blocks were mounted with the vertically aligned roots in the testing machine one at a time. Each specimen was subjected to load until the root fractured. The end point values were recorded. **Results:** Mean fracture load among specimens of group GP and group R was found to be 518.46 N and 793.49 N respectively. In the present study, while analysing statistically, it was seen that mean fracture load of specimens of group R was significantly higher in comparison to specimens of group GP. **Conclusion:** Resilon group showed significantly higher resistance to fracture in comparison to Gutta-percha group.
Key words: Gutta-percha, Resilon

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Corresponding author: Dr. Sachin Chadgal, Senior lecturer, Department of conservative dentistry and endodontics, Dental College Azamgarh

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INTRODUCTION

Root canal instrumentation, disinfection and three dimensional obturation are the main phases of endodontic therapy. Excessive dentin removal through instrumentation makes the root structure weaker and increases its potential to fracture. Most vertical root fractured teeth end up being extracted or if possible removal of the fractured root in the case of multi-rooted teeth occurs. Currently, there are two major conservative methods for tooth preservation including less possible intraradicular dentin removal and minimizing intracanal wedging forces. In addition, utilizing materials which can reinforce root tooth structure may be beneficial. The use of Gutta-percha and root canal sealers for obturating root canal has remained the standard of care in endodontics from a long time and despite their inability to routinely achieve an impervious seal along with the dentinal wall of the root canal.[1, 2]

Recently, a new filling material named Resilon (Pentron Clinical Technologies, Wallingford, CT) was introduced. According to the literature, this material may create a solid "monoblock", when used with its sealer, Epiphany SE, and reinforce the root structure.[3-5] Resin-based dental materials have been proposed to reinforce an endodontically treated tooth through the use of adhesive sealers in the root canal system. However, bonding agents and resins studied to date as root filling materials had problems in working properties, radiopacity and lack of re-treatability when used for endodontic purposes.[6] Hence; the present study was conducted with the aim of assessing and comparing the fracture resistance of teeth obturated with Gutta percha and Resilon.

MATERIALS & METHODS

The present study was conducted with the aim of assessing and comparing the fracture resistance of teeth obturated with Gutta percha and Resilon. A total of 50 freshly extracted mandibular first premolars were included in the present study. Cleaning of the extracted samples was done followed by storing in normal saline. Carious tooth, deformed tooth and tooth with presence of structural anomaly were excluded. Disinfection of the specimens was done with sodium hypochlorite solution. Sectioning of the specimens was done at the point of cement-enamel junction. Root length was established by manually inserting #15 K-files (Dentsply Maillefer, Tulsa, Ok, USA) into the canals, until the file tip was visible at the apical foramen. Working length was determined 1.0 mm shorter than real root canal length. Canal preparation was carried out with stainless steel files to a #40 K-file as a master apical file, then #2 and 3 gates glidden drills (Dentsply, Maillifer, Switzerland) were used to widen the coronal two third. Patency was obtained with a #10 K-type file. Canals were irrigated with 10 mL of 5.25% NaOCl. To remove the smear layer, 3 mL of 17% EDTA (Prevest Denpro, India) were introduced and allowed to remain in the canals for 3 minutes. Then, a final flush 1 mL of 5.25% NaOCl followed by 5 mL of normal saline was performed. The prepared canals were then dried with sterile paper points. All the specimens were divided into two groups with 25 specimens in each group as follows:

Group GP: Canals were obturated with gutta percha and AH-plus sealer.

Group R: Canals obturated with Resilon points and Resilon sealer.

Obturation in both the groups were done according to manufacture instructions using cold lateral condensation method.

All prepared teeth were vertically set in self-cure acrylic resin within the rings that had height of 20 mm and diameter of 40 mm. The apical 8 mm of each root was kept exposed. After 24 hours, the acrylic resins were set and the blocks were stored in 95% humidity before mechanical tests. Universal testing machine was used for mechanical examination. The upper part of the machine housed a round tip of 4 mm diameter that was placed in contact with the occlusal surface of the sample. Compressive loading was applied at a crosshead speed of 1 mm/min until fracture occurred. The measured value at fracture, which was recorded as fracture strength of specimen, was recorded in Newtons (N). All the results were recorded in Microsoft excel sheet and were analysed by SPSS software. Mann-Whitney U was used for evaluation of level of significance.

RESULTS

All the specimens were divided into two groups with 25 specimens in each group as follows: Group GP: Canals were obturated with gutta percha and AH-plus sealer, and Group R: Canals obturated with Resilon points and Resilon sealer. Mean fracture load among specimens of group GP and group R was found to be 518.46 N and 793.49 N respectively. In the present study, while analysing statistically, it was seen that mean fracture load of specimens of group R was significantly higher in comparison to specimens of group GP.

Table 1: Comparison of mean fracture load

Group	Mean Fracture load (Newton)	U- value	p- value
GP group	518.46	129.46	0.00 (Significant)
R group	793.49		

DISCUSSION

Success of endodontic treated tooth fully relies on the root canal sealing material which ensures a good seal and repair of the periapical area. As per many studies endodontically treated teeth are widely considered to be more susceptible to fracture than are vital teeth. The reasons most often reported have been the water loss and loss of collagen cross-linking, excessive pressure during obturation procedure and the removal of tooth structure during endodontic treatment.[7- 9] An ideal root canal filling material should be able to reinforce and strengthen a weakened root structure against fracture in addition to sealing the canal. Although, gutta-percha as an endodontic root filling material is the golden standard, limitations such as coronal microleakage and inability to reinforce endodontically treated roots have led to the introduction of some new products.[10] The novel Resilon/Epiphany obturation system creates a chemical bond with root canal structure that is maintained over time; therefore, could a better option than gutta-percha.[11] Hence; the present study was conducted with the aim of assessing and comparing the fracture resistance of teeth obturated with Gutta percha and Resilon.

In the present study, while analysing statistically, it was seen that mean fracture load of specimens obturated with Resiilon (group R) was significantly higher in comparison to specimens filled with Gutta Percha (group GP).The results obtained are in agreement with some previous studies.[12-14] Resilon is a synthetic polymer, and thus, resin sealer attaches to it as well as to bonding agent or primer. Furthermore, primer penetrates easily into dentinal tubules, creating a monoblock (consisting of Resilon core material, resin sealer, bonding agent/primer and dentin).[15] This could be the reason for better fracture resistance of Resilon/Epiphany system.

CONCLUSION

Within the limitations of the present *in vitro* study, it can be concluded that Resilon has better fracture resistance than gutta percha in endodontically treated teeth.

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