



COMPARATIVE EVALUATION OF TIME TAKEN TO RETRIEVE GP USING TWO DIFFERENT RETREATMENT FILES IN ROOT CANAL TREATED TEETH - AN IN VITRO STUDY

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Abstract

Objective: Non surgical retreatment is considered as an conservative option over periapical surgery in case of persistent infections. Retreatment procedures should be performed faster and efficiently with appropriate instruments. The main objective of this study is to compare the time taken by two different rotary instruments in retrieving endodontic material from the root canal and to assess the amount of remaining gp on the root canal wall.

Materials and Methods: A total of sixty extracted single rooted teeth were taken. Cleaning and shaping was done using Step Back technique by maintaining the master apical file size 40. Irrigation was done using 3% NaOCl and 17% EDTA to remove the smear layer. Paper points were used to dry the canals. Obturation was done using lateral compaction technique with sealer being AH plus. The teeth were divided into two groups: Group I- Protaper universal retreatment files and Group II- Solite RS3 files. Stop clock was used to measure the time taken to retrieve the Gp and CBCT was used to assess the remaining gp on the root canal wall. Independent t test was used to check the statistical significance.

Results: It can be inferred from the results that comparatively more time was taken by Solite RS3 files over protaper universal files in retrieving the gp. However, there is no significant difference between the files ($p < 0.05$).

Conclusion: Hence it can be concluded within the limitations of the study that Solite RS3 files have taken less time to retrieve the gp compared to protaper universal files.

Keywords: Guttapercha, Protaper Retreatment files, Retreatment, Retrieval, Root canal, Solite RS3

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1. Introduction

The success of root canal treatment depends on a three dimensional fluid tight seal of the root canal system. The success of root canal treatment ranges from 86-98%. The factors that necessitate retreatment are improper apical seal which can lead to micro leakage, residual pulpal tissue, inadequate debridement, missed canals and improper obturation (Paradkar et al. 2022). Non surgical retreatment is always preferable compared to surgical re-intervention. During this procedure, it should be ensured that the obturating material is completely removed from the canal to pave way for the irrigants and intracanal medicaments to flow into the canal intricacies (Prasad et al., n.d.).

Another important aspect of retreatment is to entirely remove the endodontic material from the root canal system for accomplishing the objectives of endodontic treatment. The clearance of endodontic material from the root canal wall is of utmost importance to ensure proper disinfection of the root canal system and retreatment. Hence it is important to clear the root canal wall completely of the endodontic material. Numerous devices have been employed to retrieve the obturating material. Rotary NiTi files have been superior to conventional files in terms of laboriousness and achieving a tapered preparation.

Retrieval of the obturation material can be done mechanically using hand instruments and rotary instruments or chemically using gp solvents or physically using heat and ultrasonic instruments. Thermal, mechanical or chemical means or combination of three can influence the time taken for retrieval of gp (Garg et al. 2015). According to previous studies, rotary instruments comparatively take less time to retrieve the gp than hand instruments. This can be attributed to the speed of the rotary instruments. There are many studies published on the effectiveness of rotary instruments in retrieving the gp (Garg et al 2015, Alakabani et al, 2018). The most commonly used retreatment NiTi instruments are Protaper universal files (Garg et al. 2015; Indi et al. 2022; Alakabani, Faus-Ll acer, and Faus-Matoses 2018).

Protaper universal files come in three different lengths, diameters and unique taper in a sequential manner to retrieve gutta percha (Ali et al. 2019). The present study aims to test the effectiveness of a novel retreatment file- Solite RS3 retreatment files. Solite RS3 files are different from protaper universal files in that they are heat treated. They also come in three different lengths, three different tapers and three different colours for easy identification. They are flexible to conform to the contours of the canal and

retrieve the gp without inadvertently removing the root canal dentin.

The main aim of this study is to comparatively evaluate the time taken to retrieve the gp using protaper universal files and Solite RS3 files and to assess the amount of remaining gp on the root canal wall.

2. Materials and Methods

Specimen preparation

Sixty freshly extracted single-rooted teeth with completely formed apices were selected for the study. Ethical clearance (SRB/SDC/ENDO-2067/19/007) was obtained from the Institutional Ethical Committee. Inclusion criteria for the tooth selection were single canal, absence of fractures or cracks, signs of internal or external resorption and a canal curvature of $<15^\circ$. The teeth were verified with digital radiography in a buccolingual and mesiodistal direction to ensure the presence of a single straight canal. The teeth were then decoronated with a diamond disk and the teeth were standardized to 18 mm.

Root canal preparation

Teeth were divided into two groups. Endodontic access cavity preparation was made and a glidepath was created using #10 k-file. Cleaning and shaping was done using Step Back technique by keeping the master apical file size 40. Irrigation was done using 3% NaOCl and 17% EDTA to remove the smear layer. The drying of the root canal was done using paper points. Obturation was done using lateral compaction technique with AH plus sealer. Upon completion of the obturation, all the teeth were sealed using composite resin and maintained in the humid environment.

Gutta percha retrieval

After one week of obturation, the teeth were subjected for retreatment using protaper retreatment files and Solite RS3 retreatment files under the groups assigned. No chemical solvents were used. The root canals were intermittently irrigated with 3% NaOCl during gp retrieval and the final rinse was made with saline solution. The retreatment preparation was assessed by taking digital radiographs to assess for any remnants of obturating material or sealer. The time taken to retrieve the gp was recorded on a stop clock. The amount of remaining gp was also assessed by taking cbct.

Statistical analysis

The time taken for retrieval of endodontic material by every group was documented on an excel sheet. The data were statistically analyzed using SPSS version 23.0 software. To assess the significance

Independent t test was performed, $p < 0.05$ was considered to be statistically significant.

3. Results

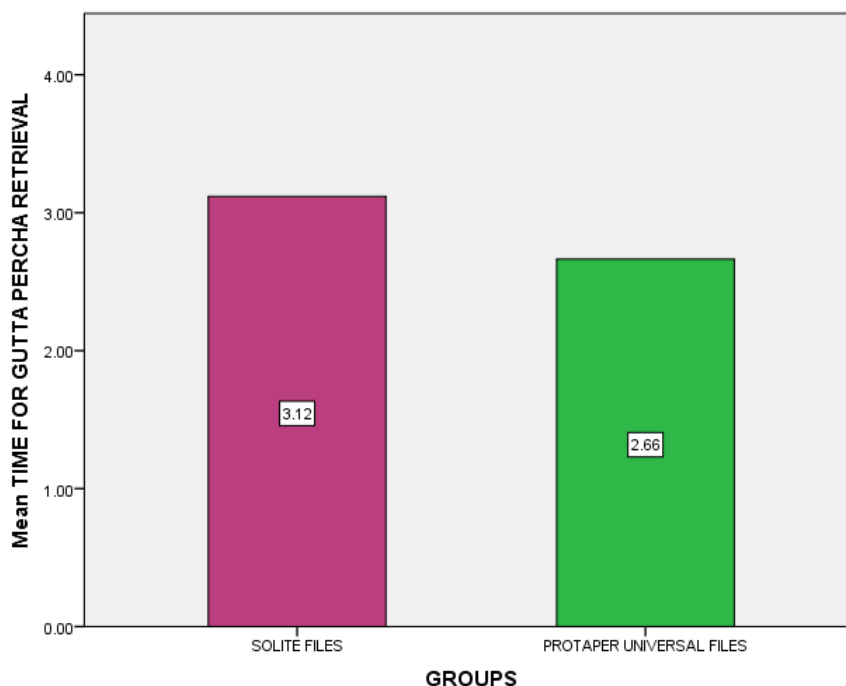


Figure 1: The bar graph depicts the mean time taken for gp retrieval using solite and protaper universal files.

GROUPS	SAMPLES	MEAN +/- STANDARD DEVIATION	p VALUE
Solite files	10	3.1+/- 0.6	0.7
Protaper universal files	10	2.6+/- 0.1	

Table 1: The table shows the mean and standard deviation values of solite and protaper universal files of the total time taken to retrieve the gp.

4. Discussion

Endodontic failure can be attributed to various factors such as inadequate debridement, inadequate obturation and missed canals. This can lead to postoperative complications such as pain which warrants retreatment (Simon and Pertot 2019). Non surgical retreatment is always preferable as it is less invasive than surgical intervention. Endodontic retreatment has replaced endodontic surgery in eliminating persistent periapical infection (Rodrigues et al. 2016).

Many studies were published previously comparing the effectiveness of different file systems in retrieving the obturating material (Saad, Al-Hadlaq, and Al-Katheeri 2007; Taşdemir et al. 2008). Previous studies followed certain methodologies

like using chemical solvents to retrieve gp, clearing techniques to render them transparent, two dimensional digital radiography to ensure complete removal of gutta percha (Schirmeister et al. 2006; Horvath et al. 2009).

Solvents were not used in this study, as its use could lead to misleading results as various studies reported with large amounts of endodontic material remaining and sealer on the walls of root canal when solvents were used during retreatment procedure (Alberto Rubino et al. 2018)(Schirmeister et al. 2006; Horvath et al. 2009). Also it has been reported that there could be uncertainty in determining the working length when solvents are being used as it may further irritate the periapical tissues (Dotto et al. 2021).

Conventional radiographs, Cbct, microcomputed CT and longitudinal sectioning are the recommended methods to evaluate the remaining obturating material. In this study, cbct was used to assess the complete retrieval (Zhang et al. 2021). The time taken to retrieve the gp was recorded using stopwatch. Rotary instruments are preferred over hand instruments in retreatment as they plasticise the Gp due to friction thus enabling easy retrieval. Rotary instruments also tend to reduce the operator fatigue, working time and also help to maintain the canal shape (Schirrmeister et al. 2006).

In the present study, Protaper universal retreatment files and a novel file named SoliteRS3 retreatment file were used. Solite retreatment files come in three different tapers, lengths and three different colour codings for easy identification. The three files are RS1, RS2 and RS3 in blue, red and yellow respectively. RS2 and RS3 files are heat treated which enable them to flex through the canal systems. The results of the present study show that solite files have comparatively taken more time than protaper universal files. However there is no significant difference between the results. The reason can be attributed to the flexibility of the files and their lesser stiffness due to heat treatment which could not enable the obturating material to be retrieved faster.

5. Conclusion

The limitations of the current study were limited sample size, single rooted teeth and in vitro study. Within the limitations of the study, there is no significant difference between the two files in terms of time taken to retrieve the gp and the amount of remaining gp.

6. References

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