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Original Research

Assessment of cyclic fatigue resistance of different reciprocating files systems

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ABSTRACT:

Background: The use of stainless steel hand files and H and K-files were the conventional shaping method. The present study was conducted to assess cyclic fatigue resistance of reciprocating files systems. **Materials & Methods:** The present study was conducted in the department of Endodontics. Wave One Gold files (Group I) size 25 taper 0.07 and Reciproc files (Group II) size 25 taper 0.04 were used. The files were tested in artificial 600 curved canals on machined metal block. The time required to fracture the file was recorded in both files systems. **Results:** In group I, wave one gold files (Group I) size 25 taper 0.07 and in group II, Reciproc files (Group II) size 25 taper 0.04 were used. The time for fracture of wave one gold files file system was 76.3 seconds and for Reciproc file system was 120.4 seconds. The difference was significant ($p < 0.05$). **Conclusion:** Authors found that Reciproc is more resistant to cyclic fatigue than Wave One. The time required by Reciproc file system to fracture is more compared to Wave one.

Key words: Reciproc, file system, Wave One.

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INTRODUCTION

Evolution of endodontic shaping instruments has occurred over time, which has proven to be beneficial for maximizing debridement and decreasing procedural errors. The use of stainless steel hand files and H and K-files were the conventional shaping method.¹ These hand files were replaced by rotary systems. This was because of their troublesome use when shaping curved canals and owing to several disadvantages, including both rigidity that may cause many iatrogenic errors (transportations, ledges, and zipping) and the tendency to result in lengthy root canal treatment procedures.²

NiTi rotary instruments are popular among clinicians because of their high flexibility and elasticity when compared with stainless steel files.³ Nickel-titanium (NiTi) file fracture during root canal preparation is one of the most frequently seen complications. Removing the fractured segment of the file, which is inside the root canal, is usually a difficult process, and the amount of residual dentin tissue significantly decreases while taking the instrument outside the canal. As a result, the prognosis of endodontic treatment might be negatively

affected. Cyclic fatigue occurs when all parts of NiTi file rotates continuously in the curved root canal. At that point, flexion and tension cycles occur until file is broken.⁴ The present study was conducted to determine cyclic fatigue resistance of reciprocating files systems.

MATERIALS & METHODS

The present study was conducted in the department of Endodontics, Jaipur Dental College, Jaipur. The study protocol was approved from institutional ethical committee. Wave One Gold files (Group I) size 25 taper 0.07 and Reciproc files (Group II) size 25 taper 0.04 were used. The files were tested in artificial 600 curved canals on machined metal block. Files were placed into artificial root canal without exerting any pressure to the hand piece. Working length of files was adjusted to 20 mm with Endoblock. Each file rotated continuously with 350 rpm speed and 2.5Ncm torque until the file was fractured. The time required to fracture the file was recorded in both files systems. Results were tabulate and subjected to statistical analysis. P value less than 0.05 was considered significant.

RESULTS

Table I Distribution of file systems

Groups	Group I	Group II
Files system	Wave One Gold files	Reciproc files

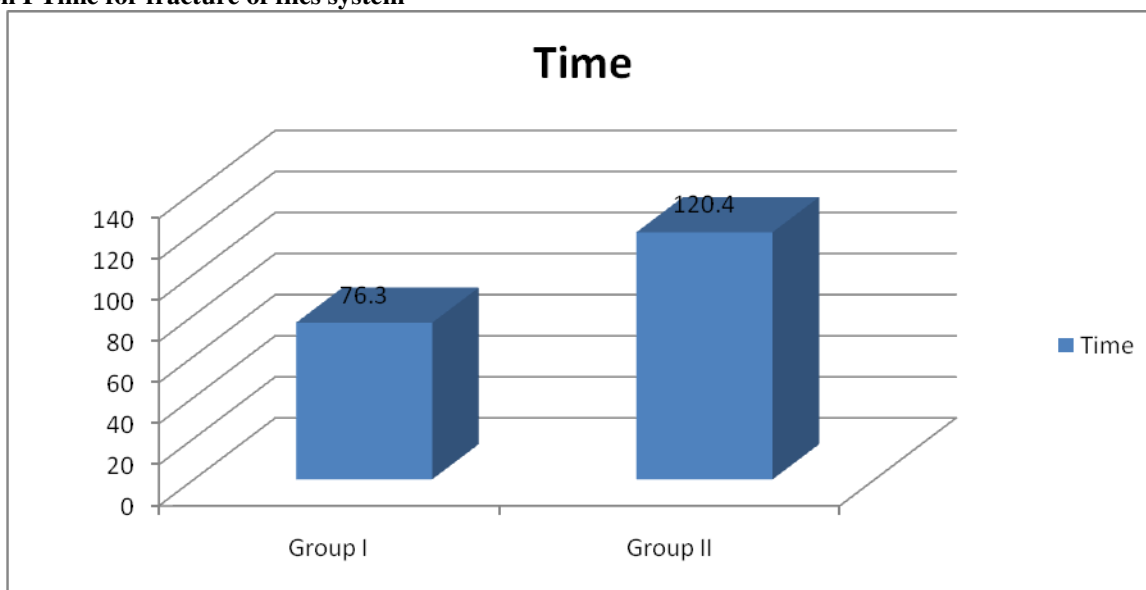
Table I shows that in group I, wave one gold files (Group I) size 25 taper 0.07 and in group II, Reciproc files (Group II) size 25 taper 0.04 were used.

Table II Time for fracture of files system

Groups	Group I	Group II	P value
Time (Seconds)	76.3	120.4	0.001

Table II, graph I shows that time for fracture of wave one gold files file system was 76.3 seconds and for Reciproc file system was 120.4 seconds. The difference was significant ($p < 0.05$).

Graph I Time for fracture of files system



DISCUSSION

Reciproc and Wave One Gold are a new generation single-file systems that have recently been introduced and used in the market.⁵ Both file systems have reciprocating motion. RPC files have an S-shaped cross-section, two cutting edges and a non-cutting tip. A novel aspect of the new Wave One Gold file system is the molecular structure of the files. A new type of heat treatment, which increases the cyclic fatigue resistance of the files named M wire technology. The M-wire Technology promises to improve resistance to cyclic fatigue and increases flexibility, counts as one of these renovations.⁶ The present study was conducted to determine cyclic fatigue resistance of reciprocating files systems.

In this study, in group I, wave one gold files (Group I) size 25 taper 0.07 and in group II, Reciproc files (Group II) size 25 taper 0.04 were used. Gambarini et al⁷ evaluated the cyclic fatigue resistance of two different Ni-

Ti reciprocating rotary files Wave One Gold and Reciproc at angle of 60 degrees in a metal block. This study was performed on 7 files in each group including Wave One files 25/07 (Group 1) and Reciproc R25/08 files (Group 2). The files were tested in artificial 600 curved canal on computer numerical control (CNC) machined metal block. Each file rotated in a reciprocated motion with 350 rpm speed and 2.5 Ncm torque until files were fractured. The time elapsed during rotation were recorded and the length of fractured part of the instruments measured for each file. The time periods and the length of the fractured parts of the instruments in each group: Group1 Wave one Gold #25 10:07±0.56 sec (n=7); Group 2 Reciproc #25: 09:02±0.36 sec/(n=7). No significant difference was observed between cyclic fatigue of Group1 Wave one Gold #25 and Group 2 Reciproc #25. No significant differences between groups were apparent regarding length of the fractured part.

We found that time for fracture of wave one gold files file system was 76.3 seconds and for Reciproc file system was 120.4 seconds. The difference was significant ($p < 0.05$). Alsilani et al⁸ in their study found that the time to fracture for the Reciproc and Wave One systems ranged from 119.7 sec to 156.4 sec and 74.8 sec to 99.6 sec, respectively. The pooled difference in mean time to fracture was longer for the Reciproc system by 45.6 sec. This difference was statistically significantly at P value < 0.001 .

De-Deus et al⁹ evaluated the amount of apical extruded dentin and found that there were no significant differences between the two reciprocating instruments. In regards to postoperative pain and analgesic intake, there was no significant difference between Reciproc and Wave One systems. In addition, reciprocating systems also showed no significant difference when compared to continuous rotation systems.

Froata et al¹⁰ conducted a study in which eighty instruments from the ProTaper Universal, Wave One, MTwo, and Reciproc systems ($n = 20$) were submitted to dynamic bending testing in stainless-steel simulated curved canals. Axial displacement of the simulated canals was performed with half of the instruments ($n = 10$), with back-and-forth movements in a range of 1.5 mm. Time until fracture was recorded, and the number of cycles until instrument fracture was calculated. Cyclic fatigue resistance was greater for reciprocating systems than for rotary systems ($P < 0.05$). Instruments from the Reciproc and Wave One systems significantly differed only when axial displacement occurred ($P < 0.05$). Instruments of the ProTaper Universal and MTwo systems did not significantly differ ($P > 0.05$). Cyclic fatigue and torsional resistance were greater for reciprocating systems than for continuous rotary systems, irrespective of axial displacement.

CONCLUSION

Authors found that Reciproc is more resistant to cyclic fatigue than Wave One. The time required by Reciproc file system to fracture is more compared to Wave one.

REFERENCES

1. Ferreira F, Adeodato C, Barbosa I, Aboud L, Scelza P, Zaccaro Scelza M. Movement kinematics and cyclic fatigue of NiTi rotary instruments: a systematic review. *Int Endod J* 2016;50:143–52.
2. Parashos P, Messer HH. Rotary NiTi instrument fracture and its consequences. *J Endod* 2006;32:1031–43.
3. Plotino G, Costanzo A, Grande NM, et al. Experimental evaluation on the influence of autoclave sterilization on the cyclic fatigue of new nickel-titanium rotary instruments. *J Endod* 2012;38:222–5
4. Lopes HP, Elias CN, Vieira MV, Siqueira JF, Mangelli M, Lopes WS. et al. Fatigue life of Reciproc and Mtwo instruments subjected to static and dynamic tests. *J Endod* 2013;39:693–6.
5. Champa C, Divya V, Sreirekha A, Karale R, Shetty A, Sadashiva P. An analysis of cyclic fatigue resistance of reciprocating instruments in different canal curvatures after immersion in sodium hypochlorite and autoclaving: An in vitro study. *Journal of conservative dentistry: JCD*. 2017 May;20(3):194.
6. Peters OA. Current challenges and concepts in the preparation of root canal systems:a review. *J Endod* 2004;30:559–67.
7. Gambarini G, Grande NM, Plotino G, Somma F, Garala M, Luca MD, AndLuca Testarelli, Fatigue Resistance of Enginedriven Rotary Nickel-Titanium Instruments Produced by New Manufacturing Methods. *JOE* 2008;34(8).
8. Alsilani R, Jadu F, Bogari DF, Jan AM, Alhazzazi TY. Single file reciprocating systems: A systematic review and meta-analysis of the literature: Comparison of reciproc and WaveOne. *Journal of International Society of Preventive & Community Dentistry*. 2016 Sep;6(5):402.
9. De-Deus G, Neves A, Silva EJ, Mendonca TA, Lourenco C, Calixto C, et al. Apically extruded dentin debris by reciprocating single-file and multi-file rotary system. *Clin Oral Investig*. 2015;19:357–61.
10. da Frota MF, Espir CG, Berbert FL, Marques AA, Sponchiado-Junior EC, Tanomaru-Filho M, Garcia LF, Bonetti-Filho I. Comparison of cyclic fatigue and torsional resistance in reciprocating single-file systems and continuous rotary instrumentation systems. *Journal of oral science*. 2014;56(4):269-75.