

# Comparison of the cyclic fatigue resistance of 3 rotary endodontic systems made from nickel titanium M Wire, CM Wire and Phase R.

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## INTRODUCTION

The main objective of root canal treatment is the disinfection and shaping the root canal system , and then make the filling , in recent years has been remarkable the influence that technology has had on the practice of endodontics and introduced instrumental, equipment and new materials . Rotary instruments made of nickel titanium have been one of these great advances; Nickel Titanium is a metal alloy with unique characteristics and properties. The main features of this alloy are that it has two crystallographic forms, martensite (strong and hard) and austenite (soft and ductile). these give the properties of shape memory is the ability to recover its original shape after undergoing large deformation by heating , and the super-elasticity is the ability to return to its original shape after removal of the applied load.



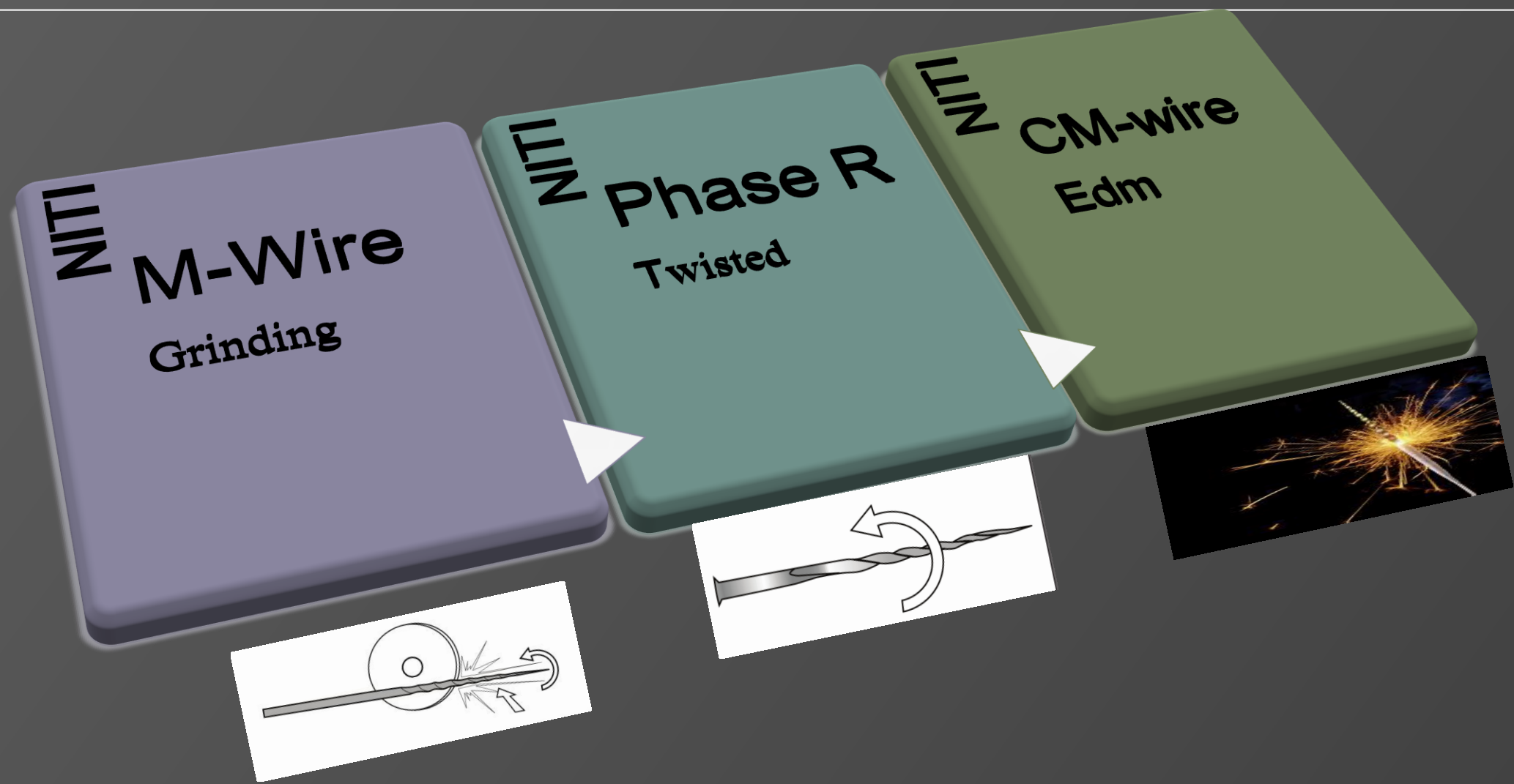
Yet accidents continue to happen in clinical practice as breaking files into the canal, these can happen for two reasons, cyclic fatigue fracture and torsional stress. It is for this reason that new designs (taper shape, cross-section, the heat treatment applied to nickel-titanium manufacturing process) and alloys and different motions have been introduced to increase the cyclic fatigue resistance of nickel-titanium files.



## AIM



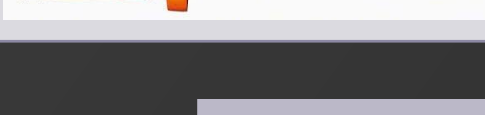
Compare the resistance to cyclic fatigue of three rotary systems nickel titanium endodontic manufactured with different heat treatments (M-Wire, Phase R and CM-Wire)

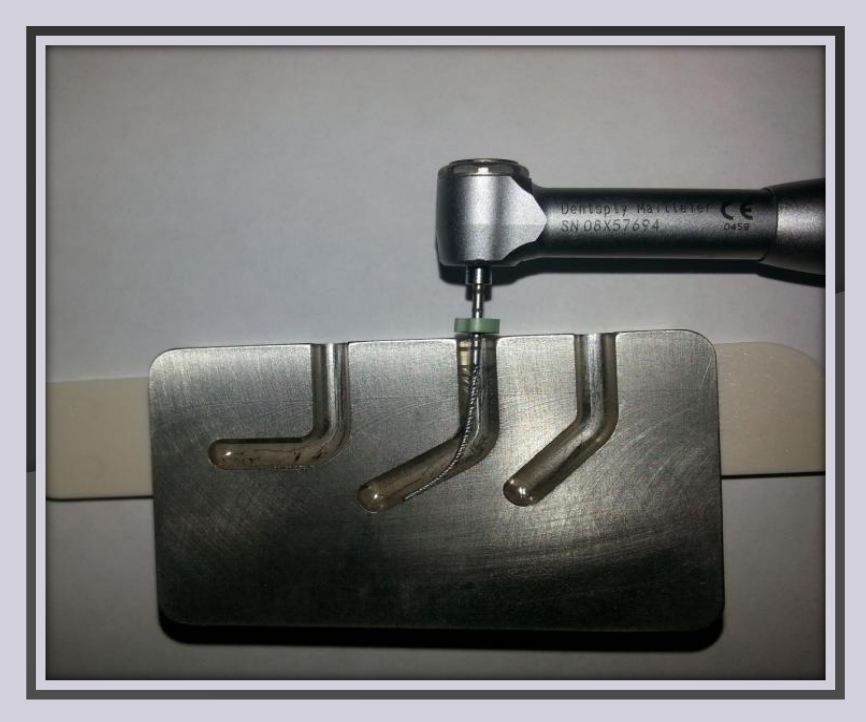
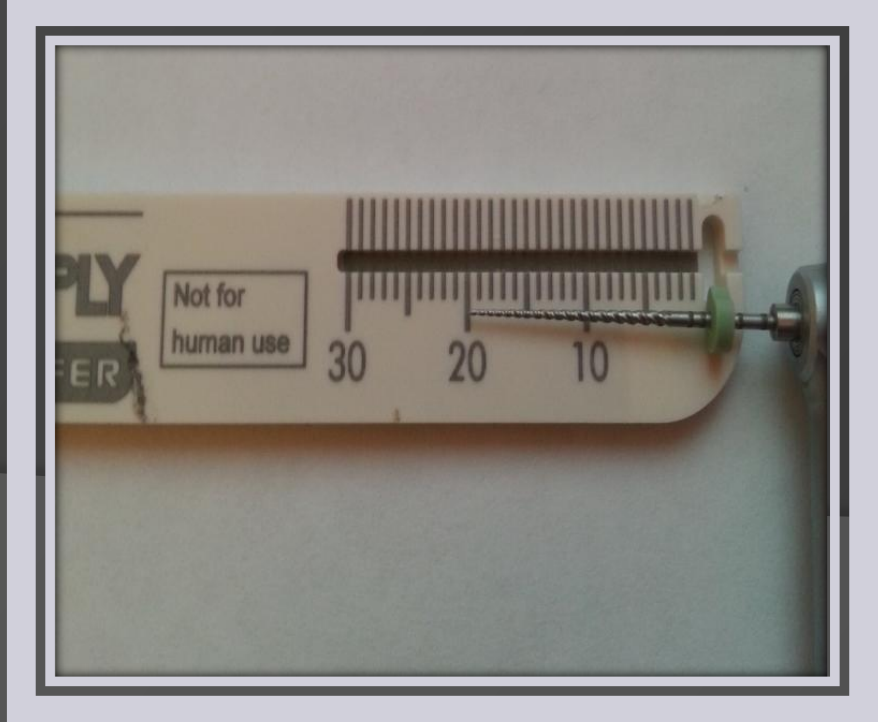
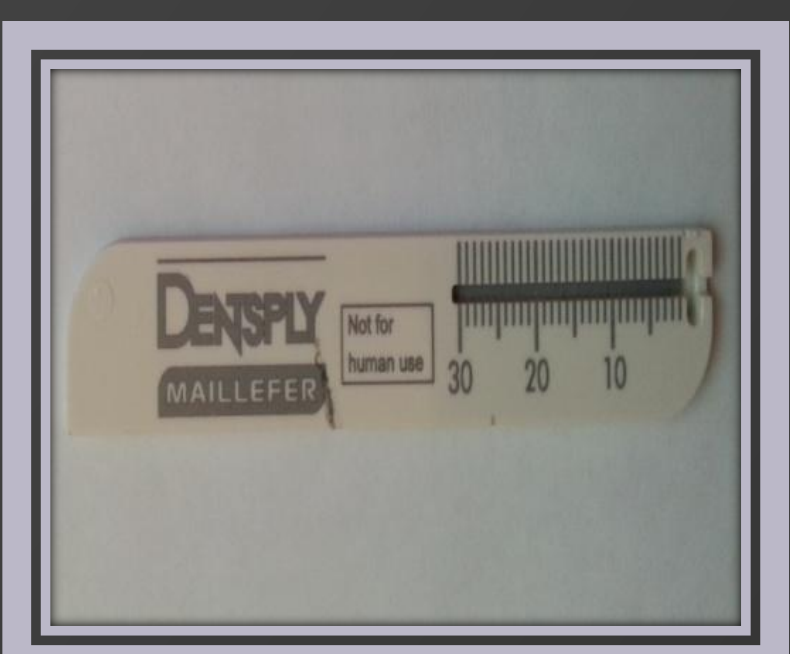
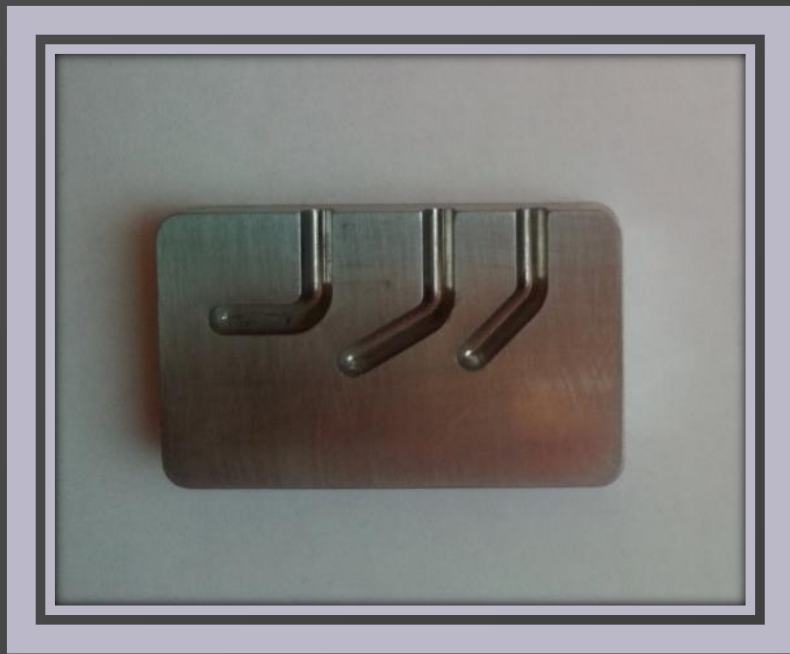
•To study the influence of the manufacturing process (grinding, twisted and EDM) on cyclic fatigue resistance of these instruments



## Materials and Methods

60 files of nickel titanium were utilized, 20 files Protaper Universal (Dentsply Maillefer, Ballaigues, Switzerland)® , 20 files HyFlex CM (HyFlex; Coltene Whaledent, Cuyahoga Falls, OH)® and 20 files twisted file (SybronEndo, Orange, CA)®, all of 25 caliber and 0.06 of taper, one artificial canal fabricated in a block of stainless steel, with a length of 18 mm, radius of 3 mm and curvature of 60 grades, using an endodontic motor (maillefer, Dentsply) with a continuous rotation of 350 RPM, the time of fracture was measured using a digital stopwatch counting from the start of the rotation to the fracture of the file. The canal was lubricated with glycerin to reduce the friction and minimize over-heating. The total number of cycles was calculated multiplying the speed of rotation by the time of fracture

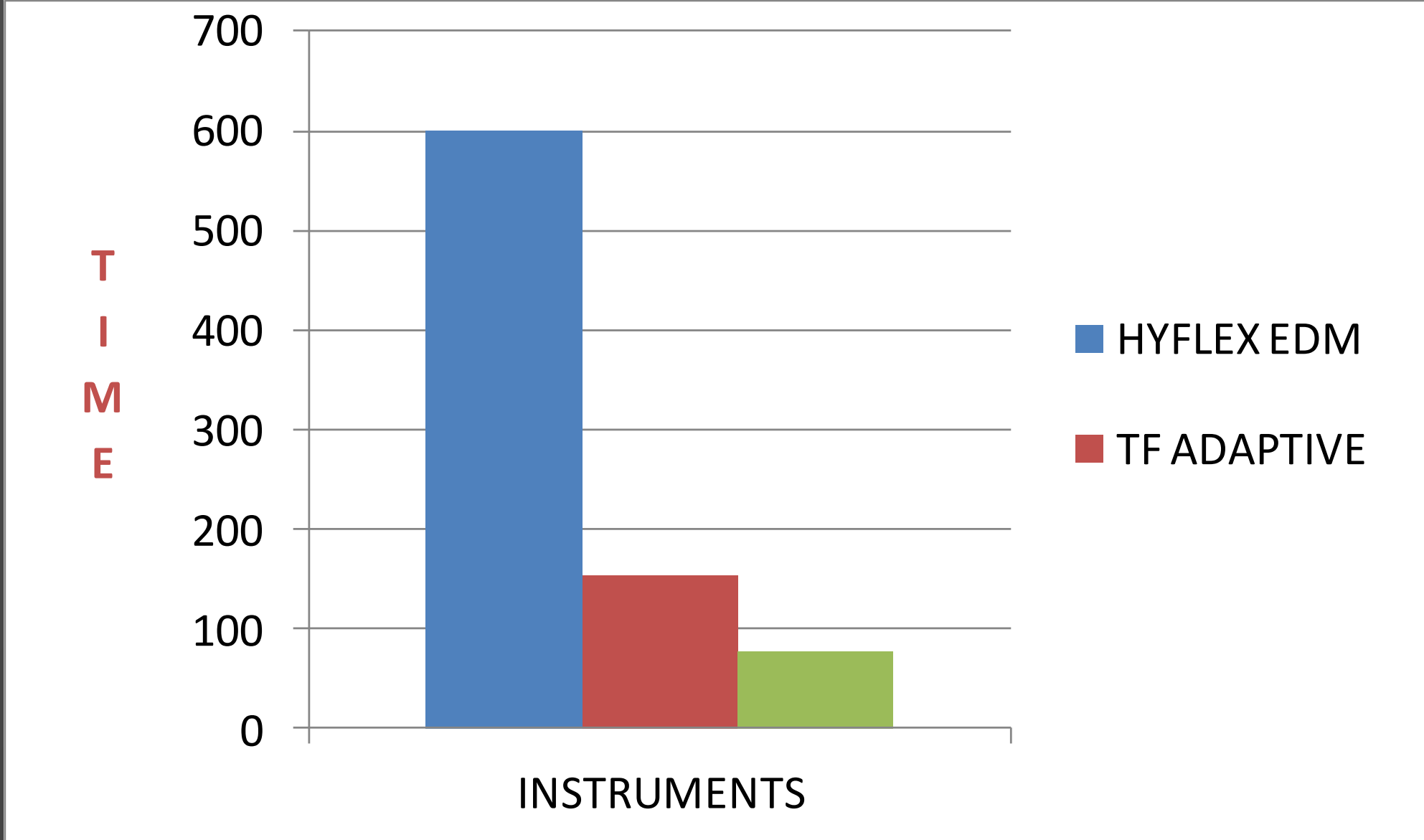
SISTEM	DIAMETER	HEAT TREATMENT	MANUFACTURING PROCESS	
PROTAPER NEXT	25	M-WIRE	GRINDING	
TF Adaptive	25	PHASE R	TWISTED	
HYFLEX EDM	25	CM-WIRE	EDM	



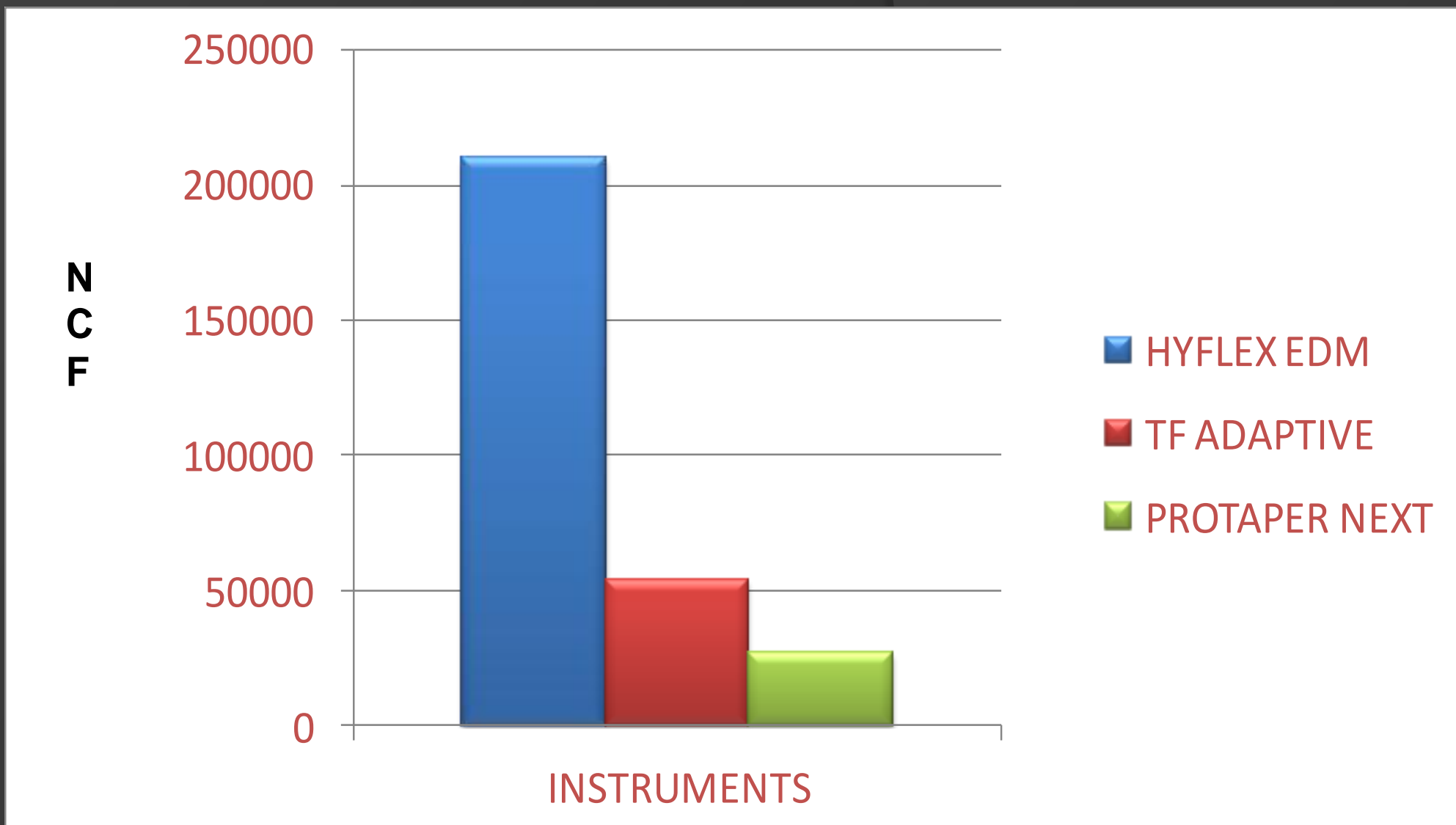
NCF (number of cycle to fracture)= RPM x TIME (seconds)

## RESULTS

Instruments	Protaper Next	TF Adaptive	Hyflex EDM
Time (seconds)	77,25	153,66	600



Instruments	Protaper Next	TF Adaptive	Hyflex EDM
NCF	27037,5	53781	210000



## DISCUSSION

- **Pereira y cols (2012)**  
NITI M-wire > NITI conventional
- **Plotino G, Y Cols (2014)**  
The new manufacturing process of HyFlex CM- WIRE increases resistance to cyclic fatigue fracture compared to ProTaper next and Revo - s
- **Grande n m y cols. (2006)**  
Previous studies have show that that the time of fracture is affected by the radius and angle of curvature.
- **Gabardine y cols. (2010)**  
advances in technology NITI and thermal treatments applied to the alloy , offer greater flexibility instrument .
- **Yum j. y Cols. (2012)**  
K3 xf made NITI phase R and manufactured by torsion showed increased resistance to cyclic fatigue compared com K3 conventional NITI.

## CONCLUSIONS

- HyFlex EDM files the showed greater resistance to cyclic fatigue, compared to the Protaper Next files and TF adaptive systems.
- The heat treatment applied to NITI and method of manufacturing rotary instruments improves its properties and behavior.

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