

and BT was not significant. Indeed, the significant parameters in instruments break down are MF, DG, and BB in descending order. Pursuing these features was made using SEM examination. Figure 2(c and f) revealed clearly the interrelation between the DG and the occurrence of MF which increased markedly by the increase in the number of canals unfilled jeopardize its further use.

Most of the wear features were detected in D2 instruments specially its tip (fig4 c and d). Total tip destruction was noted in a D2 instrument. Tip has completely worn and disappeared – not separated- as shown from the alloy turn over. Probably this is because it comes into direct contact with the compact gutta percha filling in the body of the canal with the instrument greater taper of 8% and size 25 contrary to what is expected in the greater taper concept (on which most of the rotary NiTi files' designs are made). As -according to the former concept- the instruments' tip is not touching the canal walls. In the PTU rotary retreatment files the first instrument to initiate unfilling is D1. This instrument is the only one with an active tip to start digging in the compact gutta percha. However, continuous digging is needed during unfilling in the middle third of the canal as the compacted gutta percha has no central glide path at any level in the canal. Even the idea of dependence on the frictional heat to plasticize and soften the gutta percha; ahead on the instruments' tip was not enough to prevent tip turnover specifically detected in size D2 PTU retreatment files.

This was not however the view point of Giuliani and his co-workers<sup>(36)</sup> who conducted a study on canal cleanliness after unfilling using the PTU retreatment file system. They reported that, the active tip of the D1 file might facilitate the penetration of the subsequent files (D2 and D3). They declared also that, the nonactive tips of D2 and D3 reduce the incidence of ledging, perforation, and stripping during the removal of filling materials, as opposed to another the Mtwo-Retreatment files retreatment (which has active tips for all retreatment in-

struments). In fact in their study, they used drops of chloroform to facilitate instrument's path in the compacted gutta percha along with some of the previous studies<sup>(13)</sup> which was not included in the manufacturer's direction. Dry unfilling was followed also in most of the contemporary preceding studies<sup>(42,43)</sup>. This might had an effect on their results. This point was addressed in the study of Gu et al<sup>(28)</sup> where they reported that, if the rotary instruments did not advance in the canal prior to reaching the designated depth, stainless steel K files were used to establish a glide path before reintroducing the rotary instruments.

No Instrument's separation was found in any of the examined retreatment files during the three treatment phases. Same result was also reported previously<sup>(28)</sup>. In 2009 Shen et al<sup>(27)</sup>, reported that, no scientific methods have been developed to date that evaluate the functional lifespan of NiTi rotary instrument. The frequency of distortion is low (0%-2.9%) if an engine file was to be treated as a disposable instrument. However, while this idea is logic for NiTi rotary instrument designed for canals' shaping it might not be wise and cannot be applied for the instruments that are specially designed for retreatment. There are marked differences between dentin and gutta percha or Resilon core filling materials. The former is harder and does not soften by frictional heat of the revolving instrument. This means that, rotary retreatment NiTi files might not be considered as a disposable instrument. However, other factors like the degree of canal curvature, operator's experience should be considered. In a recent study retreatment files were discarded after being used in 5 single rooted teeth<sup>(42)</sup>.

## CONCLUSION

Based on the present study, Protaper Universal retreatment rotary files can be safely used in unfilling of 4-6 canals provided that no visible signs of distortion are noted.

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