# Proglider files – next step in glide path preparation

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## Abstract

As the field of Endodontics has become revolutionized with development of rotary Ni-Ti files, the advancements of these file systems have improved the cleaning & shaping of root canal with time. Before using these Ni-Ti rotary instruments, a glide path preparation within canal seems to be very necessary. The endodontic glide path is a smooth radicular tunnel from canal orifice to physiologic apical terminus (apical foramina constriction). Glide Path can be generated either with stainless steel file system or rotary Ni-Ti Files. Recently, M -wire technology has been incorporated in endodontic file systems, which offers greater flexibility and resistance against cyclic fatigue. So, the present review article introduces the Proglider Glide path File (Dentsply mallifer) which is the next step in glide path management with progressive taper and M-Wire metallurgy, securing canals that have never been easier or safer.

**Keywords:** Glide Path, Rotary instrument, M-Wire technology, Proglider, Root canal treatment.

## Introduction

One of the mechanical objectives of root canal instrumentation is to achieve a continuous tapering funnel shape of the original canal from the coronal access to the apex. To achieve this goal, a glide path within canal must be discovered or prepared. The glide path can be short or long, narrow or wide, essentially straight or curved. Ni-Ti instrument when used directly in the root canal and starts rotating, they may experience structural fatigue which eventually lead to failure.[1] Torsion and fatigue through flexure are the main two reasons for rotary Ni-Ti instrument separation within canal.[2,3] The flexural fatigue (bending stress) resulting in to fracture usually occurs when an instrument (already weakened by metal fatigue) is kept under stress and the amount of such stress transforming onto a file depends on the root canal anatomy especially the canal curvature.[4] Usually, torsional fracture occurs when the tip or any other part of the rotating instrument bind to the root canal walls while rest of the file keeps turning.[5] The reasons for torsional fracture may include exerting too much apical force on the rotating instrument in the root canal or when there is a wide area of contact between the cutting flutes of the instrument and the canal wall or when the canal section is smaller than the dimension of the non-cutting or non-active tip of the instrument.[6] Considering the flexural fatigue, the instrument does not bind to the canal walls, but rotate freely until the separation of instrument occurs, at the point of maximum flexuer.[7] Factors associated with Ni-Ti rotary instruments separation may include – instrument design, instrumentation technique, rotational speed, and torque on instrument. To minimize the risk of instrument fracture, performing coronal enlargement of root canal becomes very essential.[8]

Perhaps the greatest obstacle performing endodontic treatment is to consistently find, follow, and secure any given canal from coronal to its apical terminus. For this, Glide path management requires flawless performance which may be defined as the ability to execute a task in a prescribed manner. Completely negotiating and securing canal with small sized hand files requires a mechanical skilful touch, patience, and desire. A small- sized hand file is initially used to scout, expand, and refine the internal wall of the canal. Once the canal can be manually reproduced, a mechanical glide path file may be used to expand the working width in preparation for shaping procedures.

The glide path should be created with small flexible stainless steel manual file to verify within any portion of root canal. This will allow sufficient space for the rotary instrument to follow. Proglider files which come in single file system, generates a faster & safer glide path preparation. Proglider file is made of M-wire Ni-Ti alloy to provide greater flexibility and resistance against cyclic fatigue. Before understanding the concepts of such path files, the M-wire technology has to be known.

## M-wire Technology

M-wire (Sportswire LLC, Langley, OK, USA) is a new Ni-Ti wire that has been developed through proprietary thermo-mechanical processing. M-wire has significantly improved fatigue resistance of endodontic rotary instruments in comparison with those made of conventional superelastic Ni-Ti alloy.[10,11,12] M-wire consists of 508 nitinol, which undergo a processing method comprising of thermo-mechanical treatment of the raw wire under specific tensile stresses and temperature.[10]

Fine microstructural differences between the two wires can be seen under Transmission Electron Microscope (TEM) imaging of non-deformed wire. The Ni-Ti wire consisted essentially the β phase austenite with a dislocation-cell substructure and precipitate whereas the M-wire microstructure contained martensite, with cell substructure and precipitates.[13]

**Features of Pro Glider File:[14]**

Proglider is single Ni-Ti file for glide path preparation. It is most advanced glide path solution in terms efficiency, simplicity and safety. Features are –

- One Single mechanical glide path file
- Progressive tapers from 2% to 8% over its length
- Offers a smoother 'glide path' Transition
- Utilising M-wire technology
- Controlled, smooth, inward cutting action
- Continuous rotation, 300rpm/2ncm, adjustable up to 5.2ncm
- Three Blade Length - 21mm, 25mm, 31mm.
- The Pro glider file has a diameter of 0.16mm at D0 and 0.82 mm at D 16.

Proglider file is suitable for most root canals including the highly curved ones. Pro glider File also respect the root canal anatomy better than manual glide path file, which make it difficult to avoid the risk of canal transportation, zips and ledges.

## Discussion

The mechanical objective of biomechanical preparation is to get a continuous tapering funnel shape of root canal from coronal access to the apex. To achieve this goal, a glide path within canal must be prepared. There are four skills that require glide path preparation. First skill is to find the canal, second is to follow the canal, third skill is to understand the four possible reasons that you may not follow the radiographic terminus and last technique is to understand and master the four manual motions to prepare the rotary glide path. Four reasons for a file not following to its radiographic terminus, include when canal is blocked, file curvature does not replicate canal curvature, diameter of file is too wide at its tip and diameter of file is too wide in its shafts. Sometimes, a combination of reason one to four, or all four may be the situation.[9] Pro Glider path file is solution of all four problems. It removes the coronal dentin restriction due to progressive taper from 0.16mm to tip to 0.82mm at D16. Due to its high flexibility, Proglider respects the root canal anatomy better than manual glide path file.

Generally, during the endodontic therapy, Ni-Ti instruments are used under rotational speed ranging from 300 to 500 rpm, applied by an endodontic motor operating with torque varying from 3 to 5 N cm in a 16:1 reduction.[15,16] Figueiredo et al[17] showed that the number of cycle to failure in martensitic Ni-Ti wire (Proglider) can be as much as100 times larger than in stable and superelastic austenitic Ni-Ti. M-Wire technology has improved fatigue behaviour due to presence of thin martensite variants. The presence of these martensite variants, which can be related to high transformation temperature found in M-wire.[18,19]

According to Miyazaki and Otsuka[20], martensite variants can undergo stress – induced reorientation at relatively lower stress and this can be reason for the lower apparent elastic modulus of M-wire and smaller force required for bending by the same amount M-wire in relation to conventional Ni-Ti.

Alpati et al[18] evaluated the first metallurgical characterization of M-wire and showed that under certain processing condition, M-wire consisted of austenite, martensite and R phase with their relative proportions depending on the processing conditions. They also reported that M –wire had higher transformation temperature, compared with a conventionally treated Ni-Ti wire employed for the manufacture of Ni-Ti instrument. Also, M-wire had a lower apparent elastic modulus as well as smaller transformation stress and mechanical hysteresis. So, the Proglider having M-wire technology showed superior physical and mechanical properties than conventional Ni-Ti wire for manufacturing rotary endodontic instrument. [13]

## Conclusion

Preparing the Glide path with M-wire path file (pro Glider) has superior physical and mechanical properties than conventional Ni-Ti path file. It contains martensite in non-deformed microstructure and this is the probably the reason why M-wire (pro glider) had higher fatigue resistance under 6% strain level than the Ni-Ti wire. Due to progressive taper and offset design, Proglider Path Files follow & expand original anatomy, improve shaping results, reduce chair time and decrease post-operative pain.

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