CLINICAL INSIGHTS

PRESENTED BY

ESCONDIDO ENDODONTICS

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Preventing Nickel Titanium Rotary Instrument Breakage

Nickel Titanium (NiTi) Rotary instruments have become a popular replacement for traditional hand files for root canal preparation. Proven advantages of rotary instruments are an inherent ability to pull tissue and dentin debris out of the canal spaces and maintain a centered canal preparation. Although Nickel Titanium is a highly flexible metal it has limitations when stresses are produced during rotation.

Nickel Titanium instrument separation or breakage is caused by excess torque and / or cyclic fatigue. A torque failure is caused by a single rotational event while a cyclic fatigue failure is caused by multiple flexing events (over-use of the instrument).

Events that cause increased torque or cyclic fatigue are:

(1) Canals that come together at sharp angles. (2) Curved canals that change directions abruptly.

Torque is increased by: insufficient lubrication, increased pressure, increased canal curvature, increased surface area, decreased rotational RPMs.

Cyclic Fatigue is increased by: increased canal curvature, decreased radius of curvature, increased diameter of the instrument, and increased taper of the instrument.

A three year tracking study of NiTi instrument failure indicates that 65-75% of separation occurs in the mesial canals of lower molars.

Lower molars often have secondary (S-Shaped) or Tertiary (Bucco-lingual) curvatures. 40-50% of mesial roots have 2 mesial canals that unite in the apical 2-3 mm's and have internal ledges.

MINIMIZING FILE SEPARATION:

- Preparation with NiTi instruments takes time, don't rush.
- Use an electric torque controlled handpiece specifically designed for NiTi instrument use.
- Never force the instrument in the canal, very light pressure only.
- Use crown-down shaping. Enlarge the coronal 1/3 of the root first using larger NiTi rotary instruments in a larger to smaller order.
- Then explore the apical 1/3 of the canal using very small files such as 6, 8, and 10.
- Create a glide-path by enlarging the apical 1/3 to at least a size 15 before using rotary files.
- Maintain lubricants and irrigants in the canal spaces at all times. Clean the flutes of all debris.
- After each insertion, inspect the instrument for shiny spots indicating wear or unwinding flutes.
- Consider changing from.06 to. 04 taper if a larger taper fails to go to length.
- Small size NiTi instruments should be considered "single use" instruments.
- Make sure the instrument is rotating when entering and exiting the canal.
- A good rule: "Take what the canal will give you and don't over-prepare the space".

If an instrument separates stop what you are doing. Take a radiograph and assess where the instrument is in the canal. Depending on location, separated instruments can be removed using a surgical operating microscope and ultrasonic tips.

Before dismissing the patient, inform them that a procedural mishap has occurred. Explain that a small piece of a biocompatible metal instrument has separated in the tooth and that you are going to refer the patient to an endodontist to have them attempt to remove it.

Jerome CE, Hanlon RJ. Identifying multiplanar root canal curvatures using stainless-steel instruments. J Endodon 2003;29:356-358.

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