

Recent Trends in NiTi Files and Guidelines for Their Selection

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Nickel-titanium (NiTi) endodontic instruments have significantly advanced modern root canal treatment by improving shaping efficiency while reducing procedural errors compared with traditional stainless-steel files. Over the past two decades, continuous technological innovations—including heat-treated alloys, modified cross-sectional geometries, reduced taper designs, and alternative kinematics—have expanded the range of available NiTi file systems. These developments have enabled clinicians to perform more efficient and conservative canal preparation while preserving the structural integrity of root dentin.

Despite these improvements, the increasing diversity of NiTi instruments has also made selecting an appropriate file system more complex in daily clinical practice. Furthermore, unexpected instrument separation remains a concern, emphasizing the need for a thorough understanding of the mechanical behavior and metallurgical characteristics of modern NiTi alloys.

This lecture will review recent trends in the development of NiTi instruments and discuss key factors that influence their clinical performance. Particular attention will be given to advances in alloy heat treatment, surface modification technologies, and changes in instrument design that contribute to improved flexibility, cyclic fatigue resistance, and shaping ability.

The presentation will also examine the evolution of NiTi file systems across different generations, including the introduction of variable tapers, enhanced cutting geometries, and alternative kinematics such as reciprocating motion. In addition, the mechanical principles related to file fracture, including cyclic fatigue and torsional stress, will be reviewed in order to better understand strategies for preventing instrument separation.

Finally, based on the characteristics and performance of contemporary NiTi systems, practical guidelines will be proposed for selecting appropriate instruments according to canal anatomy, clinical objectives, and operator preference. Emphasis will be placed on achieving efficient canal preparation while minimizing the risk of instrument fracture and preserving root dentin for the long-term prognosis of endodontically treated teeth.

Learning Objective

- * Course-takers will learn that recent technological advances in NiTi instruments, including heat treatment and innovative design, have improved flexibility, fatigue resistance, and shaping efficiency.
- * Course-takers will learn that understanding the mechanical and metallurgical properties of NiTi instruments is essential for minimizing the risk of instrument separation.
- * Course-takers will learn that appropriate selection of NiTi file systems should consider canal anatomy, clinical objectives, and instrument characteristics.

Profile

- * Graduated from Pusan National University College of Dentistry, PhD
- * Dean, Pusan National University School of Dentistry
- * APEC President, Asian Pacific Endodontic Confederation
- * Present, President, Pusan National University Dental Hospital
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