



Introduction

# NEW ADVANCES IN SCIENCE AND TECHNOLOGY OF ENDODONTICS

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New advances in health care have changed the lives of millions of individuals around the globe. As a result, people in many parts of the world are living longer and are enjoying a better quality of life. Dentistry, like medicine, has contributed significantly to this improvement. Two of the main objectives of dentistry have been the prevention of oral disease and the preservation of natural dentition. For decades, we have been fighting decay and periodontal disease, and restoring function and aesthetics to teeth affected by these maladies.

Root canal therapy has been a major contributing factor to the success of the dental profession. Many advances have occurred in endodontics within the last 10 years. These include new information in basic and clinical sciences, management of pain and anxiety, clinical practice, new techniques and instruments, retreatment, management of mishaps and endodontic surgery.

Studies have shown that pulpal and/or periradicular pathosis does not develop without the presence of bacteria. Depending on the stage of pulpal pathosis, various species of bacteria can be cultured from infected root canals. These bacteria are predominantly gram-negative anaerobes and they can infect the root canals by direct pulp exposures (caries or traumatic injuries) or by coronal micro-leakage. Because bacteria plays an important role in the development of pulpal and periradicular dis-

eases, and the success of root canal treatment depends on the absence of bacterial contamination following root canal therapy, the main objectives of root canal therapy are cleaning and shaping, obturating the root canal system in three dimensions and preventing reinfection.

To effectively diagnose and treat pulpal and periradicular diseases, the clinician must be familiar with the new information on the nature and complexity of root canal infections.

New technological advances in the field of microbiology have allowed researchers in the field of endodontics to identify new species of bacteria and to develop a more elaborate description of microbial diversity. Histological and immunological studies of inflamed pulp and periradicular lesions have shown the presence of numerous immune competent cells capable of defending these tissues. The repair potential of the dental pulp is related to the presence of these cells. However, interaction of the irritants and the immune cells can also cause destruction of these tissues. Proper diag-



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## TO EFFECTIVELY DIAGNOSE AND TREAT PULPAL AND PERIRADICULAR DISEASES, THE CLINICIAN MUST BE FAMILIAR WITH THE NEW INFORMATION ON THE NATURE AND COMPLEXITY OF ROOT CANAL INFECTIONS.

nosis of pulpal and periradicular disease is the most important aspect of modern endodontic treatment. Cold testing with tetrafluoroethaneethyl chloride or CO<sub>2</sub> snow is a relatively reliable method to assess the responsiveness of the pulp to cold substances. This testing is more reliable than using heat or electrical testing of the dental pulp. Considerable advances have been made in the management of pain, infection and anxiety in patients with pulpal and periradicular diseases.

The use of Nickel titanium (NiTi) files during cleaning and shaping of root canals has changed this procedure significantly. The flexibility of this metal allows practitioners to use rotary files during instrumentation. Many NiTi files with various tapers have been designed to shape root canals. Because of the flexibility of and presence of non-cutting tips in these files, the curvature of canals can be more easily maintained compared to stainless-steel files. Inappropriate use of these files can result in perforations and instrument locking, and separation.

New intra-canal medications are on the horizon to disinfect root canals. The use of gutta-percha in conjunction with a root canal sealer is still the method of choice for obturation of the root canal system. The main methods of obturation of root canals are lateral and vertical condensation techniques. There is no clinical study showing superiority of one technique over another. Mineral Trioxide Aggregate (MTA) has become very popular in plugging the apical third of roots with open apices. The

lack of a coronal seal has been recently identified as an important factor in the development of periradicular lesions following root canal treatment. Therefore, placement of a coronal seal following root canal treatment is critical in the outcomes of this procedure.

The introduction of the microscope to the field of endodontics has provided the clinician an opportunity to observe areas of interest at high magnification under constant illumination. The use of this device during root canal treatment can assist the clinician in locating and negotiating calcified canals, and performing surgical and nonsurgical root canal treatments. Endoscopes, oroscopes and magnifying loupes with or without a supplemental light source are also useful tools to enhance visualization of the operative field. Ultrasonic devices are used to remove posts and separated instruments from the root canal system. These tools are also used to prepare a root-end cavity preparation during surgical root canal treatment. Determination of working length during cleaning and shaping using an apex locator is more accurate and is associated with less health hazard compared to the use of radiographs in endodontic patients. The introduction of new devices and techniques into the field of endodontics has significantly improved the success rate of retreatment. Root perforation during root canal treatment reduces the success rate of this procedure; the use of MTA to repair root perforations has significantly improved the

success of root canal treatment.

Nonsurgical root canal treatment is a highly successful procedure if practitioners are thorough with their diagnoses and proficient in performing their clinical treatments. The common belief that unresolved periradicular lesions should be corrected surgically is not always true. Although surgery is necessary in some situations to retain a tooth that would otherwise be extracted, retreatment can correct most persistent endodontic pathosis. Lesions of endodontic origin that have not healed can have a second chance with recent improvements in endodontic surgical instruments, materials and techniques. Current, relevant knowledge on the outcome of endodontic treatment is key to clinical decision-making, particularly when endodontic treatment is weighed against tooth extraction and replacement.

The purpose of this issue is to share new advances in some areas of endodontics. These areas are microbiological aspects of endodontic infection, management of endodontic emergencies, retreatment, endodontic surgery and the data on the success of endodontic treatment. I believe that the use of these new concepts and adherence to the principles of proper root canal treatment will result in the retention and rehabilitation of millions of natural teeth, as well as the satisfaction of patients throughout the world. Our goal continues to be that of working with all disciplines of dentistry promoting the best in oral health care for our patients. **CDA**