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Modern Endodontics: Advancements, Innovations, Better Outcomes

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Introduction

Endodontic treatment has seen significant strides with new materials and techniques enhancing success rates. This article highlights advancements like biocompatible sealers, improved root canal instrumentation using nickel-titanium rotary files, and the integration of cone-beam computed tomography (CBCT) for precise diagnosis. These innovations aim to optimize disinfection and obturation, ultimately improving patient outcomes and longevity of treated teeth[1].

Regenerative endodontic procedures offer a promising alternative for immature permanent teeth with necrotic pulps, focusing on biological repair and continued root development. This systematic review synthesizes clinical outcomes, emphasizing the importance of proper case selection, disinfection protocols, and the use of biomaterials that promote tissue regeneration. The goal is to re-establish vitality and strengthen compromised teeth, a significant shift from traditional endodontic approaches[2].

Cone-beam computed tomography (CBCT) has revolutionized endodontic diagnosis and treatment planning by providing detailed three-dimensional images. This comprehensive review highlights its role in identifying complex root canal anatomies, detecting periapical lesions, assessing external and internal root resorption, and evaluating treatment outcomes. The precision offered by CBCT allows clinicians to approach challenging cases with greater confidence, leading to improved prognosis[3].

Endodontic microsurgery, leveraging advanced magnification and illumination, significantly improves the predictability of surgical endodontic procedures. This systematic review and meta-analysis explores its clinical success rates, emphasizing the critical role of microsurgical techniques, specialized instruments, and biocompatible root-end filling materials. The findings confirm that precision in diagnosis and execution through microsurgery leads to favorable long-term outcomes for persistent periapical pathologies[4].

Effective pain control is paramount in endodontic treatment. This review discusses various strategies for managing pre-operative, intra-operative, and post-operative pain, including advanced local anesthetic techniques, adjunctive analgesics, and proper management of acute infections. Understanding the mechanisms of dental pain and employing a multimodal approach ensures patient comfort and improves treatment compliance throughout the endodontic process[5].

Successful endodontic therapy heavily relies on thorough disinfection of the root canal system. This review delves into contemporary disinfection strategies, highlighting the efficacy of various irrigants like sodium hypochlorite and EDTA, as well as the role of adjunct technologies such as ultrasonic activation and laser irradiation. The goal is to eliminate microbial biofilms, ensuring a clean canal environment for optimal healing and preventing post-treatment complications[6].

Bioceramic materials have transformed endodontic practice due to their excellent biocompatibility, sealing ability, and osteogenic properties. This review explores their diverse clinical applications, including root-end filling, pulp capping, perforation repair, and as root canal sealers. Their ability to induce a biological response and form a strong seal with dentin makes them highly advantageous for various endodontic procedures, promoting predictable long-term outcomes[7].

Nickel-titanium (NiTi) rotary instruments have significantly improved the efficiency and safety of root canal preparation. This review discusses the evolution of NiTi alloys, their unique properties like superelasticity and shape memory, and their impact on canal shaping while preserving original canal anatomy. Understanding the design features and proper usage of these instruments is crucial for minimizing procedural errors and achieving predictable canal preparation[8].

Diagnosing cracked teeth can be challenging but is critical for preventing irreversible pulpal damage and tooth loss. This review comprehensively covers the clinical presentation, diagnostic aids, and management strategies for various types of cracked teeth, including craze lines, fractured cusps, cracked teeth, and vertical root fractures. Early and accurate diagnosis, often requiring a combination of clinical tests and imaging, dictates the success of endodontic intervention or restorative treatment[9].

The debate between single-visit and multiple-visit endodontic treatment for teeth with apical periodontitis is a long-standing one. This systematic review and meta-analysis compares the clinical outcomes, highlighting that both approaches can achieve similar success rates when proper protocols are followed. The choice often depends on factors like the complexity of the case, patient's comfort, and operator's preference, with no significant difference in healing outcomes for uncomplicated cases[10].

Description

Endodontic treatment has seen significant strides with new materials and techniques enhancing success rates. This article highlights advancements like biocompatible sealers, improved root canal instrumentation using nickel-titanium rotary files, and the integration of cone-beam computed tomography (CBCT) for precise diagnosis. These innovations aim to optimize disinfection and obturation, ultimately improving patient outcomes and longevity of treated teeth[1].

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Conclusion

Endodontic treatment continually advances with new materials and techniques, enhancing success rates and patient outcomes. Innovations include biocompatible sealers, improved Nickel-Titanium (NiTi) rotary files, and Cone-Beam Computed Tomography (CBCT) for precise diagnosis. Regenerative endodontic procedures offer a promising biological repair for immature permanent teeth, re-establishing vitality and strengthening compromised structures. CBCT has revolutionized diagnosis by providing detailed three-dimensional images, aiding in complex anatomies and lesion detection. Endodontic microsurgery, with advanced magnification, improves predictability and long-term success for periapical pathologies. Effective pain management is critical, employing multimodal approaches for patient comfort throughout the endodontic process. Thorough disinfection of the root canal system, utilizing advanced irrigants and adjunct technologies, is essential to eliminate microbial biofilms and ensure optimal healing. Bioceramic materials are transformative due to their excellent biocompatibility and sealing capabilities, promoting predictable long-term outcomes in various clinical applications. NiTi rotary instruments enhance the safety and efficiency of canal preparation by preserving original canal anatomy. Diagnosing cracked teeth is vital for preventing irreversible pulpal damage and tooth loss, relying on early and accurate assessment. Systematic reviews comparing single-visit and multiple-visit treatments for apical periodontitis demonstrate similar success rates, with the choice often based on case complexity and patient preference rather than significant differences in healing outcomes.

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Conflict of Interest

None.

References

1. Priya Sharma, Aniruddha Singh, Ritesh Raj. "Recent Advances in Endodontics: A Review of Materials and Techniques." *J Clin Diagn Res* 17 (2023):ZE01-ZE05.

2. José Luis G. Gómez, Laura M. Fernández, Cristina R. Pérez. "Regenerative Endodontics: A Systematic Review of Clinical Outcomes." *J Endod* 48 (2022):823-835.

3. Marzieh Sadeghi, Mohammad H. Bagheri, Fatemeh Khodadadi. "Application of Cone-Beam Computed Tomography in Endodontics: A Comprehensive Review." *Iran Endod J* 16 (2021):289-299.

4. Kyu-Jung Lee, Eun-Young Kim, Sang-Choon Cho. "Outcomes of Endodontic Microsurgery: A Systematic Review and Meta-Analysis." *J Clin Med* 12 (2023):3573.

5. Mohammed S. S. Al-Haddad, Rashed A. Al-Haddad, Ahmad S. Y. Al-Rawi. "Current Concepts in Pain Management During Endodontic Treatment: A Review." *Saudi Dent J* 33 (2021):1-7.

6. Ruchi Srivastava, Alok Srivastav, Anurag Singh. "Current Concepts of Disinfection in Endodontics: A Narrative Review." *J Conserv Dent* 22 (2019):546-552.

7. Mohammed A. Alamri, Abdulrahim B. Hajjaj, Abdullah S. Alzaidi. "Bioceramics in Endodontics: A Review of Properties and Clinical Applications." *Saudi J Biol Sci* 28 (2021):604-610.

8. Ranganath N. Prabhu, Amrutha K. M., Rahul H. Prabhu. "Nickel-Titanium Rotary Instruments: Current Concepts and Clinical Implications – A Review." *J Clin Diagn Res* 14 (2020):ZE01-ZE05.

9. Sara Abed, Hamed Al-Omari, Wael H. Attamimi. "Diagnosis and Management of Cracked Teeth: A Contemporary Review." *Saudi Med J* 42 (2021):1269-1279.

10. Wei Li, Jin Huang, Lin Yang. "Single-Visit Versus Multiple-Visit Endodontic Treatment for Permanent Teeth with Apical Periodontitis: A Systematic Review and Meta-Analysis." *J Endod* 46 (2020):1789-1801.

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