

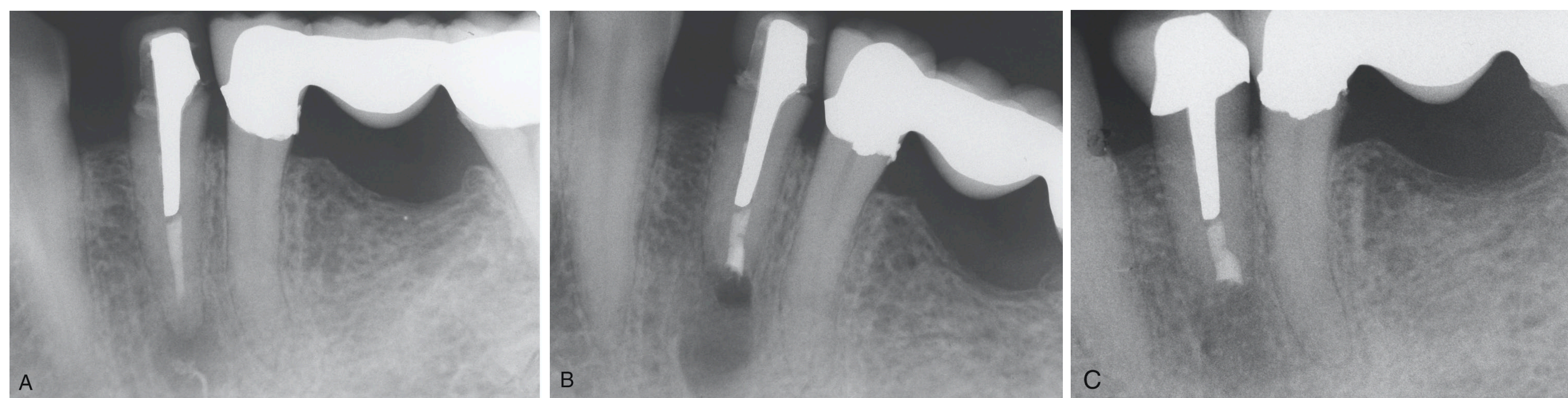
INTRODUCTION

Endodontic surgery is a procedure that addresses apical periodontitis by removing a portion of a root. Indications for apical surgery include failing root canal treatments due to persistent or refractory intracanal infection, irretrievable materials in the root canal or periapical tissues, microorganisms in proximity of the constriction and the apical foramen, and anatomic complexities of the root canal system that prevent complete cleaning, shaping and obturation of the root canal system. The healing pattern in endodontic surgery is that of an excisional wound, whereas the healing after nonsurgical root canal therapy is indirect through removing the etiological infectious source from the root canal system. Due to the difference in types of healing between the two procedures, different success criteria should be utilized.

OUTCOME MEASURES

Ideal healing outcomes following endodontic apical surgery include periapical tissue regeneration with cementum formation over the resected root, and regeneration of the destroyed cortical plates. Periapical healing after apical surgery can be classified as complete healing, limited healing, uncertain healing, and unsatisfactory healing. In complete healing, the periodontal space has reformed to a normal width over the entire sectioned root surface. In limited healing, the resected root surface exhibits complete healing but could have the continuity of the cortical plate interrupted by an area of lower density, or bone has not fully formed in the access osteotomy site. Uncertain healing is when the volume of the low density area appears decreased and is thicker than twice the width of the periodontal space. Unsatisfactory healing is when the volume of the low density area appears larger or unchanged.

APICAL SURGERY ON PREMOLAR



(A) Apical surgery indicated due to inadequate root canal treatment, large post, and patient's discomfort.
(B) PA taken after endodontic surgery. MTA used as a root-end filling material.
(C) PA taken 4.5 years post-op reveals complete healing and functional tooth.

TRADITIONAL vs. MICROSURGERY

Traditional surgical retreatment uses a straight surgical handpiece, beveled root section, and amalgam as a root-end filling material. Weighted pooled success rates for the procedure have shown to be at 59%. Endodontic microsurgery utilizes ultrasonic tips, more biocompatible root-end filling material, microsurgical instruments, high power magnification and illumination. Endodontic microsurgery has demonstrated higher levels of success, ranging from 91.4% to 94.4%.

INFLUENCING FACTORS

Prognostic factors reported for periapical healing following endodontic surgery include the periapical lesion size prior to surgery, quality of the root-end preparation, remaining thickness of the root dentin, and restorability of the tooth. Maxillary lateral incisors may be associated with higher failure rates due to higher frequency of scar tissue healing.

REFERENCES

- Haxhia, Enida, et al. "Root-End Surgery or Nonsurgical Retreatment: Are There Differences in Long-Term Outcome?" *Journal of Endodontics*, vol. 47, no. 8, 2021, pp. 1272–1277, <https://doi.org/10.1016/j.joen.2021.04.024>. Ng, Yuan-Ling, and Kishor Gulabivala. "Factors That Influence the Outcomes of Surgical Endodontic Treatment." *International Endodontic Journal*, vol. 56, no. S2, 2023, pp. 116–139.
- Rubinstein, Richard, et al. "Apical Microsurgery." *Endodontics: Principles and Practice*, 6th ed., Elsevier, pp. 428–441.
- Setzer, Frank, et al. "Endodontic Treatment Outcomes." *Endodontics: Principles and Practice*, 6th ed., Elsevier, pp. 453–470.
- Setzer, Frank C., et al. "Outcome of Endodontic Surgery: A Meta-Analysis of the Literature—Part 1: Comparison of Traditional Root-End Surgery and Endodontic Microsurgery." *Journal of Endodontics*, vol. 36, no. 11, 2010, pp. 1757–1765.

SURGICAL vs. NONSURGICAL

In a retrospective study by Enida H., Mohamed I., Pradeep B., it was found that there was no significant difference in the long-term outcome between nonsurgical retreatment and root-end surgery in cases without prior nonsurgical retreatment within a 6 year time frame. The survival rates of teeth that received nonsurgical retreatment were 90% after 2 years, 86.8% after 4 years, and 85% after 6 years, where as the survival rates of teeth that received root-end surgery were 93.7% after 2 years, 90.5% after 4 years, and 88% after 6 years. There was no statistical difference for survival rates between the two procedures regarding tooth location. Factors influencing decision making for the clinician between the two procedures following a failed primary treatment include whether the original anatomy was altered during the primary treatment, if the tooth restoration allows proper access into the canals, or if the cause of the failure can be identified and removed. Other factors include patient preference, financial limitations, clinician comfort level and experience.