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Intentional Replantation: A Last Resort Endodontic Procedure

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Abstract

Background: Intentional replantation (IR) is an endodontic procedure where a tooth is deliberately extracted, treated extraorally (usually with retrograde root-end management), and then reinserted into its socket. Though historically considered a desperate measure, modern refinements in microsurgical techniques, atraumatic extraction, and biocompatible materials have renewed interest in IR as a viable last-resort alternative when conventional endodontic therapy or apical surgery is not feasible.

Objective: This article reviews the rationale, indications, techniques, success rates, complications, and future perspectives of intentional replantation in modern endodontics.

Methods: A narrative review of literature, clinical studies, and case reports was conducted to evaluate clinical outcomes, advantages, limitations, and evolving strategies in intentional replantation.

Results: Intentional replantation demonstrates high survival and success rates (70–95%) when performed under strict protocols, with atraumatic extraction, minimal extraoral time (<15 minutes), and the use of bioactive materials such as MTA and bioceramics. It provides an alternative to extraction and prosthetic replacement, preserving natural dentition. Limitations include risk of root resorption, ankylosis, and periodontal breakdown.

Conclusion: Intentional replantation remains a last-resort, tooth-preserving procedure when conventional

retreatment and periapical surgery are impractical. With proper case selection and modern techniques, it offers predictable outcomes, serving as a bridge between tooth preservation and tooth loss.

Keywords: Intentional Replantation, Endodontic Microsurgery, Tooth Replantation, Root-End Filling, Endodontic Retreatment, MTA, Bioceramics

Introduction

The primary goal of endodontics is the preservation of natural teeth through conventional root canal therapy or retreatment when necessary. However, in certain clinical scenarios, these approaches may not be possible or may fail. Apical surgery (periapical surgery) offers an alternative, but it too has limitations in terms of accessibility, anatomical complexity, and patient-related factors. [1,2]

Intentional replantation (IR) involves the deliberate extraction of a tooth, extraoral inspection and retrograde management of the root, and reinsertion of the tooth into its original socket. Historically regarded as a procedure of last resort with poor prognosis, IR was associated with high rates of failure due to trauma, infection, and resorption. [3,4]

However, with modern advancements in atraumatic extraction instruments, magnification, micro-surgical techniques, and biocompatible root-end materials (MTA, Biodentine, calcium silicate cements), the procedure has experienced a resurgence as a valid and predictable treatment modality. [5-7]

Discussion

1. Indications for Intentional Replantation[8,9]

IR is considered when other endodontic options are not feasible:

- Persistent periapical pathology where retreatment is not possible due to obstruction, posts, or iatrogenic complications.
- Anatomical limitations that hinder periapical surgery (e.g., proximity to mandibular canal, maxillary sinus, or dense bone).
- Complex root canal anatomy inaccessible by conventional instrumentation.
- Root-end fractures or perforations.
- Situations where patient preference or medical limitations preclude surgical intervention.

2. Contraindications [10]

- Non-restorable teeth (extensive decay, severe periodontal compromise).
- Teeth with long, thin, or curved roots where atraumatic extraction is unlikely.
- Advanced periodontal disease with poor prognosis.
- Medically compromised patients where extraction/replantation poses systemic risks.

3. Technique of Intentional Replantation [11-13]

- **Preoperative Assessment:** Detailed radiographic and CBCT imaging for root morphology and pathology.
- **Atraumatic Extraction:** Using periotomes or microsurgical elevators to preserve root surface and periodontal ligament.
- **Extraoral Management (within 10–15 min):**
  - Root-end resection.
  - Root-end preparation with ultrasonic tips.
  - Retrograde filling with biocompatible materials (MTA, Biodentine, bioceramics).
  - Inspection under magnification for cracks/fractures.
- **Reinsertion:** Replanting into the original socket with gentle pressure.
- **Stabilization:** Splinting if necessary for 1–2 weeks.
- **Postoperative Care:** Antibiotics (if indicated), chlorhexidine rinses, soft diet, and periodic radiographic follow-up.

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4. Success Rates and Prognosis [14-17]

- Earlier reports suggested variable success (~50–60%).
- Modern techniques with atraumatic handling and bioactive materials report **success rates of 70–95%**.
- Prognosis depends on:
  - Minimal extraoral time (<15 min).
  - Preservation of periodontal ligament cells.
  - Biocompatible retrograde filling material.
  - Patient's periodontal health.

5. Complications [18-20]

- **External Root Resorption:** Due to trauma, desiccation, or infection.
- **Ankylosis:** Replacement resorption when periodontal ligament is severely damaged.
- **Periodontal Breakdown:** Loss of alveolar bone support.
- **Root Fracture:** If extraction is traumatic.

Conclusion

Intentional replantation, though considered a last-resort procedure, remains a valuable option in modern endodontics. It preserves natural dentition when other treatments are impractical or impossible. With the use of microsurgical techniques, bioactive root-end filling materials, and strict adherence to atraumatic protocols, IR offers success rates comparable to more conventional treatments.

Future Directions[21-23]

1. **Bioactive and Regenerative Materials:** Enhanced root-end sealing using nanomaterials and stem cell-based scaffolds.
2. **Digital Planning and 3D Printing:** Patient-specific surgical guides and 3D-printed models to aid atraumatic extraction and reinsertion.
3. **Improved Periodontal Healing Strategies:** Use of platelet-rich fibrin (PRF) and growth factors to accelerate periodontal regeneration.
4. **Artificial Intelligence in Case Selection:** Predictive AI models to identify candidates with the highest probability of success.
5. **Clinical Standardization:** Development of universal guidelines to ensure consistency in technique and outcome reporting.

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