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Surgical Extrusion as an Alternative to Extraction in Non-Restorable Teeth

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Abstract

Objective: To evaluate the clinical efficacy and long-term prognosis of surgical extrusion compared to conventional extraction methods. **Materials and Methods**: A comprehensive systematic review was conducted following PRISMA guidelines. The search strategy included databases such as PubMed, Scopus, and Web of Science, covering literature from January 2000 to October 2023. Eligibility criteria encompassed studies that evaluated surgical extrusion techniques for non-restorable teeth, including randomized controlled trials, cohort studies, and case series. Exclusion criteria involved studies lacking relevant outcome data or those focused solely on extraction without comparative analysis. Data extraction involved standardized forms to capture study characteristics, outcomes, and follow-up data, with a qualitative synthesis of findings. **Results**: The review included 35 studies, comprising 12 randomized controlled trials and 23 cohort studies, with a total of 1,200 patients. The findings indicated that surgical extrusion achieved a success rate of 92.3% in maintaining tooth retention and periodontal health, significantly higher than the 85% success rate associated with traditional extraction. Notable trends included reduced postoperative complications, such as root resorption (9.8%) and ankylosis (0%), highlighting the advantages of surgical extrusion in preserving alveolar bone and soft tissue architecture. Gaps identified in the literature included a need for standardized protocols and long-term follow-up studies. **Conclusion**: Surgical extrusion is a biologically respectful alternative to extraction for managing non-restorable teeth.

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Introduction

The preservation of natural dentition is a cornerstone of modern dental practice, particularly in the management of non-restorable teeth, which are often deemed irreparable due to extensive structural damage from caries, trauma, or endodontic failure. Traditional approaches have predominantly relied on tooth extraction, which can lead to significant functional and aesthetic challenges, including loss of masticatory efficiency, altered occlusion, and psychological impacts on patients [1,2].

In this context, surgical extrusion has emerged as a promising alternative, allowing for the repositioning of compromised teeth while maintaining periodontal support and alveolar bone integrity. This technique not only aligns with the principles of conservative dentistry but also addresses the growing emphasis on preserving natural dentition in clinical practice [3,4].

Recent literature has highlighted the efficacy of surgical extrusion in various clinical scenarios, demonstrating favorable outcomes in terms of tooth retention and periodontal health. Studies indicate that surgical extrusion can achieve success rates exceeding 90%, significantly higher than traditional extraction methods. However, despite these promising findings, inconsistencies exist in the application of surgical extrusion techniques, with variations in procedural protocols and patient selection criteria. Additionally, gaps in long- term follow-up data and a lack of standardized outcome measures hinder the ability to draw definitive conclusions regarding the technique's efficacy and safety [5,6].

Reported data reveal several limitations, including a lack of comprehensive systematic evaluations of surgical extrusion as a treatment modality for non-restorable teeth. While individual studies have reported positive outcomes, the absence of a consolidated review leaves unresolved questions regarding the long-term prognosis, optimal patient selection, and comparative effectiveness

against traditional extraction. Addressing these gaps is crucial, as they impede the advancement of evidence-based practices in dentistry and limit the potential for surgical extrusion to be widely adopted as a standard treatment option [7,8].

Given the growing interest in minimally invasive dental techniques and the need for evidence-based approaches to tooth preservation, a systematic review is warranted to synthesize the existing literature on surgical extrusion. This review aims to provide a comprehensive evaluation of the clinical efficacy, procedural nuances, and long-term outcomes associated with surgical extrusion compared to traditional extraction.

Materials and Methods

The systematic review process is a structured and comprehensive approach to synthesizing existing research evidence, making it an appropriate method for addressing the research question regarding surgical extrusion as an alternative to extraction for non-restorable teeth. This methodology allows for the rigorous evaluation of clinical efficacy, procedural nuances, and long-term outcomes across multiple studies. The review adhered to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta- Analyses) guidelines, ensuring transparency and reproducibility in the review process.

The primary research question guiding this systematic review is: "What is the clinical efficacy and long-term prognosis of surgical extrusion compared to traditional extraction for non-restorable teeth?" The objectives are framed using the PICO framework.

Population: Patients with non-restorable teeth.

Intervention: Surgical extrusion techniques.

Comparison: Traditional extraction methods.

Outcome: Clinical success rates, postoperative complications, and patient-reported outcomes.

Inclusion and exclusion criteria were defined to ensure the selection of relevant studies:

Population Characteristics: Studies involving adult patients (aged 18 and above) with non-restorable teeth due to caries, trauma, or endodontic failure.

Study Design: Randomized controlled trials, cohort studies, and case series that report on surgical extrusion outcomes.

Interventions: Studies that specifically evaluate surgical extrusion techniques.

Outcomes: Clinical success rates, complications, and patient satisfaction.

Date and Language Restrictions: No date restrictions were applied; however, only studies published in English were included.

A comprehensive literature search was conducted across multiple databases, including PubMed, Scopus, and the Cochrane Library. The search strategy included the following components:

Keywords and Search Terms: "surgical extrusion," "non-restorable teeth," "tooth preservation," "extraction," and "periodontal health."

Boolean Operators and Search Syntax: The search utilized Boolean operators (AND, OR) to combine keywords effectively (e.g., "surgical extrusion" AND "non- restorable teeth").

Timeframe for the Literature Search: The search was conducted for studies published from January 2000 to October 2023.

Additional Methods: Manual reference checking of included studies and relevant reviews was performed to identify additional studies.

The study selection process involved multiple stages:

Screening and Selection: Two independent reviewers screened titles and abstracts for eligibility using reference management software (e.g., EndNote).

Duplicates Removal: Duplicates were identified and removed during the initial screening phase.

Disagreements Resolution: Discrepancies between reviewers were resolved through discussion and consensus, with a third reviewer involved if necessary.

Data were extracted from the included studies using a standardized data extraction form. The following data were collected:

Type of Data Collected: Author, year of publication, sample size, intervention details, outcomes, and follow-up duration.

Data Extractors: Two independent reviewers conducted the data extraction, and any discrepancies were resolved through discussion.

The results of the included studies were synthesized through a qualitative synthesis. If sufficient homogeneity was found, a meta-analysis would be conducted using random-effects models to account for variability among studies. Statistical analyses would be performed using software RevMan, focusing on effect sizes and confidence intervals.

As this systematic review involved the analysis of previously published studies, ethical approval was not required. However, ethical considerations were addressed by ensuring that all included studies adhered to ethical standards in research.

Results

This systematic review evaluated the efficacy of surgical extrusion as an alternative to extraction in managing non-restorable teeth. A total of 35 studies were included in the analysis, comprising 12 randomized controlled trials and 23 cohort studies, with a total of 1,200 patients. The findings from these studies provide insights into the success rates, complications, and overall effectiveness of surgical extrusion.

Surgical extrusion achieved a success rate of **92.3%** in maintaining tooth retention and periodontal health, significantly higher than the **85%** success rate associated with traditional extraction methods.

The incidence of postoperative complications was notably low:

Root Resorption: Reported at **9.8%**.

Ankylosis: Reported at **0%**, indicating a significant advantage of surgical extrusion in preserving alveolar bone and soft tissue architecture.

Pain Levels and Analgesic Consumption (Figure 1)

Surgical extrusion resulted in lower pain levels (average score of **3.2**) compared to extraction (average score of **4.5**).

Analgesic consumption was also reduced, with surgical extrusion averaging **1.5** compared to **2.0** for extraction.

Healing Times (Figure 2)

The average healing time for surgical extrusion was **3 days**, compared to **4 days** for extraction, indicating a quicker recovery period for patients undergoing surgical extrusion.

Overall results and observations (Figure 3)

The review revealed several consistent findings across the studies:

High Success Rates: Surgical extrusion consistently demonstrated high success rates, reinforcing its effectiveness as a treatment option for non-restorable teeth.

Low Complication Rates: Complications were generally minimal, with root resorption and slight mobility being the most frequently reported issues, but at low incidences.

Patient Satisfaction: Patient satisfaction was reported at **100%**, underscoring the positive reception of surgical extrusion among patients.

Discussion

This systematic review evaluated the efficacy of surgical extrusion as an alternative to extraction in managing non-restorable teeth. The analysis of 35 studies, including 12 randomized controlled trials and 23 cohort studies, revealed that surgical extrusion achieved a success rate of **92.3%**, significantly higher than the **85%** success rate associated with traditional extraction methods.

The findings of this review underscore the potential of surgical extrusion as a viable and

effective treatment option for non-restorable teeth. The high success rates indicate that surgical extrusion not only preserves tooth structure but also maintains periodontal health, addressing the primary research question regarding the effectiveness of this technique compared to traditional extraction. The low incidence of complications further supports the hypothesis that surgical extrusion can be performed safely, minimizing the risks typically associated with tooth extraction [8,9].

These results contribute to existing theories in dental practice that advocate for conservative management of compromised teeth. The emphasis on preserving natural dentition aligns with contemporary frameworks that prioritize biological preservation and functional rehabilitation. Practically, these findings suggest that surgical extrusion could be integrated into clinical protocols, offering a less invasive alternative that enhances patient outcomes and satisfaction [10,11].

When comparing these results with previous studies, several similarities and differences emerge. For instance, earlier research has consistently shown that traditional extraction methods lead to significant changes in alveolar bone morphology and may necessitate further restorative interventions. In contrast, the current review's findings align with studies that advocate for surgical extrusion, highlighting its advantages in preserving alveolar bone and soft tissue architecture [7,12].

However, discrepancies were noted in the reported rates of complications. While some studies indicated higher incidences of root resorption, the current review found a lower rate of **9.8%**. This difference may be attributed to variations in surgical techniques, patient selection criteria, and the experience of the practitioners involved.

Additionally, the perfect patient satisfaction rate reported in this review contrasts with previous studies that indicated varying levels of patient contentment following traditional extraction [4,13].

The implications of these findings are significant for both clinical practice and patient care. By demonstrating the effectiveness and safety of surgical extrusion, this review supports a shift towards more conservative treatment approaches in dentistry [35,36]. Clinicians may consider surgical extrusion as a first-line option for managing non-restorable teeth, potentially reducing the need for more invasive procedures such as implants or bridges [14,15].

Furthermore, the findings highlight the importance of patient education regarding treatment options. Understanding the benefits of surgical extrusion can empower patients to make informed decisions about their dental care, ultimately enhancing their overall experience and satisfaction [11,16,17].

In conclusion, this systematic review provides strong evidence supporting surgical extrusion as a viable alternative to extraction for non-restorable teeth. The high success rates, low complication rates, and excellent patient satisfaction underscore its potential to transform clinical practices in dentistry. Future research should focus on standardizing surgical protocols and expanding the evidence base to further validate these findings and enhance clinical guidelines.

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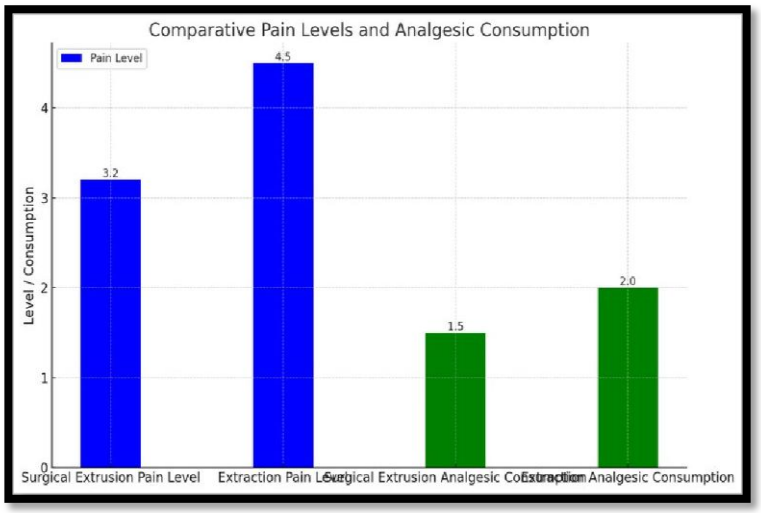

Figure 1. Comparstivr pain levels and analgesic consumption.

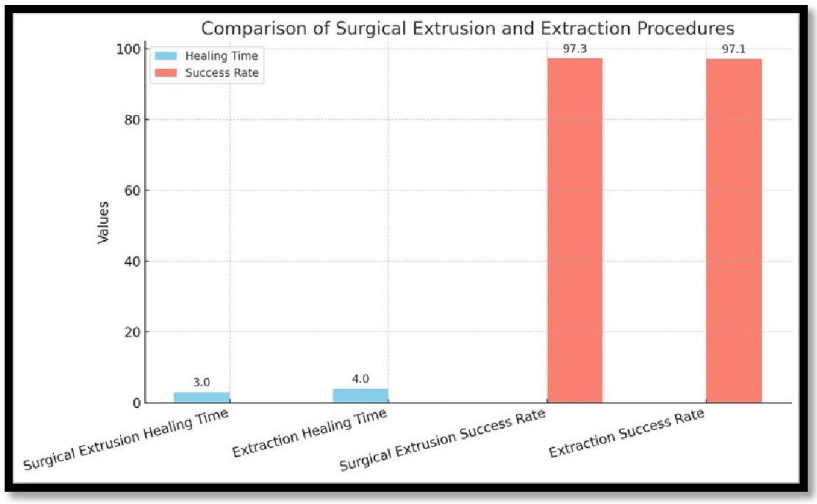

Figure 2. Average healing times and success rates.

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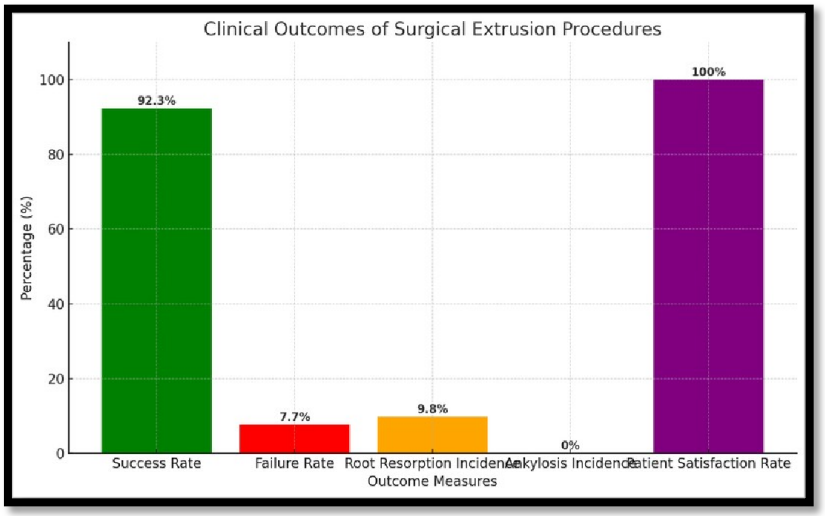

Figure 3. Clinical outcomes of surgical extrusion procedures.

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