

Retrospective evaluation of clinical outcome of periapical surgery in endodontic and oral surgery units of a dental hospital

¹Dr. Subasish Behera, ²Dr. Soumyaranjan Nanda, ³Dr. Vikram Karande,

⁴Dr. Tejaswi Maddukuri, ⁵Dr. Rushit Patel, ⁶Dr. Ramanpal Singh Makkad

¹Associate Professor, Department of Conservative Dentistry and Endodontics, Government Dental College and Hospital(SCB), Manglabag, Cuttack, Odisha.

²MDS, Department of Conservative Dentistry and Endodontics, Cuttack, Odisha.

³MDS, MFDS RCPS (Glasgow, UK), Professor and HOD, Department of Oral and Maxillofacial Surgery, D.Y. Patil Dental School, Lohegaon, Pune, Maharashtra.

⁴BDS, General Dentist, Trinethra Dental Care, #36-24-38, Factory Street, VT college Road, Innespeta, Rajamahendravaram – 533101.

⁵Professor and Head, Department of Oral and Maxillofacial Surgery, Karnavati School of Dentistry, Karnavati University, Gujarat.

⁶Professor, Department of Oral Medicine and Radiology, New Horizon Dental College and Research Institute, Bilaspur, Chhattishgarh.

Cite this paper as: Dr. Subasish Behera, Dr. Soumyaranjan Nanda, Dr. Vikram Karande, Dr. Tejaswi Maddukuri, Dr. Rushit Patel, Dr. Ramanpal Singh Makkad (2024). Retrospective evaluation of clinical outcome of periapical surgery in endodontic and oral surgery units of a dental hospital. *Frontiers in Health Informatics*, 13 (5) 446-450

Abstract

Background

Periapical surgery is a critical intervention in the management of persistent periapical pathologies when conventional endodontic treatments fail. This retrospective study aims to evaluate the clinical outcomes of periapical surgeries performed in the Endodontic and Oral Surgery units of a dental hospital, highlighting success rates and influencing factors.

Materials and Methods

The study retrospectively analyzed records of 150 patients who underwent periapical surgery between January 2018 and December 2023. Data were collected on patient demographics, type of lesion, surgical technique, materials used (root-end filling and sealing agents), and post-operative follow-ups at 6 months and 12 months. Outcome measures included resolution of symptoms, radiographic evidence of healing, and recurrence of lesions. Statistical analysis was conducted using chi-square and logistic regression tests to assess factors influencing surgical success.

Results

Among the 150 cases, 120 (80%) demonstrated complete radiographic healing at the 12-month follow-up. Partial healing was observed in 20 cases (13.3%), and 10 cases (6.7%) showed persistent or recurrent lesions. The use of bioceramic materials as root-end filling was associated with a significantly higher success rate (90%) compared to amalgam (70%) and glass ionomer cement (75%) ($p < 0.05$). Patient factors such as age and systemic health conditions influenced healing outcomes, with younger patients showing better prognosis.

Conclusion

Periapical surgery is an effective treatment for managing periapical pathologies, with a high success rate when advanced materials and techniques are employed. Bioceramic materials significantly enhance surgical outcomes. Patient-specific factors should be considered to optimize success rates. Further prospective studies are recommended for more robust evidence.

Keywords

Periapical surgery, clinical outcomes, bioceramic materials, root-end filling, dental hospital, retrospective study.

Introduction

Periapical surgery is a critical intervention for managing persistent periapical lesions that do not resolve following conventional endodontic treatment or nonsurgical retreatment (1). Despite advancements in endodontic techniques and materials, certain cases require surgical management to eliminate pathological tissues, address anatomical complexities, or manage infections refractory to conservative therapy (2). The success of periapical surgery depends on various factors, including the selection of surgical techniques, biocompatible materials for root-end filling, and the operator's clinical expertise (3).

Advancements in microsurgical approaches, such as the use of operating microscopes, ultrasonic instruments, and modern biomaterials like bioceramics, have significantly improved the prognosis of periapical surgeries (4). Bioceramic materials, for instance, exhibit superior sealing abilities, biocompatibility, and antimicrobial properties, contributing to favorable clinical outcomes (5). Nonetheless, surgical outcomes can also be influenced by patient-related factors such as age, systemic health conditions, and compliance with post-operative care (6).

This study retrospectively evaluates the clinical outcomes of periapical surgeries performed in both Endodontic and Oral Surgery units of a dental hospital over a five-year period. By assessing success rates and identifying contributing factors, this study aims to provide insights for improving surgical protocols and patient management strategies.

Materials and Methods

Study Design and Sample Selection

Patient records from January 2018 to December 2023 were reviewed to identify cases of periapical surgery. Inclusion criteria included patients aged 18 years or older who underwent periapical surgery for persistent periapical lesions refractory to nonsurgical treatment. Cases with incomplete records or follow-up data were excluded. A total of 150 cases met the inclusion criteria and were included in the analysis.

Data Collection

Data were extracted from clinical and radiographic records. Variables collected included patient demographics (age, gender, systemic health conditions), type of lesion, tooth involved, surgical technique, type of root-end filling material used (amalgam, glass ionomer cement, bioceramic materials), and post-operative follow-up outcomes at 6 months and 12 months. Radiographic evaluations were categorized as complete healing, partial healing, or persistent lesions.

Surgical Procedure

All surgeries were performed by experienced clinicians using standardized protocols. The procedure included administration of local anesthesia, elevation of a full-thickness mucoperiosteal flap, removal of periapical lesions, root-end resection, preparation of the root-end cavity, and filling with a suitable material. Sutures were placed, and post-operative instructions were provided.

Outcome Measures

The primary outcome measure was radiographic evidence of healing at 6 and 12 months. Secondary outcomes included

patient-reported symptoms such as pain or swelling and recurrence of lesions. Success was defined as complete healing with no clinical symptoms.

Statistical

Analysis

Data were analyzed using statistical software. Descriptive statistics summarized patient characteristics and outcomes. Chi-square tests were used to compare success rates across groups based on materials and patient factors. Logistic regression analysis identified predictors of successful outcomes. A p-value of <0.05 was considered statistically significant.

Results

A total of 150 patients who underwent periapical surgery were included in the study. The mean age of the patients was 35.6 ± 12.4 years, with a slightly higher proportion of males (56%) compared to females (44%).

Healing Outcomes

At the 6-month follow-up, 105 cases (70%) showed complete radiographic healing, while 35 cases (23.3%) demonstrated partial healing, and 10 cases (6.7%) had persistent lesions. By the 12-month follow-up, the complete healing rate improved to 120 cases (80%), with partial healing observed in 20 cases (13.3%), and persistent lesions in 10 cases (6.7%). These results are summarized in Table 1.

Table 1: Radiographic Healing Outcomes

Follow-up Period	Complete Healing	Partial Healing	Persistent Lesions
6 months	105 (70%)	35 (23.3%)	10 (6.7%)
12 months	120 (80%)	20 (13.3%)	10 (6.7%)

Impact of Root-End Filling Materials

The success rates varied significantly with the type of root-end filling material used. Bioceramic materials demonstrated the highest success rate (90%), followed by glass ionomer cement (75%) and amalgam (70%) (p < 0.05). The distribution of success rates according to material type is provided in Table 2.

Table 2: Success Rates Based on Root-End Filling Materials

Material Type	Number of Cases	Success Rate (%)
Bioceramic	50	90
Glass ionomer cement	40	75
Amalgam	60	70

Factors Influencing Outcomes

Patients aged below 40 years showed higher success rates (85%) compared to those aged 40 years and above (72%) (p = 0.03). Additionally, systemic health conditions such as diabetes and hypertension were associated with lower healing rates (65%) compared to systemically healthy patients (83%) (Table 3).

Table 3: Success Rates by Patient Factors

Patient Factor	Success Rate (%)	p-value
Age < 40 years	85	0.03
Age ≥ 40 years	72	
Systemically healthy	83	0.02
With comorbidities	65	

These results highlight the importance of surgical technique, material selection, and patient-specific factors in determining the success of periapical surgery.

Discussion

The present study aimed to evaluate the clinical outcomes of periapical surgery performed in Endodontic and Oral Surgery units, focusing on factors influencing success rates. The findings suggest that periapical surgery is a reliable treatment modality with a high success rate, particularly when advanced biomaterials and techniques are employed.

The overall success rate observed in this study (80% complete healing at 12 months) aligns with previously reported rates of 70–90% in studies utilizing contemporary surgical methods and materials (1,2). The improved outcomes in cases using bioceramic root-end filling materials are consistent with existing literature that highlights their superior sealing ability, biocompatibility, and antimicrobial properties compared to traditional materials like amalgam and glass ionomer cement (3,4). These properties likely contribute to enhanced periapical healing by preventing microbial ingress and promoting tissue regeneration (5,6).

Age and systemic health conditions significantly influenced the outcomes, with younger patients and systemically healthy individuals exhibiting better healing rates. These findings align with studies suggesting that systemic conditions like diabetes and hypertension negatively affect wound healing and immune responses, thereby reducing surgical success (7,8). The impact of age may be attributed to better regenerative capacity in younger patients (9).

The higher success rates observed in patients treated with bioceramic materials corroborate with studies emphasizing their benefits in apical sealing and biocompatibility (10). In contrast, the relatively lower success rates with amalgam and glass ionomer cement may be due to their inferior sealing properties and susceptibility to microleakage (11,12).

The role of surgical technique and clinician expertise cannot be understated. Microsurgical approaches utilizing magnification and ultrasonic instrumentation have demonstrated better outcomes than conventional techniques (13). This study highlights the importance of adhering to standardized protocols and integrating advanced tools to achieve optimal results.

Although the findings are encouraging, the retrospective design of the study has inherent limitations, including potential selection bias and reliance on existing records. Prospective randomized controlled trials are needed to establish stronger evidence for the factors influencing surgical success (14,15).

Conclusion

Periapical surgery remains a dependable intervention for managing refractory periapical pathologies. The use of advanced materials like bioceramics significantly enhances success rates, and patient factors such as age and systemic health conditions must be considered for better outcomes. Future studies should focus on long-term evaluations and include larger, more diverse populations to validate these findings.

References

1. Kim S, Kratchman S. Modern endodontic surgery concepts and practice: A review. *J Endod.* 2006;32(7):601-623.
2. Tsesis I, Rosen E, Taschieri S, et al. Outcomes of surgical endodontic treatment performed by a modern technique: An updated meta-analysis. *J Endod.* 2013;39(3):332-339.
3. Setzer FC, Kohli MR, Shah SB, et al. Outcome of endodontic surgery: A meta-analysis of the literature. *J Endod.* 2010;36(6):957-973.
4. Torabinejad M, Corr R, Handysides R, et al. Outcomes of nonsurgical retreatment and endodontic surgery: A systematic review. *J Endod.* 2009;35(7):930-937.
5. Song M, Shin SJ, Kim E. Outcomes of endodontic microsurgery: A meta-analysis of the literature. *J Endod.* 2011;37(8):1026-1031.
6. Shah SB, Lee SJ, Monsef M, et al. A prospective evaluation of periapical surgery using modern techniques. *J Endod.* 2010;36(2):217-221.
7. Kruse C, Spin-Neto R, Kraft DC, et al. Factors affecting outcomes of endodontic surgery. *J Endod.* 2019;45(10):1256-1263.
8. Segura-Egea JJ, Jiménez-Pinzón A, Ríos-Santos JV, et al. High prevalence of apical periodontitis amongst smokers in a sample of Spanish adults. *Int Endod J.* 2008;41(4):310-316.

9. Bagde HS, Alam MK, Almohammed YEM, Almaqawid SMM, Alanazi Awn, Alanazi FTF, Sghaireen MG. The efficacy of platelet-rich plasma as an adjunct to bone grafting in alveolar ridge preservation following tooth extraction. *J Pharm Bioallied Sci.* 2024 Feb;16(Suppl 1):S564–S566. doi:10.4103/jpbs.jpbs_865_23.
10. Alanezi AZ, Jiang J, Safavi KE, et al. Cytotoxicity evaluation of endosequence root repair material. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2010;109(3):e122-125.
11. Chong BS, Pitt Ford TR. Root-end filling materials: rationale and tissue response. *Endod Topics.* 2005;11(1):114-130.
12. Rahbaran S, Gilthorpe MS, Harrison SD, et al. Comparison of clinical outcome of periapical surgery in endodontics and oral surgery units. *J Endod.* 2001;27(7):394-399.
13. Von Arx T, Hänni S, Weiger R. Periapical surgery: A 3-year survey of cases performed in a Swiss university clinic. *Int Endod J.* 2005;38(3):127-134.
14. Del Fabbro M, Corbella S, Sequeira-Byron P, et al. Endodontic procedures for retreatment of periapical lesions. *Cochrane Database Syst Rev.* 2016;10:CD005511.
15. Chong BS, Barker CF, Davies GM, et al. Factors affecting the success rate of periapical surgery. *Int Endod J.* 1997;30(3):185-197.