

# Healing of Endodontic Peri - Apical Lesions after Surgical Treatment: A Systematic Review

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**Abstract:** *This article provides a comprehensive overview of the study conducted to evaluate the effectiveness of surgical root canal retrograde treatment in healing periapical lesions. The study, based on a systematic review of eight selected studies, explores various aspects of periapical lesion treatment, including success rates, follow-up durations, and the comparison between surgical and non-surgical approaches. The results indicate that surgical treatment offers a shorter healing period in short-term follow-ups, but there is no significant difference in long-term outcomes when compared to conventional non-surgical treatment. The abstract highlights the need for more clinical trials to establish guidelines for the appropriate use of surgical treatment in healing periapical lesions, emphasizing the importance of short-term versus long-term follow-up assessments.*

**Keywords:** endodontic surgery, apical surgery, surgical retreatment, endodontic treatment, periapical lesion.

## 1. Introduction

One of the common pathological conditions affecting periradicular tissues is periapical lesions which develop as sequelae to pulp disease (1). It is a continuation of the endodontic space infection manifested as a response of the host defense against the microbial action. It may determine local inflammation, hard tissue resorption or destruction of other periapical tissues (2). Periapical radiolucent areas are generally diagnosed either during routine dental radiographic examination or following acute toothache (3). When intra- or extra-radicular infections are persistent, and periapical pathology fails to heal after nonsurgical endodontic management protocols, only then a surgical approach should be considered (4). Surgical methods should be considered as an option only in the case of failure of nonsurgical techniques (4). Various studies concluded that microsurgical endodontic treatment is better than conventional endodontic treatment and has high success rates (5). Few studies were conducted to discuss the periapical lesion of surgically (retrograde) treated endodontic cases while there are many studies available discussing the periapical lesions of non-surgically (orthograde) treated cases. For this reason, the aim of this review is to collect all available updated data including imperative information concerning the surgical root canal (retrograde) treatment to heal periapical lesions.

## 2. Methods and Materials

PRISMA 2020 checklist with the registration number CRD42021240682 in the PROSPERO platform was used in this study (6).

### 2.1 Objectives

The objective of this systematic review is to answer the research question which is "which is better for healing of the root periapical tissues surgical or non-surgical treatment?".

### 2.2 The search strategy

The search was restricted to the English articles available (2011- 2022) on-line last updated in December 2022 from the following data-base: PubMed/Medline, Web of Science, and Science Direct. The following terms were used in the search strategies: ("healing", "periapical lesion", "surgical root canal retreatment OR surgical endodontic retreatment", "endodontic microsurgery retreatment").

### 2.3 Criteria for the inclusion and exclusion

Clinical human studies of English language conducted between (2012- 2022) were included whereas, Articles that described healing of periapical lesion with management

techniques excluding the surgical root canal retreatment and Articles that discussed healing of periapical lesion after surgical root canal retreatment by percentages and samples taken from animals both were excluded.

**2.4 Quality assessment**

Quality assessment of the studies was executed by the authors of the review, according to the Quality Assessment Tool of the National Institutes of Health (7).

**2.5 Data extractions**

Data was extracted and retrieved by the authors. A total of 3,782 studies were found by the search strategy mentioned previously, from which 3,500 were either unrelated or duplicate topics. Among the potential 282 studies, the eligibility criteria were applied and 7 studies were included in this systematic review (Figure 1).

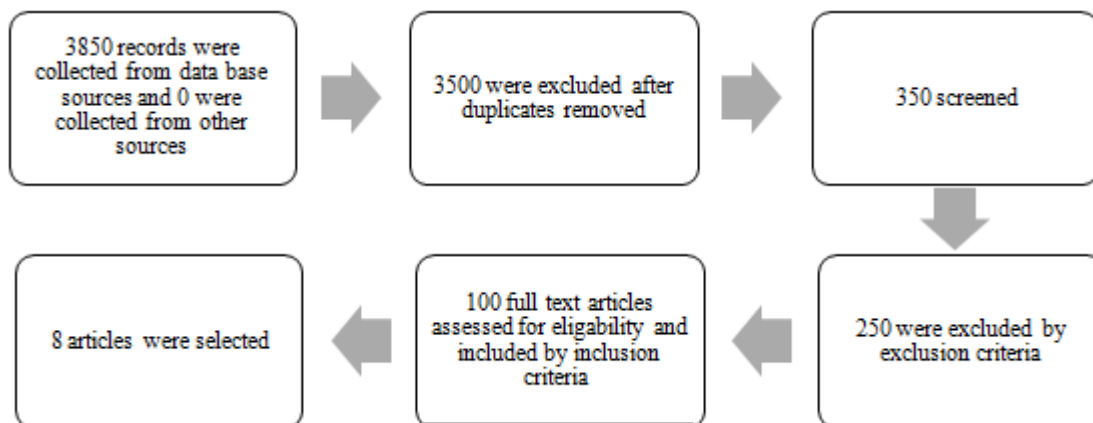


Figure 1: Study Screening Process

**3. Results**

Table (1) summarized the 8 selected studies by inclusions and exclusions criteria, these researches studied the healing of periapical lesion after retrograde root canal treatment (surgical), including success rates, duration of the follow-ups and updated studies in surgical root canal treatment. The studies that included this present systematic review were one randomized controlled trial study, two prospective studies, one retrospective study, and four case reports (8- 15). The procedures of all the studies were performed on systemically healthy persons. The duration of the follow-up performed in the included studies, one study ranged from 1 to 3-year recalls, three studies were performed with 1-year recall, three

studies up to 2 years recalls, one study up to 6 years recalls and one study up to 10 years recalls (8 -15). Regarding the surgical technique performed in the selected studies, the placement of root-end filling material was made in three studies, and in the other five studies, root-end filling material was not placed (8- 15). Healing of the periapical lesions in the included studies, all showed a high significant success rate of complete healing of the periapical lesion or remained healed after surgical retrograde treatment (8- 15). In regard to the most success rate of endodontic surgery, one study found that microsurgical techniques had a high success rate in healing the periapical lesions compared to conventional orthograde treatment (15).

Table 1: Summary of all selected study for this systematic review

Authors and type of study	Year of the study	Number of subjects	Healing (Yes or No)	Follow up duration	Results	Conclusion
Song M et al. [8]. South Korea, (Prospective Follow-up study)	2012	172	Yes	Followed up every 6 months for 24 months and every year up to 10 years.	Of the 104 followed-up cases, the successful group had 97 cases, 91 of which had complete healing and 6 had incomplete healing. The general maintained success rate was 93.3%.	In a previous 5-year study, 93.3% of endodontic microsurgery cases that were considered successfully treated stayed the same after more than 6 years.
Shinbori N et al. [9]. USA, (Retrospective study)	2015	94	Yes	Ranged from 1 to 3 years	All-inclusive the success rate was 92.0% after the endodontic microsurgery.	The use of ES-BCRR as a root canal filling material resulted in a favorable repair rate of 92.0% in endodontic microsurgery at least 12-months recall investigation
Brito-Junior M et al. [10]. Brazil, (Case Report)	2012	Case report	Yes	6 months + 1 year + 2 year followup.	A radiograph was taken following a half year exhibited progressed periapical healing in the current case. Be that as it may, a complete repair was noted at only one-year post-surgery, and complete periapical repair at the two-year follow-up.	Based on these clinical and radiographic aspects, the apical surgical intervention proved to be a successful treatment to overcome the failure of the conservative approach used in this case.

Machado R et al. [11]. Brazil, (Case Report)	2014	2 case report	Yes	Case No.1: 9 months + 1-year follow-up. Case No. 2: Follow-up examinations every 3 months for a year.	In the current cases, the outcome of the microsurgical techniques in lesion regression and tooth survival 1-year posttreatment.	It fortifies the statute that combining finding out about the biologic aspects of endodontics with surgical endodontic treatment using a modern technique is an elective foreseen treatment.
Kruse C et al. [12]. Denmark, (Randomized Controlled Trial study)	2016	44	Yes	1 year + A 6-year Follow-up.	In the recall visit after 6 years, 90% of the teeth in the GP group that were scored as effectively recuperated 12-months postoperatively stayed asymptomatic. In the MTA group, 80% of the teeth studied as adequately repaired following 12-months stayed asymptomatic.	Revelations demonstrate that a 12-months follow-up may not be adequate in evaluating the long-term result of surgical endodontic retreatment. With an extended follow-up, different determinants not clearly associated with the endodontic treatment might be appropriate for an effective result.
Song M et al. [13], South Korea, (Prospective Clinical study)	2011	54	Yes	Every 6 months for 2 succeeding and Every year.	42 cases were recalled, 39 of which were included in the success category, giving an overall success rate of 92.9%.	The use of microsurgery techniques and biocompatible materials such as MTA and Super-EBA outcome in a high clinical success rate, even in endodontic re-surgery.
Karabucak B et al. [14] USA, (Case Report)	2009	2 case reports	Yes	Case No.1: One-year and 2-year recalls. Case No.2: At a 1-year recall.	Case No.1: Radiographic assessments showed complete periapical bone healing when microsurgery was utilized. Case No.2: Normal results were found for clinical and radiographic examinations.	These cases show successful surgical treatment of combined lesions.
Kahler B [15]. Australia, (Case Report)	2010	5 case reports	1 year follow up	Yes	Healing was obvious at 12-month recall. Microsurgical techniques have significantly improved the results for healing of periapical lesions when contrasted with traditional approaches to endodontic surgery.	Success rates were found to be comparable with conventional orthograde treatment.

#### 4. Discussion

Evidence were taken for the current systematic review from eight articles. All included studies confirmed that the faster treatment time was obtained by surgical root canal (retrograde) treatment. When examining our included studies individually, all 8 studies favored the use of surgical root canal treatment, whereas most of the studies concluded that there was a high significant success rate of complete healed or remained healed of periapical lesions after the surgical treatment in short-term follow-up, there are as well some studies showed significant healing of periapical lesions after different long-term follow-ups (8- 15) This clearly shows agreement in the conclusions reached by these systematic/meta-analysis reviews regarding the healing of periapical lesions by surgical treatment compared to the conventional non-surgical treatment especially after one year of procedure which determines short-term follow-up. Our results clearly reveal the controversy in the literature, however, there is a high agreement towards supporting the microsurgical treatment. Yet, more studies are needed to structure proper guidelines and parameters of how and when surgical treatment can be used and considered as a reliable and proper treatment option to heal the periapical lesions.

#### 5. Conclusion

Surgical treatment showed its efficiency in reducing the period needed for healing of the periapical lesions and benefits patients seeking faster results in short-term follow-up. Whereas, the long-term follow-up showed no significant difference for healing of periapical lesions compared to conventional non-surgical treatment. More clinical trials are encouraged to inspect the results of surgical treatment on the healing of periapical lesions.

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