Supplement S1.

Supplementary Table S1. Table of excluded full-text studies with reasons.

Author, year	Title	Reason for exclusion
Wong et al., 2024	A retrospective study on the prognostic factors and success, survival, and failure outcomes of treated endodontic-periodontal lesions	Inadequate intervention: Lacking a primary focus on bone regeneration techniques or biomaterials applied during apical surgery.
Pereira et al., 2025	Metallomic characterization of induced periapical lesions-In vivo study	Inadequate population: Laboratory-based, preclinical animal model study.
Azim et al., 2021	The Buffalo study: Outcome and associated predictors in endodontic microsurgery- a cohort study	Inadequate comparison: Lack of a controlled comparative intervention group.
Kattimani et al., 2013	Observer strategy and radiographic classification of healing after grafting of cystic defects in maxilla: a radiological appraisal	Inadequate intervention & study design: Evaluated bone grafting without a conventional guided tissue regeneration membrane; functions as a descriptive radiological classification series lacking a controlled comparative group.
Mosquera-Barreiro et al., 2023	Predictors of periapical bone healing associated with teeth having large periapical lesions following nonsurgical root canal treatment or retreatment: A cone beam computed tomography-based retrospective study	Inadequate intervention: Evaluates periapical bone healing exclusively after nonsurgical root canal treatment or retreatment, completely lacking surgical intervention or regenerative biomaterials.
Wang et al., 2010	The involvement of Platelet-derived growth factor-A in the course of apical periodontitis	Inadequate population: Evaluates biomolecular expression exclusively in an animal model (Sprague-Dawley rats), completely lacking human clinical data.
Asgary et al., 2018	Surgical Endodontics vs Regenerative Periodontal Surgery for Management of a Large Periradicular Lesion	Inadequate study design: Case report evaluating a single patient (anecdotal evidence).
Kim et al., 2008	Prospective clinical study evaluating endodontic microsurgery outcomes for cases with lesions of endodontic origin compared with cases with lesions of combined periodontal-endodontic origin	Inadequate intervention: Evaluated conventional surgical outcomes based on lesion etiology without implementing or comparing guided tissue regeneration techniques or biomaterials.
Huang et al., 2012	A fractal dimensional approach to successful evaluation of apical healing	Inadequate intervention: Evaluates healing following nonsurgical root canal treatment, lacking any implementation or comparative evaluation of surgical guided tissue regeneration protocols.
Karabucak et al., 2008	Conventional and surgical endodontic retreatment of a maxillary lateral incisor with unusual anatomy	Inadequate study design: Single case report lacking a controlled comparative group or standardization.
Villa-Machado et al., 2013	Retrospective follow-up assessment of prognostic variables associated with the outcome of periradicular surgery	Inadequate intervention: Evaluated retrospective prognostic factors associated with conventional periradicular surgery, lacking any deployment of guided tissue regeneration barrier membranes or bone grafts.
Arx et al., 2001	Periradicular surgery of molars: a prospective clinical study with a one-year follow-up	Inadequate intervention: Evaluated general surgical outcomes of conventional periradicular surgery in molars without deploying or comparing regenerative biomaterials.
Wang et al., 2023	Implant Placement with Simultaneous Guided Bone Regeneration in the Anterior Region Close to the Periapical Lesion of Adjacent Teeth: A Combined Treatment Strategy to Prevent Complications	Inadequate population & intervention: The primary focus is dental implant placement and peri-implant guided tissue regeneration, rather than isolated apical surgery on natural teeth.
Britain et al., 2005	The use of guided tissue regeneration principles in endodontic surgery for induced chronic periodontic-endodontic lesions: a clinical, radiographic, and histologic evaluation	Inadequate population: Preclinical, laboratory-based animal study (canine model) evaluating induced defects.
Lin et al., 2015	Treatment of large apical lesions with mucosal fenestration: a clinical study with long-term evaluation	Inadequate study design: Small, uncontrolled case series (evaluating only five patients) lacking a standardized control group.
Ortega-Sánchez et al., 2009	Radiographic morphometric study of 37 periapical lesions in 30 patients: validation of success criteria	Inadequate intervention: Evaluated conventional periapical surgery to validate a radiographic morphometric scale, lacking the use of guided tissue regeneration techniques.

Author, year	Title	Reason for exclusion
Balshi et al., 2007	A retrospective evaluation of a treatment protocol for dental implant periapical lesions: long-term results of 39 implant apicoectomies	Inadequate population: Evaluated surgical outcomes and apicoectomies performed on dental implants rather than natural teeth.
Garrett et al., 2002	The effect of a bioresorbable matrix barrier in endodontic surgery on the rate of periapical healing: an in vivo study	Inadequate population: Explicitly excluded through-and-through lesions, evaluating only isolated apical defects with an intact lingual/palatal cortical plate.
Hashem et al., 2025	Healing of Extensive Through-and-Through Periradicular Lesion Using Apicoectomy Without Bone Grafting: A Case Report With 3-Year Recall	Inadequate study design & intervention: Single case report that intentionally performed conventional apical surgery without the application of any regenerative biomaterials or membranes.
Maraş et al., 2025	Investigation of the Effect of Vitamin D Supplementation on Apical Lesion Healing Rate: Prospective, Randomised Clinical Trial	Inadequate intervention: Evaluates systemic vitamin D supplementation on healing, completely lacking assessment of apical surgery or local regenerative biomaterials.
Wang et al., 2021	Resolution of a Cystic Endodontic-Periodontal Lesion Utilizing Combined Apicoectomy and Guided Tissue Regeneration: A Case Report	Inadequate study design: Single case report evaluating a single patient, lacking a comparative control group.
Peters et al., 2013	Cone beam computed tomography and other imaging techniques in the determination of periapical healing	Inadequate study design: Narrative review lacking primary clinical data or a controlled evaluation of regenerative surgical protocols.
Yahata et al., 2023	Autologous concentrated growth factor mediated accelerated bone healing in root-end microsurgery: A multicenter randomized clinical trial	Inadequate intervention: Focuses exclusively on concentrated growth factor as a biological adjunct alone, rather than conventional guided tissue regeneration barrier membranes or standard bone grafting materials.
Kreisler et al., 2013	Clinical outcome in periradicular surgery: effect of patient- and tooth-related factors--a multicenter study	Inadequate intervention: Evaluated general patient- and tooth-related prognostic factors in conventional surgery, without assessing or comparing regenerative protocols.
Güngörmüş et al., 2002	Evaluation of the effect of heterologous type I collagen on healing of bone defects	Inadequate study design: Combined experimental animal and clinical study.
Yang et al., 2024	Clinical outcomes of endodontic microsurgery in complicated cases with large or through-and-through lesions: a retrospective longitudinal study	Inadequate intervention: Retrospective study evaluating overall tooth survival and non-regenerative surgical risk factors rather than comparing specific biomaterials or guided tissue regeneration techniques.
Peñarrocha et al., 2007	Relationship of Periapical Lesion Radiologic Size, Apical Resection, and Retrograde Filling With the Prognosis of Periapical Surgery	Inadequate intervention: Evaluated the prognostic impact of anatomical and surgical dimensions during conventional periapical surgery (using silver amalgam), completely lacking the implementation of guided tissue regeneration techniques.
Singh et al., 2011	Role of platelet-rich plasma in combination with alloplastic bone substitute in regeneration of osseous defects	Inadequate intervention: Evaluates an alloplastic bone substitute combined with platelet-rich plasma as a biologic adjunct, completely lacking the mandatory application of a guided tissue regeneration barrier membrane.
Hsiao et al., 2009	A Retrospective Clinical and Radiographic Study on Healing of Periradicular Lesions in Patients Taking Oral Bisphosphonates	Inadequate intervention: Evaluates bone healing exclusively following nonsurgical root canal treatment or retreatment rather than apical surgery.
Fabbro et al., 2012	Effect of Platelet Concentrate on Quality of Life after Periradicular Surgery: A Randomized Clinical Study	Inadequate intervention & outcomes: Evaluates a platelet concentrate as a short-term biologic adjunct rather than conventional guided tissue regeneration protocols, and its outcomes are strictly limited to early postoperative quality of life parameters instead of long-term bone healing.
Song et al., 2014	Comparison of Clinical Outcomes of Endodontic Microsurgery: 1 Year versus Long-term Follow-up	Inadequate intervention: Evaluates long-term outcomes of conventional endodontic microsurgery without implementing or comparing guided tissue regeneration protocols or regenerative materials.