

Abstract

We systematically reviewed surgical treatment of suprastomal granuloma in tracheostomy-dependent children, with non-surgical observation as the comparator (15 studies; 319 children). Surgery achieved decannulation in 67.7% (95% CI, 51.0%-82.7%), with periprocedural complications in 4.3% and mortality of 0.8%. Persistent or recurrent granuloma occurred in 20.1% after surgery versus 44.1% under observation (P = 0.07), yet excision did not lower the odds of a granuloma at the next endoscopy in direct within-study comparison (OR, 1.46; 95% CI, 0.67-3.17), and most unexcised lesions resolved. Surgery is effective and safe but is best reserved for obstructing or symptomatic lesions.

Introduction

Suprastomal granuloma is the most common acquired airway lesion in tracheostomy-dependent children, forming where tube friction, bacterial colonization, and reflux act on a healing stoma. Its effects range from none to bleeding, aphonia, failed capping trials, and obstruction after decannulation. Management spans observation to cold, powered, laser, or open excision, yet the evidence consists of small single-center series and no pooled estimate exists.

Objectives

To quantify the efficacy and safety of surgical treatment of suprastomal granuloma in children with a tracheostomy, using non-surgical observation as the comparator.

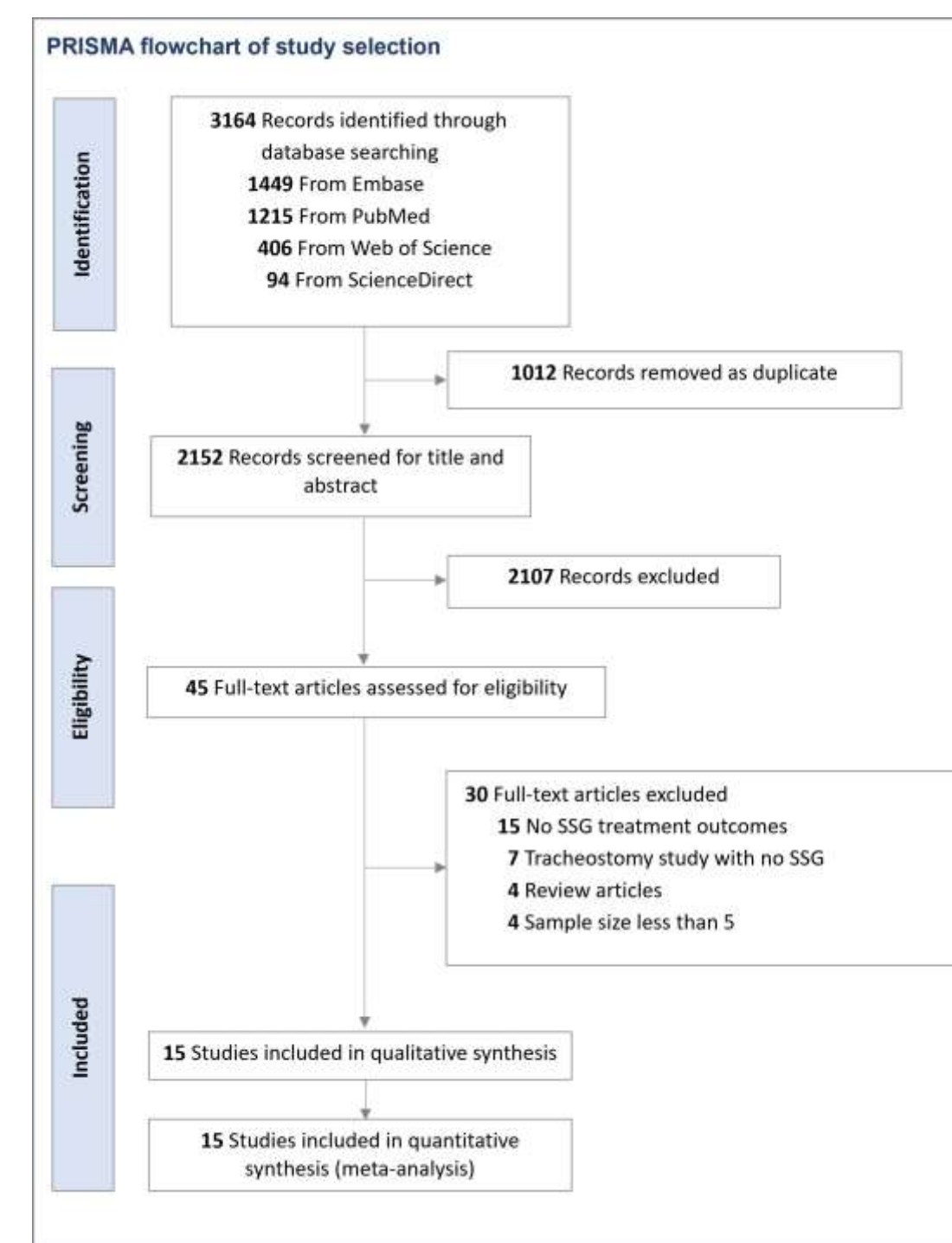
Methods and Materials

- **Data sources:** PubMed, Embase, Web of Science, and ScienceDirect from inception through September 2026, following PRISMA 2020.
- **Eligibility:** original studies of children with a tracheostomy and suprastomal granuloma reporting treatment outcomes in 5 or more patients; reviews, case reports, and collapse-only cohorts were excluded.
- **Data extraction:** two reviewers independently; outcomes harmonized to a prespecified codebook, with one non-overlapping estimate per study per pool.
- **Quality:** Joanna Briggs Institute critical appraisal tools.
- **Statistical analysis:** random-effects pooling of Freeman-Tukey transformed proportions with a confirmatory generalized linear mixed model (GLMM), plus subgroup, sensitivity, meta-regression, and publication-bias analyses in CMA version 4 and R version 4.5.2.

Results

From 3,164 records, 2,152 were screened and 45 full texts assessed; 15 studies met the inclusion criteria (Figure 1).

Figure 1. PRISMA flowchart of study selection



- 15 studies (1992-2026) contributed 319 children: United States 10, United Kingdom 2, Israel 2, Mexico 1.
- 11 retrospective case series, 2 prospective series, 1 cohort, and 1 chart review; all reported surgery, and 2 also observed 56 granulomas.
- Risk of bias was low in 4, moderate in 10, and high in 1 study.

67.7%

Decannulation after surgery

4.3%

Periprocedural complications

55.9%

Spontaneous resolution under observation

OR 1.46

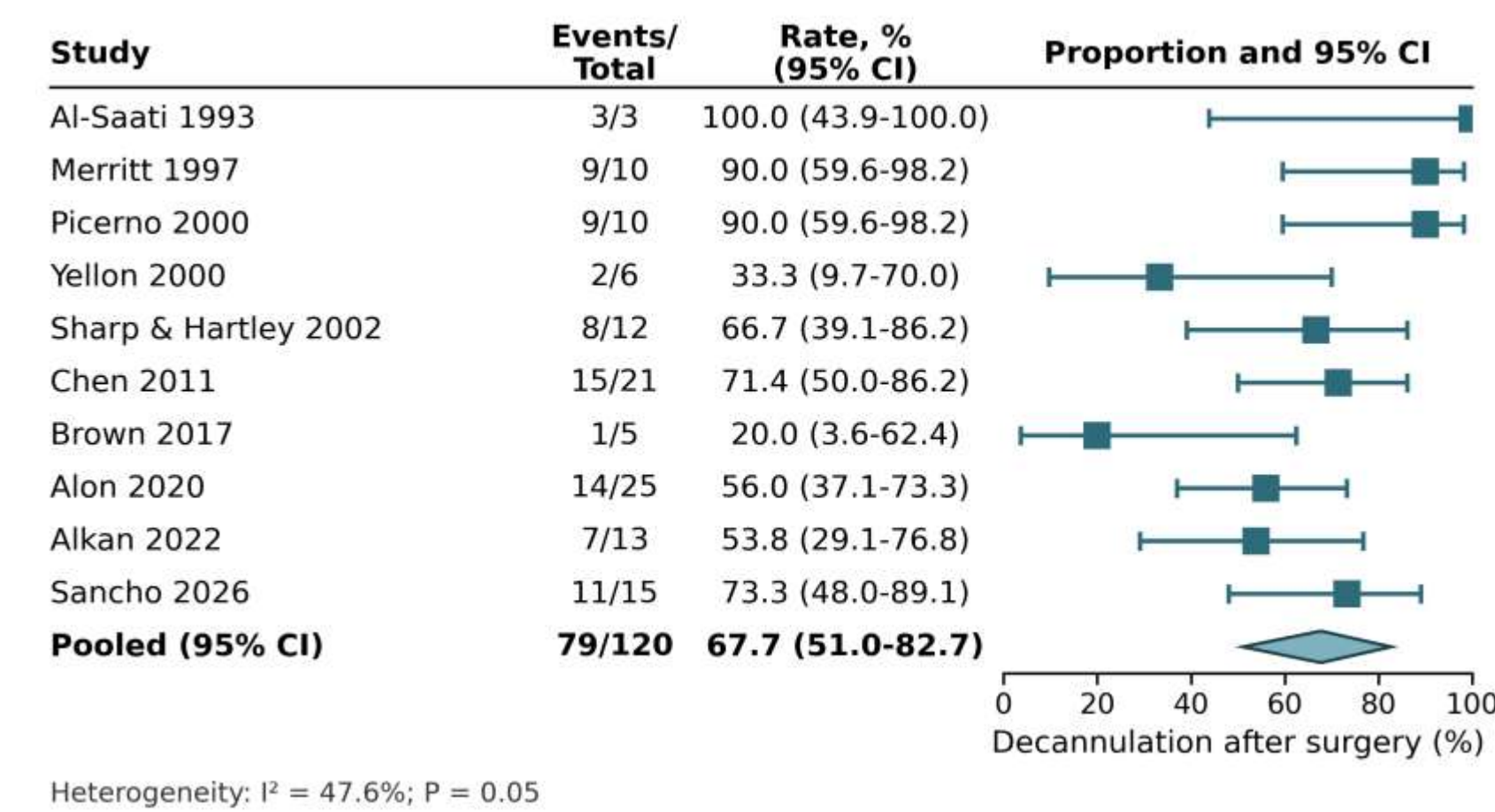
Excision vs observation (P = 0.34)

Results (continued)

EFFICACY

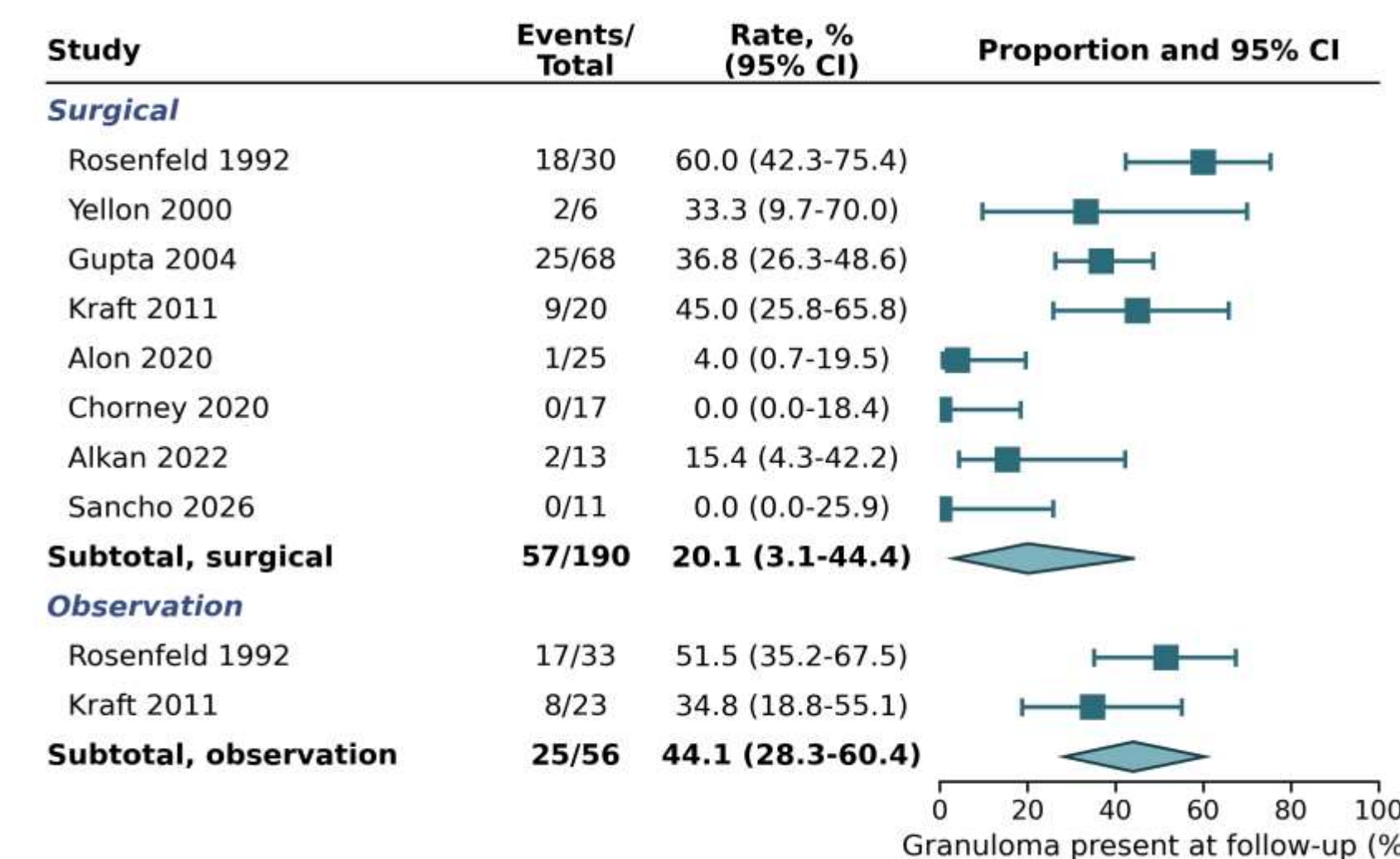
- Decannulation after surgery: 67.7% (10 studies; I² = 48%), confirmed by GLMM (66.5%); no difference between technique classes (P = 0.49).

Figure 2. Pooled decannulation after surgical treatment



- Persistent or recurrent granuloma: 20.1% after surgery vs 44.1% under observation (P = 0.07); 46.1% after surgery under protocol surveillance.

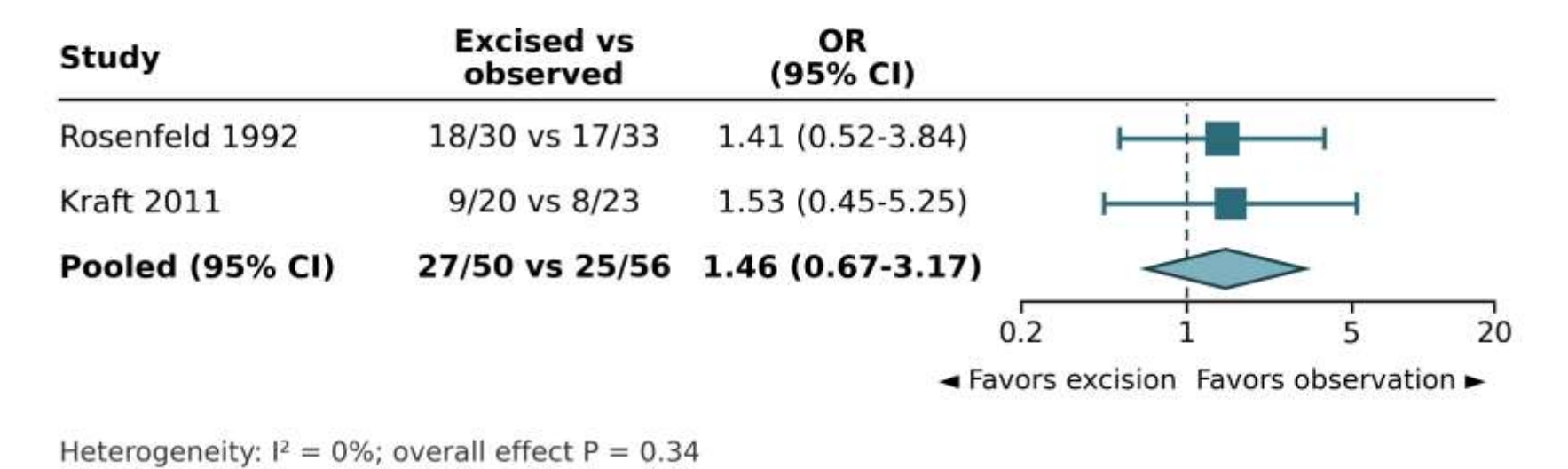
Figure 3. Persistent or recurrent granuloma, surgery vs observation



Results (continued)

DIRECT COMPARISON

Figure 4. Granuloma at next endoscopy, excision vs observation



SAFETY AND FUNCTION

- Periprocedural complications: 4.3% (95% CI, 0.3%-11.1%; I² = 0%); mortality 0.8%.
- More than 1 excision in 43.5%; subsequent open airway reconstruction in 22.4%.
- Voice improved in 63.8%; mean operative time 29.2 minutes.
- Efficacy was higher in unselected than severity-selected cohorts (81.6% vs 59.3%; P = 0.01), with no small-study effects (Egger P = 0.95).

Discussion

- Two of every 3 children are liberated after surgery, but recurrence under matched surveillance equals observation, and most unexcised lesions involute.
- No technique proved superior; apparent differences reflect case mix rather than instrument.
- Evidence is observational and the comparison rests on 2 cohorts; a validated grading system and a trial of excision versus surveillance are needed.

Conclusions

Surgical treatment of suprastomal granuloma is effective and safe, liberating two of every three children with rare complications. Because excision does not reduce persistence relative to observation, surgery is best reserved for obstructing, bleeding, or phonation-limiting lesions and for children in whom decannulation is otherwise blocked.

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