News Release

Title

Polyglycolic acid sheet covering to prevent recurrence after surgery for spontaneous pneumothorax: a meta-analysis

Key Points

- Spontaneous pneumothorax (SP) is one of the most common respiratory conditions. Reducing the SP recurrence rate after thoracoscopic surgery is an urgent task for thoracic surgeons.
- Despite the widespread use of staple line coverage in Japanese clinical practice, most previous studies that assessed the effect of coverage were small case series, including studies from a single-center experience or in a setting without a control group.
- The results showed that PGA coverage could help prevent pneumothorax recurrence. Since PGA coverage is a simple and possibly effective method, we hope that clinical trials on this method will be conducted on a larger population.

Summary

The coverage technique using absorbable mesh was first described in a European guideline published in 2015 as a preventive method for the recurrence of spontaneous pneumothorax. We performed a meta-analysis based on a literature search of primary studies that compared the postoperative recurrence rate of primary spontaneous pneumothorax between the use and nonuse of polyglycolic acid sheet coverage. Two reviewers independently selected and evaluated the quality of the relevant studies. The risk ratio in each study was calculated in a random-effect meta-analysis. Statistical heterogeneity among the included studies was quantitatively evaluated using the I2 index, and publication bias was assessed using a funnel plot. A total of 19 retrospective cohort studies were analyzed: 1,524 patients who underwent wedge resection alone (the control group) and 1,579 who received additional sheet coverage. Polyglycolic acid sheet coverage was associated with a lower recurrence rate than that in the control group (risk ratio: 0.27, 95% confidence interval 0.20–0.37, $P < 0.001$; I2 0%). The funnel plot suggested possible publication bias. The covering technique reduced the recurrence rate of pneumothorax after thoracoscopic surgery to one-fourth.

Research Background

Spontaneous pneumothorax (SP) is one of the most common respiratory conditions. Surgical excision of the underlying pathologic cause remains the procedure with the lowest recurrence rate of approximately 1% and has been recommended for cases with persistent air leakage or recurrent pneumothorax. However, since the spread of thoracoscopic surgery in the 1990s, SP's high recurrence rate has become a concern likely because the risk for recurrence was reported to be four-fold increased after thoracoscopic surgery compared with thoracotomy. Therefore, reducing the SP recurrence rate after thoracoscopic surgery is an urgent task for thoracic

surgeons.

Staple line coverage has been mainly used in Asian countries, such as China, Korea, and Japan. Despite the widespread use of staple line coverage in clinical practice, most previous studies that assessed the effect of coverage were small case series, including studies from a single-center experience or in a setting without a control group. In the present meta-analysis, to avoid high heterogeneity among the included studies, we only focused on polyglycolic acid (PGA) materials and excluded studies that involved an additional procedure other than staple line coverage, such as pleurodesis or pleurectomy.

We aimed to systematically assess the efficacy of covering the staple line with a PGA sheet to prevent SP recurrence after thoracoscopic surgery. This study excludes studies that added major techniques other than coverage and is the first meta-analysis to examine the pure preventive effect of coverage on the recurrence of pneumothorax.

Research Results

After applying the inclusion and exclusion criteria, 19 studies remained eligible for analysis. All the studies were retrospective cohort studies conducted in Japan; there was no eligible study from other countries. The 19 studies comprised 1,579 patients who underwent wedge resection plus staple line coverage or buttress stapling with PGA sleeve (PGA covering group) and 1,524 who underwent wedge resection alone (control group). In 11 studies, the control and PGA covering groups were sequentially studied (sequential group), whereas the other 8 studies compared the control and PGA covering groups during the same study period (concurrent group).

The pooled risk ratio (RR) showed that the recurrence rate was significantly lower in the PGA-covered group compared with the control group (RR 0.27, 95% confidence intervals (CI) 0.20–0.37, $P < 0.001$, I2 0%; Figure 1). The funnel plot used to assess publication bias was shown in Figure 2. The regression line tilted up slightly to the right, and a sparse area was noted in the lower right field. Egger's test for bias yielded a P-value of 0.034, which suggested publication bias to a lower summary RR.

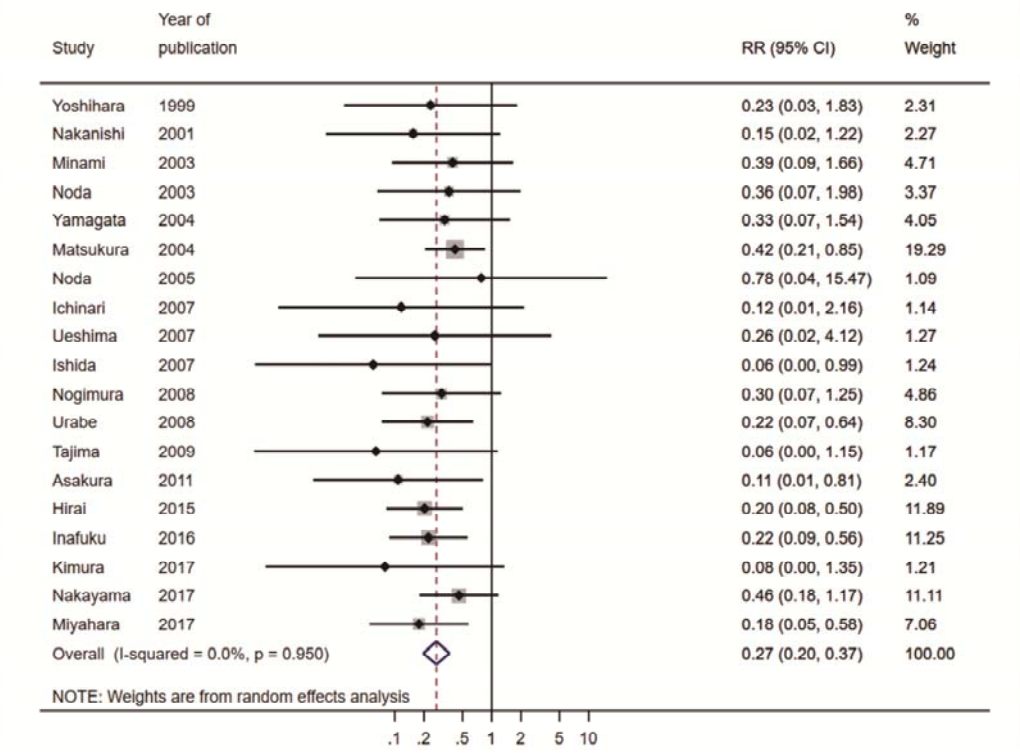


Figure 1：Forest plot of the risk ratio for recurrence

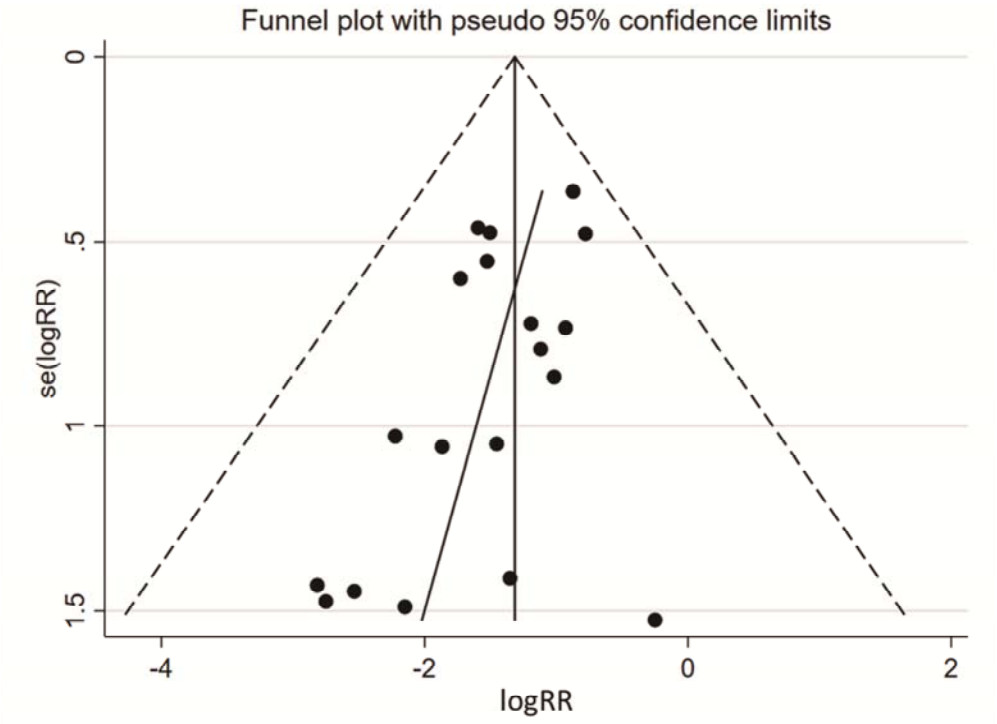
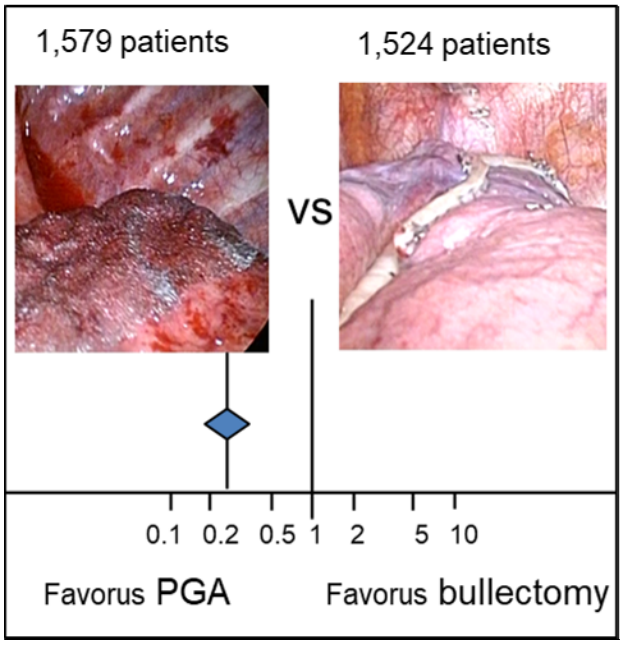


Figure 2：Funnel plot of the included studies. The asymmetrical plot indicates publication bias



Research Summary and Future Perspective

To the best of our knowledge, this study was the first meta-analysis to examine the pure preventive effect of PGA coverage during thoracoscopic surgery on a large scale and compared with the effects of wedge resection alone. The results showed that PGA coverage could help prevent pneumothorax recurrence. Although interpreting these results would require careful consideration, this meta-analysis has provided the largest-scale data that can support the PGA covering method's effect on preventing SP recurrence. Since PGA coverage is a simple and possibly effective method, we hope that clinical trials on this method will be conducted on a larger population.

Publication

Yuka Kadomatsu[1], Takayuki Fukui[2], Shoichi Mori[3], Toyofumi Fengshi Chen-Yoshikawa[2], Kenji Wakai[1],

[1] Department of Preventive Medicine, Nagoya University Graduate School of Medicine, Japan

[2] Department of Thoracic Surgery, Nagoya University Graduate School of Medicine, Japan

[3] Japanese Red Cross Nagoya DaiichiHospital, Japan

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