

Risks of Sinus Membrane Perforation and Contributing Factors during Sinus Floor Elevation: A Systematic Review and Meta-Analysis

Chun-Teh Lee, Karishma Choksi, Ming-Chieh Shih, Paul Rosen, Shale Ninneman, Yung-Ting Hsu



BACKGROUND

Posterior maxillary reconstruction is challenging for implant therapy. The sinus floor elevation (SFE) runs a significant complication rate even though it has been widely applied and generally achieved predictable bone augmentation. This systematic review aimed to investigate the risk of complications with SFE procedures, including sinus membrane perforation (SMP) and their associated factors.

QUICK FACTS ABOUT THIS META-ANALYSIS

- The first pairwise and network meta-analyses comparing SMP risks between multiple SFE techniques with the most extensive data pool.
- Features of complications varied in LSFE and TSFE using different techniques with the inherent limitations.
- TSFE had a lower risk of SMP than LSFE.
- Using TSFE, reamer mediate technique, had a lower risk of SMP than osteotome or hydraulic TSFE.
- Using techniques other than rotary bur to outline the window during LSFE may reduce the SMP risk.

MATERIALS & METHODS

Electronic databases and hand searches were conducted to screen literature published from January 1960 to August 2020. The selected studies had to report well-described SFE techniques and complications during SFE. A total of 90 studies with a total of 5812 SFE procedures were included in the meta-analysis (Fig. 1).

Variables of interest included SFE techniques and the number of SMP events. Pairwise and network meta-analyses (Fig. 2) were conducted to evaluate the associations between surgical techniques and SMP. The odds ratios of SMP between surgical techniques were calculated. The effects of variables, such as residual ridge height (RRH), clinical settings, and premedication on odds ratios were also evaluated.

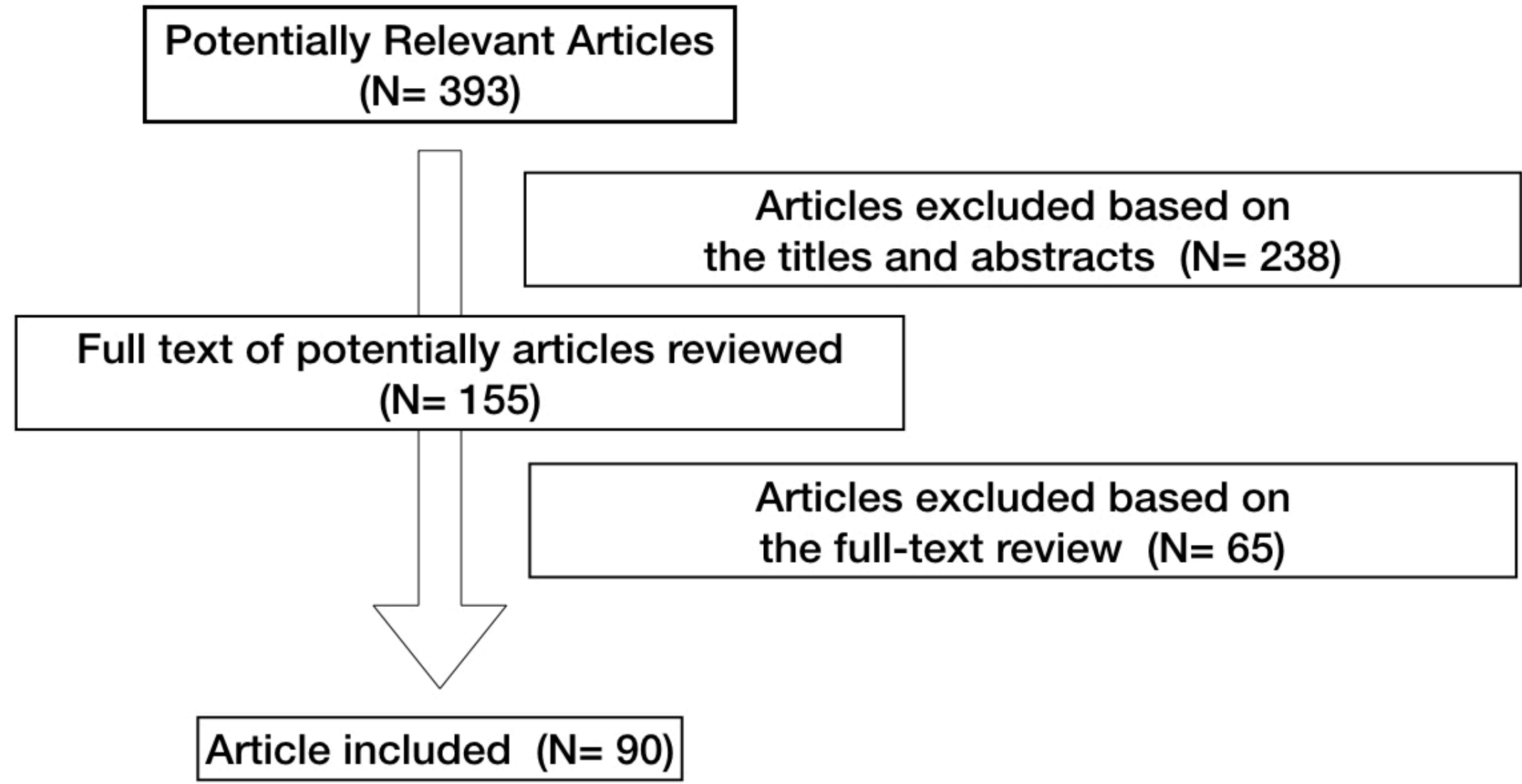


Figure 1. Flow Chart of Article Selection

RESULTS

- Different SFE techniques demonstrated distinct features of complications with varying rates.
- Lateral window sinus floor elevation (LSFE) techniques tended to have a higher risk of SMP than transcrestal sinus floor elevation (TSFE). (Fig. 3)
- The surgical technique with the lowest risk of SMP was reamer-mediated TSFE. (Fig. 4)
- Comparing LSFE techniques, the use of rotary bur showed the highest risk of SMP than LSFE using piezoelectric surgery or alternative techniques.
- RRH, clinical setting and premedication did not significantly affect the odds ratios of SMP between surgical techniques ($p>0.05$).
- Management of SFE complications is also summarized as a clinical guideline in the oral presentation

Figure 2. Network map for studies using different SFE techniques.(A) LSFE using rotary bur, (B) LSFE using piezoelectric surgery, (C) LSFE using other instruments, (D) TSFE using malleting force (E) TSFE using hydraulic pressure, (F) TSFE using reamer-mediated techniques

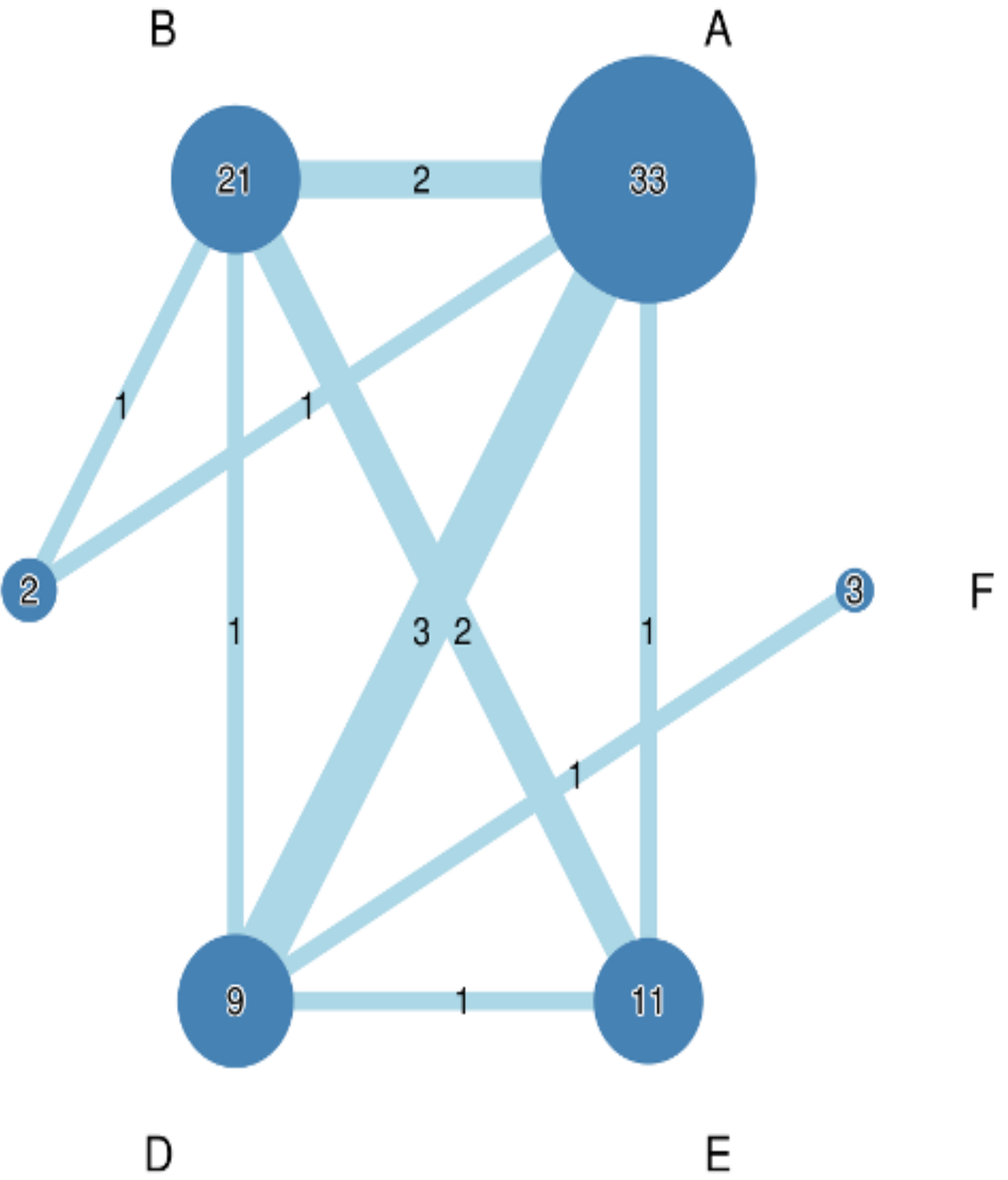
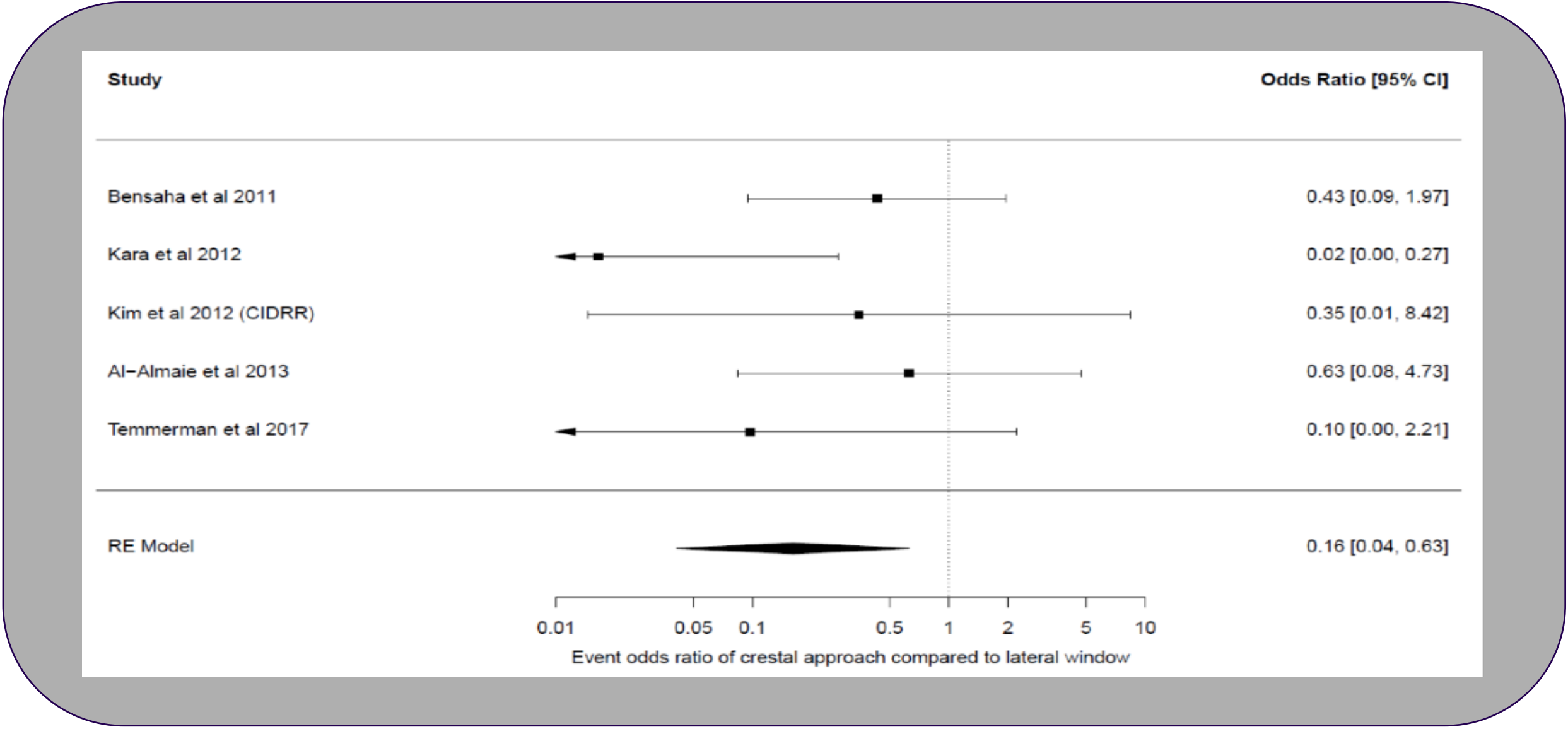


Figure 3. Odds ratios of sinus membrane perforation between the lateral window approach (LSFE) and the crestal approach (TSFE) in the pairwise meta-analysis.

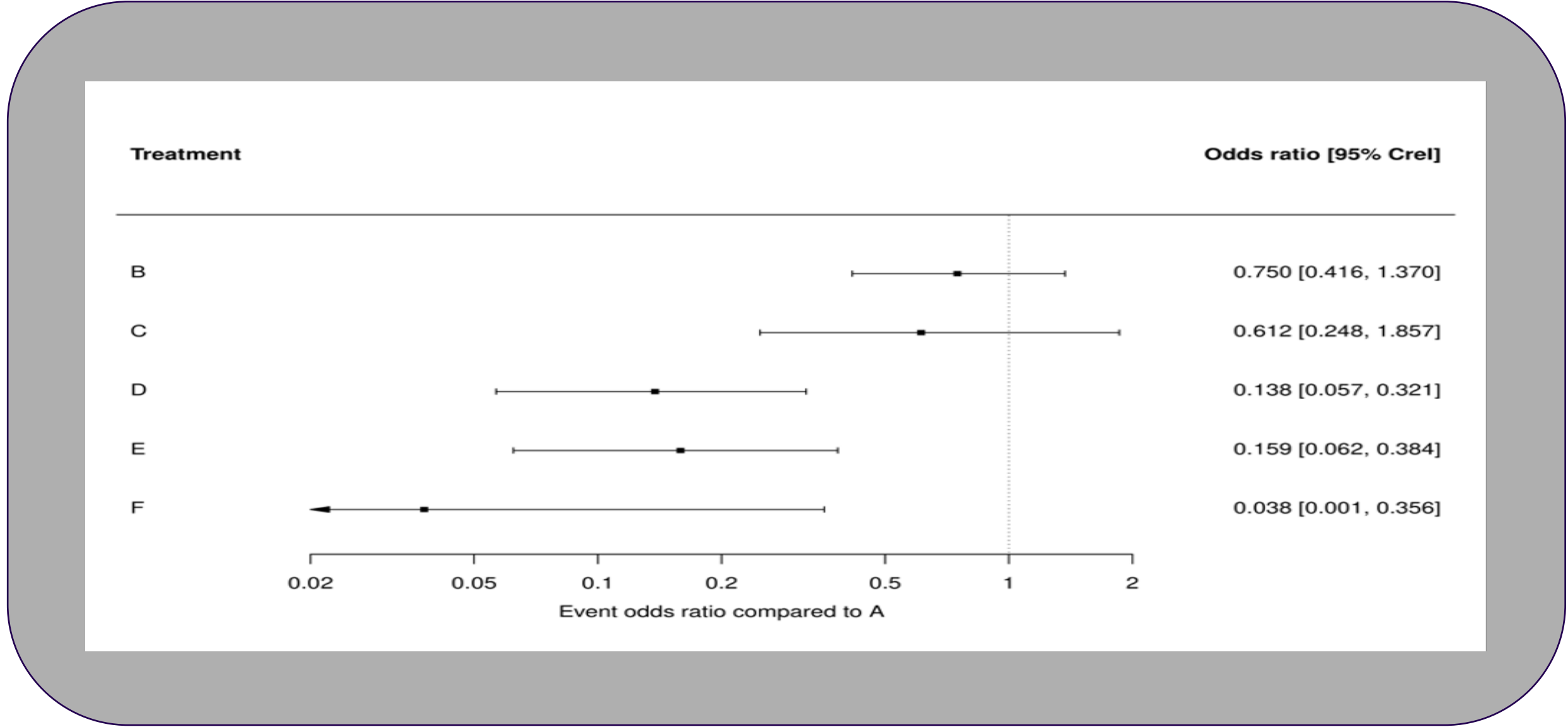


Figure 4. Odds ratios of sinus membrane perforation for comparisons between surgical techniques in the network meta-analysis.

CONCLUSION

The results of the systematic review demonstrated how features of complications varied in LSFE and TSFE using different techniques with the inherent limitations.