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Diagnostic accuracy of ultrasound findings for distinguishing complicated appendicitis from simple appendicitis in pediatric patients: A systematic review and meta-analysis

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ABSTRACT

Background

Acute appendicitis is the most common surgical emergency in children. While up to 85% of pediatric appendicitis cases are uncomplicated, the rate of complicated appendicitis can be significant, ranging from approximately 30% overall to as high as 50–75% in certain cohorts [1]. Ultrasound (US) is a first-line imaging modality, yet its diagnostic performance in accurately identifying these complications remains uncertain [2].

Methods

Following PRISMA [3], we searched PubMed, Embase, Web of Science, and Scopus from inception. Risk of bias was assessed with QUADAS-2. Bivariate random effect model pooled sensitivity and specificity; heterogeneity was summarized using I^2 and Q; small-study effects were evaluated using Deeks' test. Clinical utility was illustrated using a Fagan nomogram, and overall accuracy was assessed using a summary receiver-operating characteristic (SROC) curve.

Results

Twenty-one studies met the inclusion criteria. Nearly all procedures were conducted by specialists or residents in radiology. The age range for the pediatric population was between 0 to 18 years old. Pooled US sensitivity for identifying complicated appendicitis was 0.52 (95% CI 0.41–0.62), and specificity was 0.90 (0.84–0.94) **(Figure 1)**. The area under the curve was 0.80 (0.76–0.83) **(Figure 2)**, and the summary operating point mirrored the pooled estimates. Deeks' test suggested no significant asymmetry (p=0.08). Assuming a pre-test probability of 25%, a positive US result (LR+ = 5) increased the post-test probability to ~64%, whereas a negative result (LR−=0.54) reduced it to ~15%.

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Conclusion

In pediatric appendicitis, US demonstrates high specificity but moderate sensitivity for discriminating complicated from simple disease. A positive scan can "rule in" complication and support expedited, targeted management; a negative scan cannot exclude complication and should be interpreted alongside clinical findings, laboratory data, and, when indicated, adjunct imaging. Future studies should standardize sonographic criteria and report per-feature performance to refine thresholds and reduce heterogeneity.

Keywords

Pediatrics, Complicated appendicitis, Ultrasound, Diagnostic accuracy

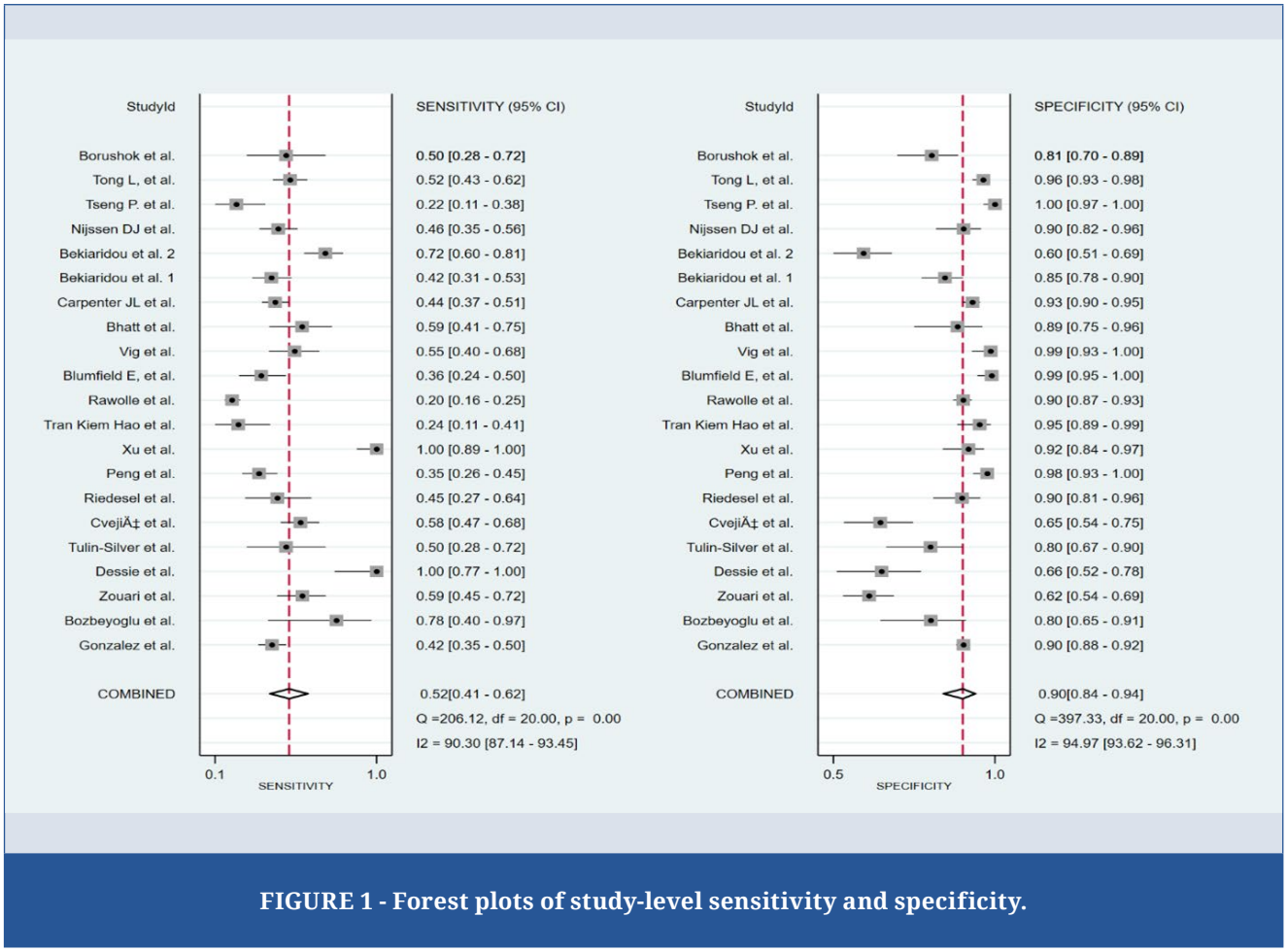

FIGURE 1 - Forest plots of study-level sensitivity and specificity.

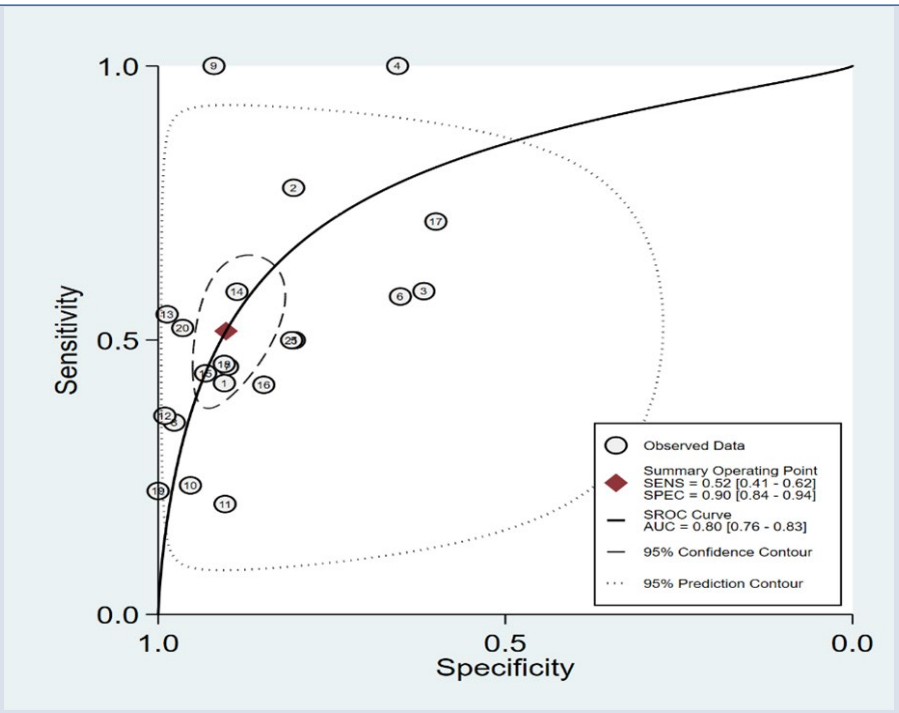

FIGURE 2 - Summary receiver-operating-characteristics (SROC) curve.

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Author contributions

All authors contributed equally and validated the final version of record.

Declarations

Conflicts Of Interests

The Authors declare that there is no conflict of interest.

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Registration

No registration applicable.

Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Ethical approval

Ethical approval for this study was not required.

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