



Visual case discussion

Pediatric acute appendicitis: Ultrasound diagnosis

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11 yo female presented to the ED for 2 days of nausea and abdominal pain that localized to the right lower quadrant. She had no fever, urinary symptoms, vomiting or diarrhea. Her vitals were a temperature of 99.5 F and heart rate of 118. Abdominal tenderness was maximal over McBurney's point, with voluntary guarding. Given a preference to avoid ionizing radiation, ultrasound was selected to evaluate for appendicitis. Our institution has limitations in obtaining formal appendix ultrasound studies; thus a bedside ultrasound was performed by a trained EM physician. At the point of maximal tenderness, a blind-ending, non-compressible structure was identified,

with a maximal diameter of 1.2 cm, consistent with acute appendicitis. (Figs. 1 and 2) A definitive diagnosis was obtained within minutes of the patient being in the ED. The child subsequently underwent an uncomplicated laparoscopic appendectomy confirming acute appendicitis.^{1–3}

Fig. 1

Supplementary material

Supplementary material associated with this article can be found, in the online version, at doi:[10.1016/j.visj.2018.10.001](https://doi.org/10.1016/j.visj.2018.10.001).

References

- Fields MJ, Davis J, Alsup C, et al. Accuracy of point-of-care ultrasonography for diagnosing acute appendicitis: a systematic review and meta-analysis. *Acad Emerg Med*. 2017;24(9):1124.
- Mittal MK, Dayan PS, Macias CG, et al. Performance of ultrasound in the diagnosis of appendicitis in children in a multicenter cohort. *Acad Emerg Med*. 2013;20(7):697.
- Goldin AB, Khanna P, Thapa M, et al. Revised ultrasound criteria for appendicitis in children improve diagnostic accuracy. *Pediatr Radiol*. 2011;41(8):993.

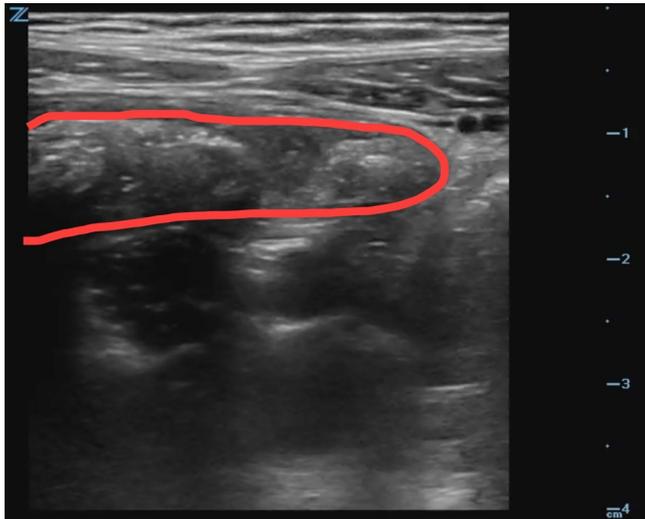


Fig. 1. Clarification of video in Figure 1, shows outline of inflamed appendix.

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Questions

1. When visualized, the sensitivity and specificity of ultrasound for diagnosis of acute appendicitis is best described by which statement?
 - a. High specificity, low sensitivity
 - b. Low specificity, low sensitivity
 - c. High specificity, high sensitivity
 - d. Low specificity, low sensitivity
 - e. Moderate specificity, low sensitivity
2. What size is considered the upper limit of normal when measuring an appendix on ultrasound?
 - a. 3mm
 - b. 5mm
 - c. 7mm
 - d. 9mm
 - e. 11mm
3. In the case of ultrasound diagnosis of acute appendicitis, findings might include?
 - a. Non-compressible structure
 - b. Peri-appendiceal fluid
 - c. Thickened, edematous wall
 - d. Appendix dilation
 - e. All of the above

Answers

1. High specificity, high sensitivity. Explanation: When the appendix is visualized, ultrasound displays a sensitivity and specificity of greater than 90%. The key point to consider is that the appendix needs to be

visualized. Management of a patient with a non-visualized appendix must be approached in the light of pre-test suspicion, resource utilization, family preference, and the ability to perform serial examinations. The performance of ultrasound is operator dependent with experienced sonographers experiencing much higher rates of visualization and better test characteristics. References: Fields MJ et al. Accuracy of point-of-care ultrasonography for diagnosing acute appendicitis: a systematic review and meta-analysis. *Acad Emerg Med.* 2017; 24(9): 1124; Mittal, MK. et al. Performance of ultrasound in the diagnosis of appendicitis in children in a multi-center cohort. *Acad Emerg Med.* 2013; 20(7):697.

2. 7mm. Explanation: Classically, 6mm has been used as the upper limit of appendix size on ultrasound. However, 7mm has replaced the previous guideline given its improved performance. This threshold results in excellent sensitivity without negatively effecting specificity. Reference: Goldin AB, Khanna P, Thapa M, et al. Revised ultrasound criteria for appendicitis in children improve diagnostic accuracy. *Pediatr Radiol.* 2011; 41(8):993.
3. All of the above. Explanation: Graded compression in the region of the right lower quadrant is the most common utilized technique for diagnostic appendix ultrasound. While size is often used as the diagnostic cut off, other identifiable characteristics are important for the ultrasound diagnosis of acute appendicitis including a non-compressible structure, peri-appendiceal fluid, and thickened edematous wall. Reference: Fields MJ, Davis J, Alsup C, et al. Accuracy of point-of-care ultrasonography for diagnosing acute appendicitis: a systematic review and meta-analysis. *Acad Emerg Med.* 2017; 24(9): 1124.