

Imaging Performance of a Handheld Ultrasound System for Thoracic Epidural Analgesia Guidance

Supplemental Materials

Physician Annotation Disagreement

As a quality control measure, the agreement between the annotations provided by each of the physician reviewers was quantitatively assessed on each image in the dataset. The 95% confidence interval of annotation error was defined as $\mu_{\text{image}} \pm 1.96 \sigma_w$, where μ_{image} is the mean measurement for each image and σ_w is the within-image standard deviation. As shown in Figure S1, the variance between reviewers for each image was not proportional to the measurement magnitude; accordingly, this permitted the use of the within-image standard deviation, which describes the variation between reviewers across all images [1,2].

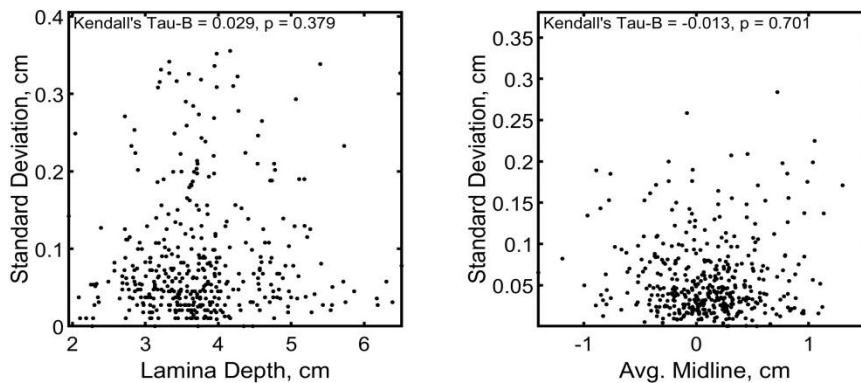


Figure S1. Measurement magnitude vs. standard deviation of reviewer annotation. The annotator error was not proportional to the lamina depth or midline measure magnitude.

Physician annotations that exceeded the confidence interval for the lamina depth or midline measures (Fig. S2) were reviewed for disagreement. If one physician annotation was not in agreement (e.g., errant selection of a rib or other anatomical feature), the single annotation was excluded from analysis. If all physician annotations disagreed, the entire case was excluded from analysis.

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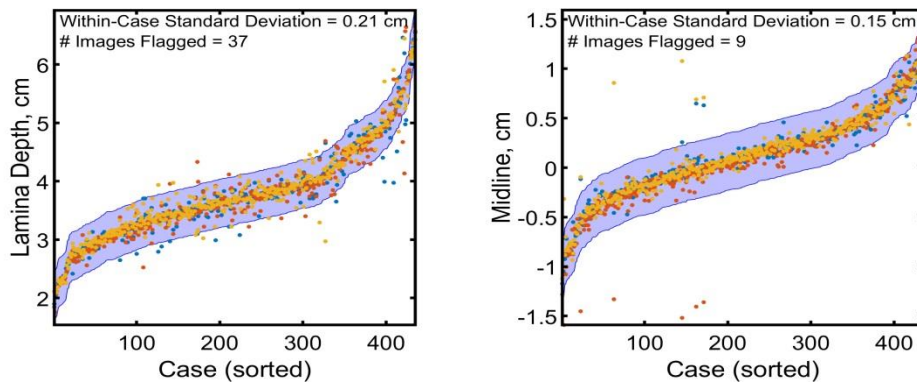
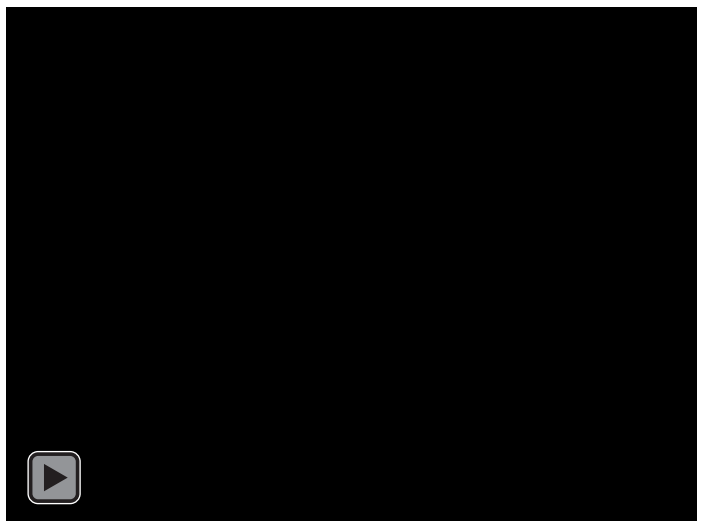
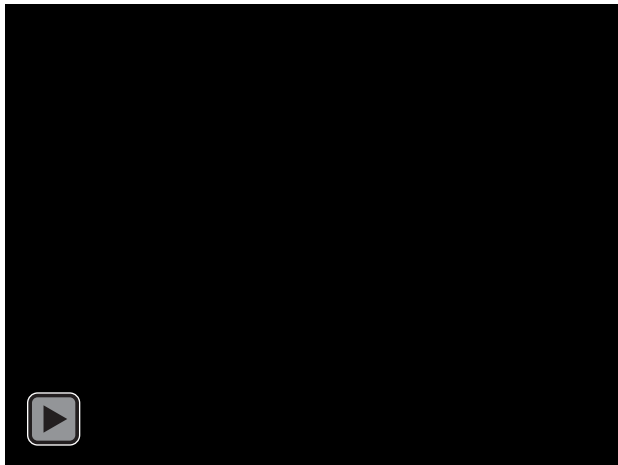


Figure S2. Depiction of the three physician reviewer annotations (red, yellow, and blue) relative to the 95% confidence interval of annotation error (shaded) for lamina depth and midline measures. Image cases that contained one or more annotations beyond the confidence interval were reviewed to assess reviewer disagreement.

List of Supplemental Digital Content

Supplemental Digital Content 1: [Supplemental_Video1.mp4](#)

Supplemental Digital Content 2: [Supplemental_Video2.mp4](#)



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References

1. Bland, J. M., & Altman, D. G. (1996). Measurement error. *BMJ : British Medical Journal* 312(7047): 1654.
2. Bland, J. M., & Altman, D. G. (1996). Statistics Notes: Measurement error proportional to the mean. *BMJ* 313(7049): 106–106. <https://doi.org/10.1136/bmj.313.7049.106>

Figure Captions List

Figure S2. Depiction of the three physician reviewer annotations (red, yellow, and blue) relative to the 95% confidence interval of annotation error (shaded) for lamina depth and midline measures. Image cases that contained one or more annotations beyond the confidence interval were reviewed to assess reviewer disagreement.

Supplemental Digital Content 1. Demonstration of thoracic imaging with the Accuro for a 38 kg/m² BMI subject. The suggested needle trajectory is shown when the thoracic anatomy is located in the center of the image and the needle trajectory intersects with the surface of the thoracic lamina.

Supplemental Digital Content 2. Demonstration of thoracic imaging with the Accuro for a 27 kg/m² BMI subject. The thoracic imaging mode depicts the lamina depth and midline boundary annotations to facilitate rapid and accurate image interpretation.