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Comments
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The Use of Ultrasound to Measure the Depth of Thoracic Epidural Space

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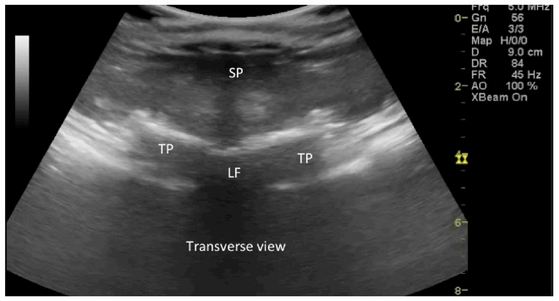
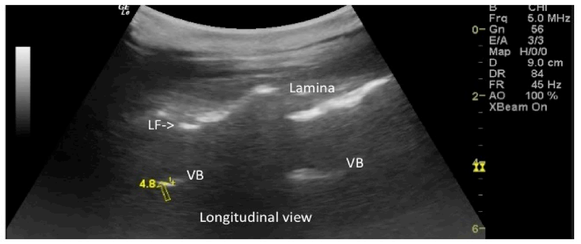
INTRODUCTION

The use of ultrasound to aid in regional blocks has increased in recent years as a result of improvement in ultrasound technology. There have been many studies to evaluate the use of ultrasound to measure the depth of the epidural space in the lumbar region[1-9,10,11,12]. Studies have shown a strong correlation between the depth of the lumbar epidural space measured by ultrasound and the distance of the needle from the skin after establishing the loss of resistance in the epidural space[3,6,7]. This study looked at the epidural space in the thoracic space to evaluate the possibility to visualize the thoracic spine anatomy and the possibility to measure the depth of the epidural space and it's correlation with the actual depth by the loss of resistance technique. This study was also designed to assess the ability of the ultrasound to define the best needle insertion point and limit the number of needle skin puncture attempts.

METHODS

After approval of the IRB at the UMass Medical School and written consent was obtained, 29 patients were enrolled in the study. Exclusion criteria included pregnancy, prisoners, and patients with an absolute contra-indication to thoracic epidural.
Ultrasound scan technique: We used a curvilinear 2-5 MHz probe. Both longitudinal para-median and transverse scan were done before the placement of the epidural catheter. The transducer was stabilized at the the best image of intra-laminal space and a mark was placed at the midpoints of the transducer. The puncture point was determined by the intersection of those two lines. The depth of the epidural space was measured using the built-in calipers. The ultrasound depth (UD) was also measured in the transverse view. The epidural catheter was placed using the standard technique at the UMass Memorial Medical Center.
Assessment of the catheter function was based on the technique, response to test dose and pain control on post operative day number one. Statistical analysis included the distributional characteristics of the measures, Pearson's correlation analysis and general linear model. Difference by gender groups were evaluated using Student's t-test.





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Spearman's rho		LOR	Age	Height
US long depth correlation Coefficient Sig. (2-tailed) N		.726 .000 26	.-015 .942 27	.197 .325 27
USD	correlation Sig. (2-tailed) N	1.00 28	.079 .691 28	.428 .023 28
US short	Correlation Sig. (2-tailed) N	.1.000 28	0.79 .691 28	.428 .023 28
Age	Correlation Sig. (2-tailed) N	.079 .691 28	1.000 29	-131 .497 29
Height	Correlation Sig. (2-tailed) N	.428 .023 28	-.131 .497 28	1.000 29
Weight	Correlation Sig. (2-tailed) N	.683 .000 28	-.1000 .604 29	.393 .035 29
BMI	Correlation Sig. (2-tailed) N	.543 .003 28	-.007 .971 29	-.190 .325 29

RESULTS

Mean ultrasound distance (UD) values were 4.22cm ± 0.82 and actual distance (AD) values were 5.59 cm ± 1.29 with Pearson's correlation coefficient between AD and ultrasound longitudinal (USL) and ultrasound short axis (USS) values were 0.637 and 0.566 respectively, The mean number of attempts were 1.96 ± 1. The number of attempts were defined as the number of skin puncture points by a single provider or the number of providers attempting in the same insertion point. The use of ultrasound was able to identify the depth of the thoracic epidural space in 24/29 cases (83 %) of the cases.
The catheter was considered at least partially functioning in 26/29 patients (20 functioning, 6 partially functioning (89.65 %)).

CONCLUSION

Ultrasound scanning can be used to measure the depth of the thoracic epidural space with good correlation.

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