

6-2012

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

Issam Khayata

University of Massachusetts Medical School

Gustavo Angaramo

University of Massachusetts Medical School

Robert Lee

University of Massachusetts Medical School

See next page for additional authors

Follow this and additional works at: https://escholarship.umassmed.edu/anesthesiology_pubs

 Part of the [Anesthesiology Commons](#)

Repository Citation

Khayata, Issam; Angaramo, Gustavo; Lee, Robert; Negroiu, Costin Catalin; Zilber, Alexandr; and Amelin, Patricia M., "The Use of Ultrasound to Measure the Depth of Thoracic Epidural Space" (2012). *Anesthesiology and Perioperative Medicine Publications*. 121. https://escholarship.umassmed.edu/anesthesiology_pubs/121

This material is brought to you by eScholarship@UMMS. It has been accepted for inclusion in Anesthesiology and Perioperative Medicine Publications by an authorized administrator of eScholarship@UMMS. For more information, please contact Lisa.Palmer@umassmed.edu.

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

Authors

Issam Khayata, Gustavo Angaramo, Robert Lee, Costin Catalin Negroiu, Alexandr Zilber, and Patricia M. Amelin

Comments

Poster presentation at the American Society of Interventional Pain Physicians 2012 Annual Meeting; Washington, DC, June 9-13, 2012.

INTRODUCTION

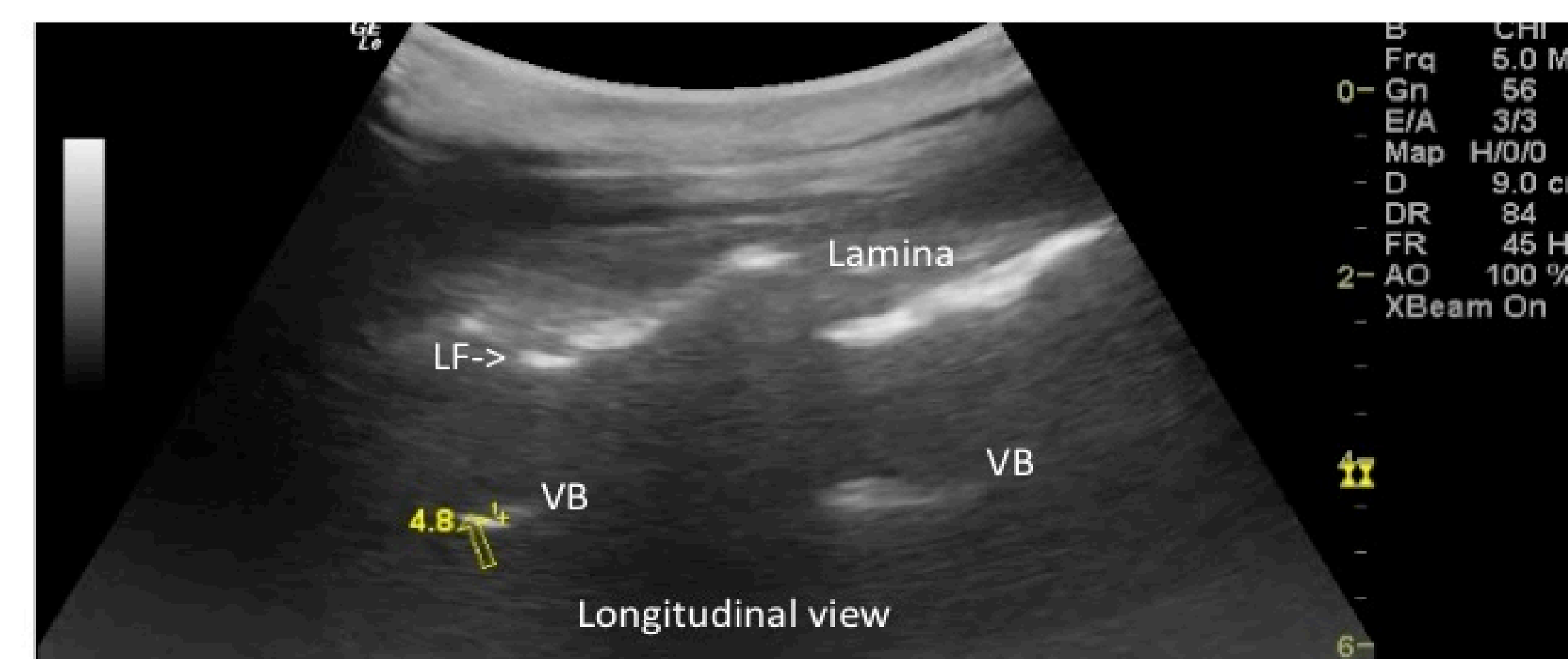
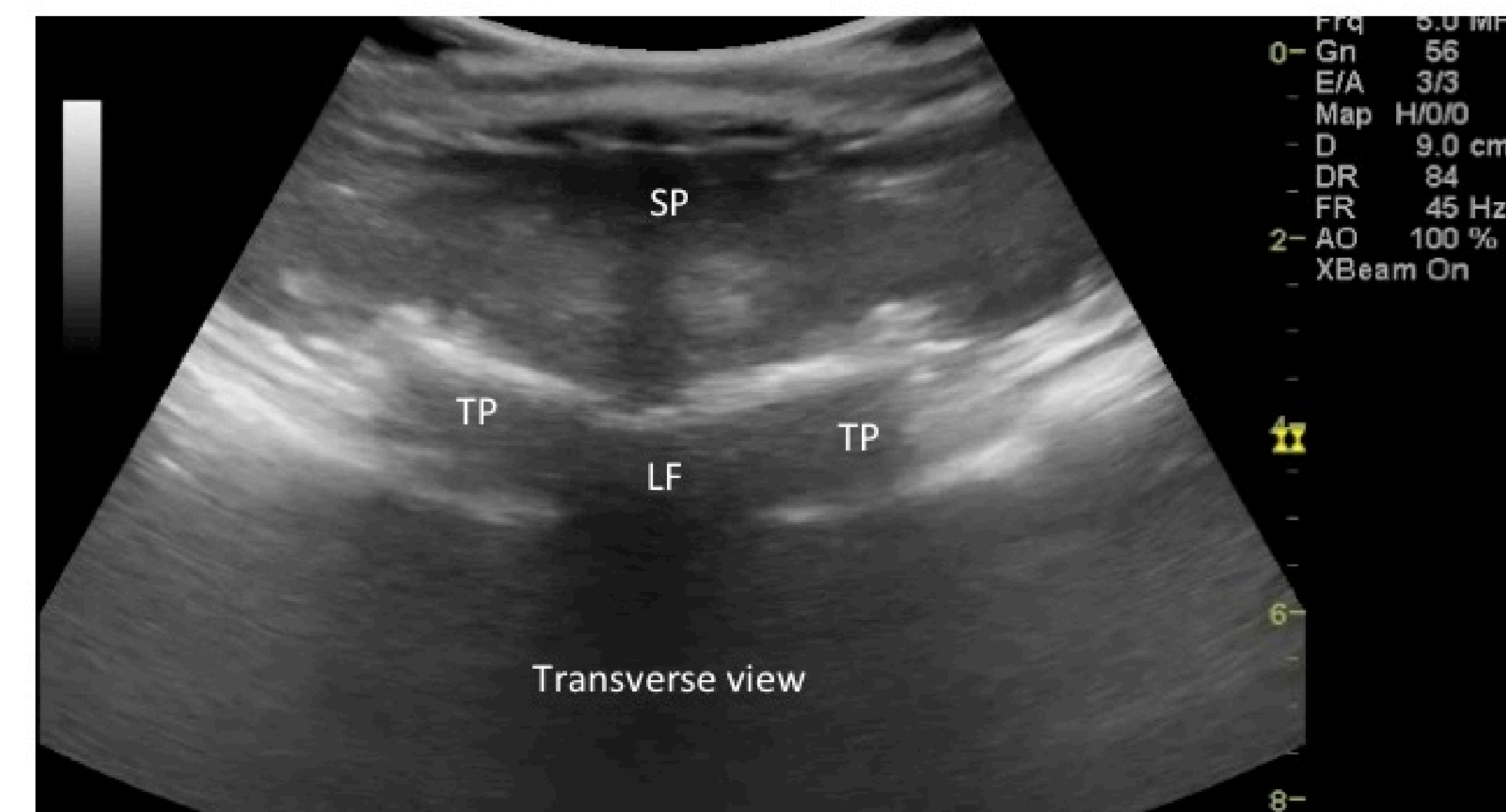
The use of ultrasound to aid in regional blocks has increased in recent years as a result of improvement in ultrasound technology. There have been many studies to evaluate the use of ultrasound to measure the depth of the epidural space in the lumbar region^{1-9,10,11,12}. Studies have shown a strong 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 its 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-lamina 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.



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

REFERENCES

- 1.) Tran D, Kamani AA, Lessoway VA, Peterson C, Hor KW, Rohling RN. Preinsertion paramedian ultrasound guidance for epidural anesthesia. *Anesth Analg*. 2009 Aug;109(2):661-7.
- 2.) Grau T, Leipold RW, Horter J, Conradi R, Martin EO, Motsch J. Paramedian access to the epidural space: the optimum window for ultrasound imaging. *J Clin Anesth*.
- 3.) Balki M, Lee Y, Halpern S, Carvalho JC. Ultrasound imaging of the lumbar spine in the transverse plane: the correlation between estimated and actual depth to the epidural space in obese parturients. *Anesth Analg*. 2009 Jun;108(6):1876-81.
- 4.) Hotta K. Ultrasound-guided epidural block. *Masui*. 2008 May;57(5):556-63.
- 5.) Grau T, Conradi R, Martin E, Motsch J. Ultrasound and local anaesthesia. Part III: ultrasound and neuroaxial local anaesthesia. *Anaesthesist*. 2003 Jan;52(1):68-73.
- 6.) Bonazzi M, Bianchi De Grazia L, Di Gennaro S, Lensi C, Migliavacca S, Marsicano M, Riva A, Laveneziana D. Ultrasonography-guided identification of the lumbar epidural space. *Minerva Anestesiol*. 1995 May;61(5):201-5.
- 7.) Arzola C, Davies S, Rofaeeel A, Carvalho JC. Ultrasound using the transverse approach to the lumbar spine provides reliable landmarks for labor epidurals. *Anesth Analg*. 2007 May;104(5):1188-92.
- 8.) Grau T, Leipold RW, Conradi R, Martin E. Ultrasound control for presumed difficult epidural puncture. *Acta Anaesthesiol Scand*. 2001 Jul;45(6):766-71.
- 9.) Grau, Thomas. The evaluation of ultrasound imaging for Neuroaxial anesthesia, *CAN J ANESTH* 2003/50/6/ pp R1-R8
- 10.) Grau, Thomas., Leipold, R.W, Horter, R The lumbar epidural space in pregnancy: visualization by ultrasonography. *Br. J Anaesth* 2001;86:798-804
- 11.) Grau T, Leipold RW, Delorme S, Conradi R, Martin E, Motsch J. Ultrasound imaging of the thoracic epidural space. *Reg Anesth Pain Med* 2002; 27: 200-6.
- 12.) Grau T, Leipold, R W, Conradi, R, Martin E, FANCA, Motsch, J; Efficacy of Ultrasound Imaging in Obstetric epidural Anesthesia. *Journal of clinical Anesthesia* 14:169-175,2002.