

Abstract #:SAT-09

Does automated interpretation of lumbar spine ultrasound images increase success rate of spinal anesthesia placement for cesarean birth among residents in training?

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Background: Spinal anesthesia is commonly administered using landmark technique. However, finding landmarks is at times difficult (obesity, hyperlordosis, etc). In such instances, ultrasound (US) has been advocated to aid with spinal placement. Operator experience with US remains the key to successful placement in most studies. Recent development of a hand-held ultrasound called the Accuro™ [2D US with 3D image rendering for easy sono-anatomy recognition] may improve spinal placement among residents in training. In this study, we compared resident's success in administering spinal anesthesia using the Accuro versus landmark technique for patients undergoing Cesarean section.

Methods: Second through fourth year anesthesia residents rotating through OB Anesthesia at the University of Virginia without previous experience with neuraxial ultrasound or using Accuro were randomized to traditional (landmark) spinal placement versus Accuro guided spinal placement in patients undergoing C-Section. During the Accuro guided cases, residents performed the US scanning and were not allowed to palpate the patient's back for landmarks at any point during the procedure. Prior to using the Accuro in the study, all residents watched a 10 min training video regarding the use of Accuro and scanned one volunteer to gain familiarity with the device. None of the residents had used the device before entering the study.

Results: 105 patients were recruited for this randomized controlled trial and 25 residents participated in the study. Overall, first insertion attempt success rate was not different among groups. In subgroup analysis, use of Accuro improved first insertion success rates in patients with BMI ≥ 30 and residents who had performed ≥ 50 procedures prior to the study (29% vs. 64%, $p=0.038$). The average number of passes prior to successful placement decreased (7.6 vs. 3.9, $p=0.018$), and there was an increase in spinals placed within the first 10 passes (95% vs. 54%, $p = 0.008$). There was no significant increase in procedure time between the landmark and Accuro groups. In less experienced residents (<50 procedures) there was no significant difference in any of these measures Data attached [Fig 2].

Conclusion: The results of this study indicate that, in "clinically experienced residents", the use of Accuro significantly improved first-attempt spinal anesthesia placement success rates and reduced the number of passes required for spinal placement. More importantly, these results were achieved in the setting of novices with regards to ultrasound use.

References:

1. Tiouririne et al: Handheld real time volumetric imaging of the spine: technology development. [Journal medical engineering and technology, 38 (2014): 100-3].
2. Vallejo MC et al: Ultrasound decreases the failed labor epidural in resident training. [Int J Obst Anesthesia, 19 (2010) 373-8]
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Table 1: Analysis of spinal placement success among all residents and all patients

	CG	UG	p-value
BMI (kg/m ²)	34.3 ± 7.3	36.6 ± 8.9	0.18
1 st insertion success	28/45 62 (47-76) %	27/45 60 (44-74) %	0.83
1 st pass success	12/45 27 (15-42) %	13/45 29 (16-44) %	0.83
Success within 5 passes	28/41 68 (52-82) %	23/34 68 (50-83) %	1.0
Success within 10 passes	33/41 80 (65-91) %	32/34 94 (80-99) %	0.08
Number of insertions	1.4 ± 0.7 [1 – 3]	1.2 ± 0.5 [1 – 3]	0.27
Number of passes	5.3 ± 5.5 [1 – 23]	4.1 ± 4.0 [1 – 19]	0.28
Time find landmarks	3.9 ± 1.4	6.0 ± 2.1	< 0.001
Time to place spinal	5.0 ± 5.2	4.0 ± 3.4	0.33
Total procedure time	15.5 ± 6.2	17.6 ± 5.4	0.13

Table 2: Subgroup analysis among obese patients and grouped by resident experience

	BMI ≥ 30 kg/m ²					
	Experience: < 50 procedures			Experience: ≥ 50 procedures		
	Control	Ultrasound	p-value	Control	Ultrasound	p-value
BMI (kg/m ²)	36.7 ± 3.7	35.6 ± 3.0	0.37	41.3 ± 5.5	39.1 ± 11.6	0.51
1 st insertion success	10/13 77 (46-95) %	10/18 56 (31-79) %	0.36	4/14 29 (8-58) %	14/22 64 (41-83) %	0.038
1 st pass success	6/13 46 (19-75) %	6/18 33 (13-59) %	0.47	2/14 14 (2-43) %	6/22 27 (11-50) %	0.31
Success within 5 passes	9/13 69 (39-91) %	10/11 91 (59-99) %	0.20	5/11 45 (17-77) %	11/19 58 (34-78) %	0.50
Success within 10 passes	10/13 77 (46-95) %	10/11 91 (59-99) %	0.37	6/11 54 (23-83) %	18/19 95 (74-99) %	0.008
Number of insertions	1.2 ± 0.6 [1 – 3]	1.1 ± 0.3 [1 – 2]	0.62	1.8 ± 1.7 [1 – 3]	1.3 ± 0.6 [1 – 3]	0.25
Number of passes	5.9 ± 7.8 [1 – 23]	3.1 ± 5.1 [1 – 19]	0.32	7.6 ± 4.9 [1 – 14]	3.9 ± 3.2 [1 – 12]	0.018
Time to landmarks	4.0 ± 1.6	7.3 ± 2.0	< 0.001	3.6 ± 1.5	5.6 ± 1.8	0.004
Time to place spinal	5.0 ± 3.8	3.9 ± 3.3	0.46	7.0 ± 7.6	4.2 ± 3.7	0.18
Total procedure time	16.1 ± 5.6	18.6 ± 3.9	0.23	18.0 ± 8.2	17.9 ± 6.2	0.97