Assessment of benefits and accuracy of a handheld ultrasound device for neuraxial placement

Pedro Acevedo-Rodríguez MD, JD[1]; David Yanez, PhD[2]; Ahmed Abdelfattah, MS[1]; Aymen Alian, MD[1], Antonio González-Fiol MD[1]
[1] Obstetric Anesthesiology, Yale School of Medicine – New Haven, CT; [2] Anesthesiology Department, Yale School of Medicine – New Haven, CT

Background

Although the use of ultrasound (US) guided neuraxial anesthesia was described over two decades ago, its use still remains scarce. The lack of adoption of this non-invasive technique persists despite its known benefits of better identification of the lumbar interspace level, estimated depth, and optimal needle insertion site. The causes for its limited use may relate to cost, technical expertise, difficulty interpreting images, access to, and space for storage of ultrasound equipment.(1,2)

Methods

- This was a prospective observational study.
- We evaluated the time from needle insertion until loss of resistance as time for epidural placement, number of insertion attempts (needle in and out of skin), number of needle redirections (needle adjustments without removal of needle from insertion point), and for cases in which the handheld US (Butterfly iQ+) was utilized estimated depth and actual depth.
- Intergroup differences were assessed using Mann-Whitney test.

Results

Table 1. Demographics and Number of needle passes and attempts

Factor	LOT	No	Yes	p-value
N		43	82	
Number needle passes (mean + SD)		2.7± 2.3	1.4 ± 0.8	<0.001
Number needle attempts (mean + SD		1.7 ± 1.3	1.2 ± 0.6	0.029
Time to perform block (min), (mean + SD)		6.3 ± 7.5	3.1 (3.2)	0.009
Estimated depth (cm), (mean + SD)		N/A	5.2 ± 0.9	
Actual depth (cm), (mean + SD)		6.0 ± 1.7	5.3 ± 0.9	0.017
BMI, (mean + SD)		32.5 ± 5.9	34.1 ± 7.9	0.46
Estimated & Actual depths (cm), (mean + SD)		N/A	-0.2 ± 0.4	
LOT number	2	7 (18%)	18 (27%)	
	3	12 (30%)	21 (32%)	
	4	18 (45%)	27 (41%)	

Table 2. Distribution of neuroaxial block by level of training (LOT)

Factor	LOT 2	LOT 3	LOT 4	p-value
N	25	33	45	
Time to perform block min (mean + SD)	4.3 ± 4.1	2.2 ± 1.7	5.2 ± 6.8	0.002
Number needle passes	1.8 ± 1.4	1.6 ± 1.5	1.9 ± 1.6	0.69

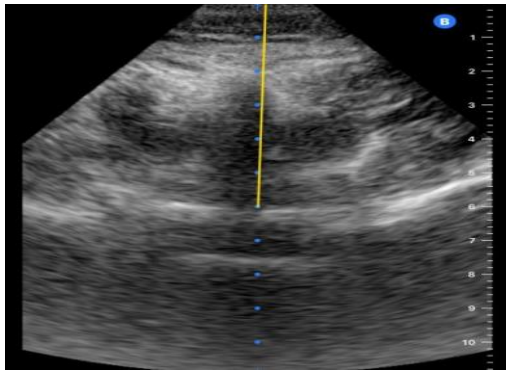

Figure 1. Epidural ultrasound Scanning

Conclusions

- The use of US helped reducing the number of needle insertion attempts when compared to landmark-guided technique.
- Our results are in agreement with previously reported accuracy, with some authors reporting an accuracy within 0.8 cm.
- The use of the portable Butterfly iQ+, obviates some of the limitations related to cost and real state.
- The use of the portable Butterfly iQ+ resulted in procedure performance in half the time when compared to a landmark technique.
- The additional information obtained from this technique improves patient satisfaction and may potentially decrease the risk of complications, such as accidental dural puncture.

References

- Seligman KM, Weiniger CF, Carvalho B. The Accuracy of a Handheld Ultrasound Device for Neuraxial Depth and Landmark Assessment. Anesthesia Analgesia. 2018 Jun;126(6):1995 1998.
- Lee A. Ultrasound in obstetric anesthesia. Semin Perinatol. 2014 Oct;38(6):349 358.