Published in final edited form as:

J Clin Anesth. 2020 February ; 59: 53–54. doi:10.1016/j.jclinane.2019.05.023.

Ultrasound-assisted epidural labor analgesia for landmark identification in morbidly obese pregnant women: A preliminary investigation

Thomas J. Vernon, (MD)^a, Tracey M. Vogel, (MD)^b, Patricia L. Dalby, (MD)^a, Gordon Mandell, (MD)^a, Grace Lim, (MD, MS)^{a,*}

^aDepartment of Anesthesiology & Perioperative Medicine, University of Pittsburgh School of Medicine, Magee-Womens Hospital of the University of Pittsburgh Medical Center, Pittsburgh, PA, USA

^bDepartment of Anesthesiology, Allegheny Health Network, Pittsburgh, PA, USA

Keywords

Morbid; Obesity; Ultrasound; Epidural; Analgesia; Anesthesia; Obstetric; Labor

To the Editor,

Identification of bony landmarks by palpation can be difficult in obese pregnant women, and obesity is associated with higher epidural catheter failure rates [1]. Ultrasound may help offset the challenges of epidural catheter placement in obese patients [2], but few studies have compared it to landmark palpation in morbidly obese (body mass index, BMI ≥ 40) patients. Placing a reliable labor neuraxial catheter in these patients is important; co-morbidities (e.g. gestational diabetes) increase risk for requiring operative interventions during labor and delivery [3]. Simultaneously, this population is prone to failed extension of epidural analgesia to cesarean delivery anesthesia. Combined, these factors place these women at risk for needing general anesthesia with all its incumbent risks and disadvantages, including failed intubation, aspiration, and poor postoperative analgesia and recovery.

Existing studies on this topic have shown conflicting results [4–6]. Ultrasound guidance for epidural catheter placement has been associated with both increased and decreased placement time. The utility of this modality in experienced hands has been questioned [4,6]; however, these studies have been limited by a focus on patients with palpable spines, and by lack of evaluation of time-to-placement in the setting of morbid obesity.

We assessed the utility of this modality for epidural catheter placement to reduce procedure time in morbidly obese pregnant women.

*Corresponding author at: Department of Anesthesiology & Perioperative Medicine, Department of Obstetrics & Gynecology, UPMC Magee-Womens Hospital, 300 Halket Street, Suite 3510, Pittsburgh, PA 15213, USA., limkg2@upmc.edu.

Declaration of Competing Interest

The authors declare no conflicts of interest.

This randomized control study was approved by the University of Pittsburgh Institutional Review Board, PRO16090665 (). Laboring women with BMI ≥ 40 and singleton and full-term gestations were eligible. Subjects were randomized to ultrasound-guided landmark clarification and needle insertion for epidural labor analgesia (Fig. 1), or to palpation alone. An experienced senior anesthesia provider blinded to group assignment placed the epidural catheter. The primary outcome was catheter placement time defined as the time of palpation or ultrasound preparation, based on group assignment, until epidural needle exit time.

24 patients were enrolled and data from 16 subjects with BMI ranging 40.2 to 61.3 kg/m² were analyzed. Groups were not different with respect to age, gravidity, parity, BMI ASA physical status, palpable interspaces, and visible external landmarks. Although ultrasound evaluation took more time than palpation (1.8 ± 0.6 vs 0.9 ± 0.1 min respectively; $P < 0.001$), it resulted in reduced placement time (mean 4.3 ± 3.5 min using ultrasound v. 10.1 ± 5.4 min using palpation; 95% confidence interval for the difference in means 0.7 to 10.8, $P = 0.03$) and fewer attempts (median 1 attempt with ultrasound v. 5 attempts with palpation; $P = 0.02$). The mean total procedure time in the ultrasound group was 6.1 ± 3.5 min compared to 11.0 ± 5.3 min in the palpation group ($P = 0.05$). Despite the reduction in time and attempts, ultrasound did not affect patients' anxiety or satisfaction with the procedure itself or their overall experience compared to palpation.

There were no differences in complications between groups. In the palpation group, there were two cases of paresthesia during epidural needle placement, one unilateral block requiring catheter adjustment (epidural catheter pulled back 1 cm, no reinsertion required), and one unintentional dural puncture resulting post-dural puncture headache (declined epidural blood patch). None of these complications occurred in the ultrasound group. Supplemental epidural boluses were required for 3 subjects, all of whom were in the palpation group. One subject required epidural catheter replacement, and this subject was in the palpation group.

We conclude that ultrasound-guided landmark clarification and needle insertion for epidural labor analgesia by an experienced provider in morbidly obese patients, is associated with reduced placement procedure time and a clinically insignificant increased preparation time. This data supports larger investigations in this population on other important clinical outcomes including failure rates, complications, and satisfaction.

Acknowledgments

Funding

Dr. Lim is supported in part by a grant from the National Institutes of Health, K12HD043441.

References

- [1]. Kula AO, Riess ML, Ellinas EH. Increasing body mass index predicts increasing difficulty, failure rate, and time to discovery of failure of epidural anesthesia in laboring patients. *J Clin Anesth* 2017;37:154–8. [PubMed: 28235511]
- [2]. Wang Q, Yin C, Wang TL. Ultrasound facilitates identification of combined spinal-epidural puncture in obese parturients. *Chin Med J (Engl)* 2012;125:3840–3. [PubMed: 23106885]

- [3]. ACOG. Practice bulletin no 156: obesity in pregnancy. *Obstet Gynecol* 2015;126:e112–26. [PubMed: 26595582]
- [4]. Arzola C, Mikhael R, Margarido C, Carvalho JC. Spinal ultrasound versus palpation for epidural catheter insertion in labour: a randomised controlled trial. *Eur J Anaesthesiol* 2015;32:499–505. [PubMed: 25036283]
- [5]. Arzola C Preprocedure ultrasonography before initiating a neuraxial anesthetic procedure. *Anesth Analg* 2017;124:712–3. [PubMed: 27669557]
- [6]. Tawfik MM, Atallah MM, Elkhaboutly WS, Allakkany NS, Abdelkhalek M. Does preprocedural ultrasound increase the first-pass success rate of epidural catheterization before cesarean delivery? A randomized controlled trial. *Anesth Analg* 2017;124:851–6. [PubMed: 27183373]

Fig. 1.

Ultrasound imaging technique for image acquisition and marking procedures. (A) Ultrasound probe placed in the sagittal plane. The star indicates the middle of the probe. Scanning over the sagittal plane is conducted until a “sawtooth” pattern is recognized. (B) “Sawtooth” pattern on ultrasound image acquired from the sagittal view. After scanning in the sagittal plane, the following structures are identified: bone (*), bone shadow (marked), and interspinous spaces (red arrows). The middle of the probe (star) is placed over the best interspinous space visualized, and the corresponding skin marking is made as shown in panel A. (C) Ultrasound probe placed in the transverse plane. After locating the appropriate interspinous space, the probe is rotated 90 degrees. The probe is moved parallel to the ground until ultrasound images of a “bat ears” pattern is acquired, indicating shadows cast from the articular processes. (D) “Bat ear” pattern demonstrating shadows cast from the transverse processes. The middle of the probe (star) is noted, and the corresponding skin marking is made to demarcate the location of space, as in panel E. This view is also used to assess depth to the posterior dural complex, by noting measurement markings on the right side of the image. (E) Procedure for skin markings. After the “bat ear” pattern is identified, the skin marking is made as before (star indicates the marking made where the middle of the probe was noted). A straight paper ruler is used to “connect the dots” made during landmark identification with the ultrasound. Skin markings are extended vertically and horizontally so that a cross-hair pattern is created. (F) Finished skin markings. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)