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Editorial

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Ultrasound assisted neuraxial blockade in obstetric anesthesia

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Letter to the Editor

Central neuraxial blocks (CNBs) relevant to the practice of obstetric anesthesia and analgesia are spinal, epidural and combined spinal-epidural injections. These techniques are routinely used for cesarean deliveries and labor pain relief. Traditionally, CNBs are performed using surface anatomical landmarks. In the first instance the highest point of each iliac crest is identifies. The imaginary line connecting these points allegedly passes through the L4 vertebral body in non-pregnant women, and L3 vertebral body in pregnant women [1]. Based on this, the operator palpates and counts the spinous processes and decides on the needle entry point. Although this technique is widely accepted as relatively reliable, the correlation is inconsistent even in non complicated cases. Obesity, tissue edema, pelvic rotation, limited ability to bend forward, hyperlordosis, labor pain, underlying spinal deformity or previous back surgery and instrumentation pose additional difficulty for anesthesiologists to correctly locate the intervertebral levels.

Failure to do so can lead to needle insertion at a higher than predicted level (1 or even 2 levels higher) at or above the lower end of the spinal cord (L1-2). This misidentification was implicated in several major and permanent injuries to the conus medullaris and the spinal cord [2-5]. The inaccuracy of the traditional landmark technique has been highlighted in a series of studies [6-8]. Overall, the correct intervertebral level was identified in less than 50% of cases. This rate was further reduced in the obstetric population. More worrisome is the fact, that the actual level thought to be the correct level for needle insertion, was in fact higher (or much higher). The traditional landmark based technique is essentially a blind procedure despite the perceived clear endpoints such as the 'loss of resistence' to saline/air or the appearance of cerebrospinal fluid in the hub of the spinal needle. Ultrasound (US) has the potential to turn this blind technique into a visual one. Important data can be gleaned and parameters can be measured resulting in successful needle insertion. In addition, US is safe, noninvasive, nonradiating, widely available, easy to use, images are real-time and reproducible. Ultrasound has the ability to identify the sacrum, to accurately locate the midline, spinous processes and intervertebral spaces. Further, it can visualize the articular and transverse processes (transverse view), the laminae and the interlaminar spaces (paramedian sagittal oblique view). Anterior and posterior complexes are more difficult to identify even for the experienced operators. Once the posterior complex is visible, sometimes its components, the ligamentum flavum , the epidural space and the dura (most visible among them) can also be differentiated. Behind the posterior complex the intrathecal space appears as a hypoechoic structure. Thus with US the operator is able to measure the depth of the epidural and intrathecal space. The angulation of the US probe is also important, as it replicates the trajectory of the CNB needle.

All structures of interest are located deep (usually 5-7 cm) beneath the skin in the lumbar area. A low frequency (2-5 MHz) curved array US probe is used most commonly, as a preprocedural tool to assist the performance of the CNB, namely to visualize, identify, measure the relevant structures and to mark the skin entry point of the needle. Real-time US-guided CNB has also been described; however it is considered a more advanced technique performed by either two [9] or one operator [10]. The most obvious advantage of the US is to accurately identify the intended intervertebral space for needle insertion. Two labor epidural analgesia studies showed significant differences (45-63%) between the documented epidural insertion site and the postpartum US scan, with 72-76 % of the epidurals being inserted higher than documented [11, 12]. In parturients with presumed difficult epidural puncture, preprocedural US can reduce both the number of puncture attempts (from 2.6 to 1.5) and the number of needle passes (from 2.2 to 1.3) [13]. Furthermore, US may increase the efficacy of epidural analgesia by reducing the failure rate and the rate of incomplete analgesia [14]. Women with previous postdural puncture headache can also benefit from a preprocedural US scan, as different spinal sonoanatomy had been incriminated [15]. Other reports state that US may indirectly reduce postbdural puncture headache and backpain by decreasing multiple needle insertion and redirection attempts, thus minimizing trauma to the dura and spinal structures. US

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is an additional tool to predict the feasibility, ease or difficulty to performe the CNB. Visualization of both the posterior and anterior complexes (good quality view) predicted easy block performance, while the lack of visualization of the complexes (poor quality image) translated into difficult CNB [16, 17]. US examination in case of a very difficult spine (multilevel spinal decompression, fusion, metal instrumentation) can give the anesthesiologist definite answer about the feasibility of the block (the presence of an accoustic window facilitates insertion). The most common cause for failed CNB is obesity, which was responsable for 50% conversion rate to general anesthesia for cesarean section in one recent audit [18]. In a review carried out in a high risk obstetric outpatient clinic, 42 % of the referred cases were morbidly obese patients [19]. The use of US may reduce the epidural needle attempts and the number of epidural catheter reinsertions. Despite a series of clear advantages of the use of US in performing CNBs, there are several limitations.

Although, there is a widespread use of US in anesthesia, US assisted CNB needs a high-end good quality device to visualize deep structures surrounded by bones. In the UK less than half of the obstetric departments have dedicated anesthesia US machine (20). Despite the recommendation of the NICE guideline since 2008, a recent survey found that more than 90% of the respondents were not trained to visualize the epidural space using US scan [21]. US assisted CNB is an advanced and difficult US technique, however the learing curve is steep. Competence to accurately identify the intervertebral level for a beginner is achieved following 23-39 or 40 scans depending on the author [22, 23]. Real time US guided CNB is considered as the most difficult US intervention and is unlikely to replace the landmark technique or the preprocedural US scan. Although US proved extremely helpful in obese women (BMI>35 kg/m2), in the morbidly obese (BMI>45 kg/m2) US imaging remained difficult [24]. Imaging of the spine is perceived as time-consuming, and thus may add to the anesthetic procedure time. In experienced hands scanning a thin patient takes less than 1 minute, but imaging a difficult spine can take 6-7 minutes. However, the overall anesthesia procedure time could be shortened taking into consideration the reduced number of puncture attempts. Finally, despite the use of US there is no guarantee as to the successful performance of CNB. Currently, there is no data on the use of US assisted CNB in advanced labor or emergency cesarean deliveries. The use of US as a preprocedural tool in obstetric CNBs is gaining popularity in view of its potential to increase efficacy, decrease complication rates and improve patient satisfaction. The subgroup that may particularly benefit from its use is where the performance of CNB has been predicted to be difficult. In conclusion US is an important addition to the armamentarium of any obstetric anesthesiologists.

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