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Original contribution

Can parturients identify the midline during neuraxial block placement?

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Abstract

Study Objective: To determine whether parturients can reliably identify their midline during epidural or spinal needle insertion, and to determine whether parturient feedback helps the anesthesiologist successfully identify the midline.

Design: Survey instrument completed by anesthesiologists.

Setting: Labor and delivery unit of a university-based, tertiary-care hospital.

Measurements: Completed questionnaires were obtained for 554 of 904 (61.3%) neuraxial blocks. Data were collected on the type of neuraxial block, number of needle redirections required to identify the midline, the patient's height and weight, the patient's position during block placement, whether the patient was questioned for assistance identifying the midline, and if so, how helpful the patient was in redirecting the needle to locate the epidural or subarachnoid space.

Main Results: The anesthesiologist requested the assistance of 194 patients (35.0%) for needle location. Of those questioned, the anesthesiologist reported 128 instances (66.0%) when the patient's response was helpful in identification of the midline. Morbidly obese parturients (BMI > 35 kg/m^2) were questioned more often than their non-morbidly obese counterparts (48.9% vs. 30.5%; $P < 0.0005$). Of those morbidly obese parturients who were questioned (n = 64), 76.6% were reported by the anesthesiologist to be helpful.

Conclusions: Most patients, including morbidly obese patients, are helpful in identifying the midline during neuraxial anesthesia.

1. Introduction

Neuraxial anesthesia/analgesia for the laboring parturient is a procedure that relies on the anesthesiologist's ability to successfully identify midline. The vertebral the midline, specifically the spinous processes and interspaces, generally are identified by palpation and are used to direct the needle toward the midline within the deep tissue. Placement may prove challenging in pregnant patients for a number of reasons. Successful neuraxial anesthesia/analgesia is more

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difficult in parturients who are obese, in those who have lumbar-sacral edema due to bed rest and/or pre-eclampsia, and in those who have anatomic abnormalities of the spine, such as scoliosis [1,2]. Even without these factors, neuraxial anesthesia/analgesia may be difficult, as patient positioning is complicated by a gravid abdomen and painful uterine contractions. The overall failure rate for epidural and/or spinal anesthesia ranges from 7% to 16%, depending on the skill of the anesthesiologist and the definition of failure [3,4]. Despite the initial high overall failure rate, adequate anesthesia/analgesia eventually may be obtained in 98% to 99% of all parturients through catheter replacement, needle redirection, and adjustments in drug(s) and dose [3,4]. Failure to place a neuraxial block successfully so as to provide adequate anesthesia and analgesia is an issue of quality of care and patient safety, since conversion to general anesthesia places parturients at greater risk of complications [5].

Many anesthesiologists routinely question the parturient for assistance when placing an epidural or spinal needle, with the assumption that the parturient's response will be helpful; however, little data exist to support that premise. A study by Wills et al. [6] showed that healthy subjects with palpable spinous processes were able to identify the midline of their own back using light touch to the skin, but it is unknown whether the same subjects could accurately identify deeper midline structures, such as subcutaneous fat, spinal ligaments, and bone. Also unknown is whether the same is true for parturients, who present unique challenges to the successful placement of epidural or spinal needles due to the gravid abdomen and painful uterine contractions. The primary goal of the present study was to determine whether parturients are able to reliably identify their midline during needle placement within the epidural or subarachnoid space, and whether parturient assistance is helpful in achieving successful needle placement when initial needle placement is difficult. A secondary goal was to determine whether assistance is requested more frequently when parturients are morbidly obese, and whether the helpfulness of the parturient varies by obesity status (morbidly obese or not), patient positioning during block placement (lateral or sitting), and the parturient's perceived needle position (midline or off-midline) when questioned.

2. Materials and methods

This prospective study was approved by the Institutional Review Board of the University of North Carolina at Chapel Hill, and a waiver of informed consent from both the patient and the anesthesiologist was obtained. A questionnaire was completed by anesthesiologists immediately after placement of a labor epidural, spinal, or combined spinal-epidural for anesthesia/analgesia for vaginal and cesarean deliveries at the labor and delivery unit. Questionnaires were distributed from January 1, 2007 through June 30, 2007 and completed by the anesthesiologist (resident or attending) who placed the neuraxial block. All anesthesiologists were instructed in the proper methodology to use when completing the questionnaire. The questionnaire was both quantitative with defined questions and responses, and qualitative with free-form answers. The questionnaire contained questions about the type of neuraxial block (epidural, spinal, or combined spinal/epidural), the number of needle redirections required before successful block placement, patient positioning (lateral or sitting), and parturient weight and height as recorded in the last clinic visit before arrival at the labor and delivery unit. Difficult block placement was defined as multiple needle advances without successful identification of the epidural or subarachnoid space after needle insertion. In the event that the anesthesiologist had difficulty identifying the epidural or subarachnoid space, the anesthesiologist had the option of questioning whether the parturient perceived the needle to be located within the midline or off to the right or left. The anesthesiologist then recorded the parturient's response on the questionnaire. Finally, the anesthesiologist recorded whether the parturient's response was helpful in redirecting the needle and ultimately identifying the epidural or subarachnoid space.

The data were analyzed using SPSS statistical software (v. 11; SPSS, Inc, Chicago, IL, USA) and Sigma Plot graphical software (SPSS, Inc.). Patients' body mass index (BMI) was calculated as kg/m^2 and morbid (Class II) obesity was defined as a BMI $\geq$ 35 kg/m^2, in accordance with the guidelines set forth by the National Heart, Lung, and Blood Institute [7]. Body mass index is commonly used for descriptive weight categories, but does not differentiate pregnant from non-pregnant patients. Therefore, we focused on morbid (Class II) obesity as opposed to Class I obesity to account for the normal weight gain associated with pregnancy. The proportion of parturients whose assistance was requested was compared for morbidly obese versus non-morbidly obese parturients, using Chi Square analysis, with $\alpha = 0.05$. The proportion of parturients whose responses were considered helpful were compared for morbidly obese versus non-morbidly obese parturients, for parturients in a lateral versus sitting position during block placement, and for parturients who reported an off-midline or midline needle position after questioning. Questionnaires with missing data points were excluded from the statistical testing.

3. Results

Complete questionnaires were obtained for 554 of 904 neuraxial blocks placed during the 6-month study period (61.3% response rate). Table 1 shows the responses of anesthesiologists to individual questions. Epidural anesthesia/analgesia was used in 71.3% of the neuraxial blocks, and