J Anesth (2009) 23:312–313
DOI 10.1007/s00540-009-0742-7

Journal of Anesthesia

Ultrasound-guided neuroaxial anesthesia: accurate diagnosis of spina bifida occulta by ultrasonography

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To the editor: Spinal dysraphism, simply referred to as spina bifida, a congenital malformation that results from an incomplete closure of the embryonic neural tube, is characterized by an incompletely formed spinal cord and by incompletely fused vertebrae. It is one of the most common birth defects worldwide, with an incidence of 0.2–3 cases per 1000 births [1]. The disease is divided into four categories according to severity: spina bifida occulta, spina bifida cystica, meningocele, and lipomeningocele.

In patients with the mildest form of the disease, spina bifida occulta, the skin at the site of the disease is usually normal, and they, without knowing of the presence of the disease, may live free of any symptoms related to the disease until symptoms related to "tethered cord syndrome (TCS)" appear [2]. However, because the most common areas of the malformation are the lumbar and sacral areas, serious complications may unavoidably take place when neuroaxial anesthesia is used in patients with spina bifida occulta [3].

Recently, ultrasound imaging of the lumbar spine has been shown to facilitate the identification of the landmarks necessary for neuroaxial anesthesia [4]. In addition to its efficacy in facilitating neuroaxial anesthesia, we show here that it is feasible to accurately diagnose the presence of spina bifida occulta by the use of ultrasound imaging for neuroaxial anesthesia, thereby paving the way to avoid possible complications with the use of neuroaxial anesthesia in such patients.

Spinal images were visualized by placing a linear high-resolution high-frequency (12-MHz) transducer probe (GE LOGIQ Book XP, San Jose, CA, USA) perpendicular to the long axis of the spine (transverse view) in a normal individual, as well as in a patient with spina bifida occulta, after written informed consent was obtained. Figure 1 shows the vertebral body and its associated transverse processes, as well as the spinous process, in the normal individual. The spinous process was identified as a small hyperechoic signal just underneath

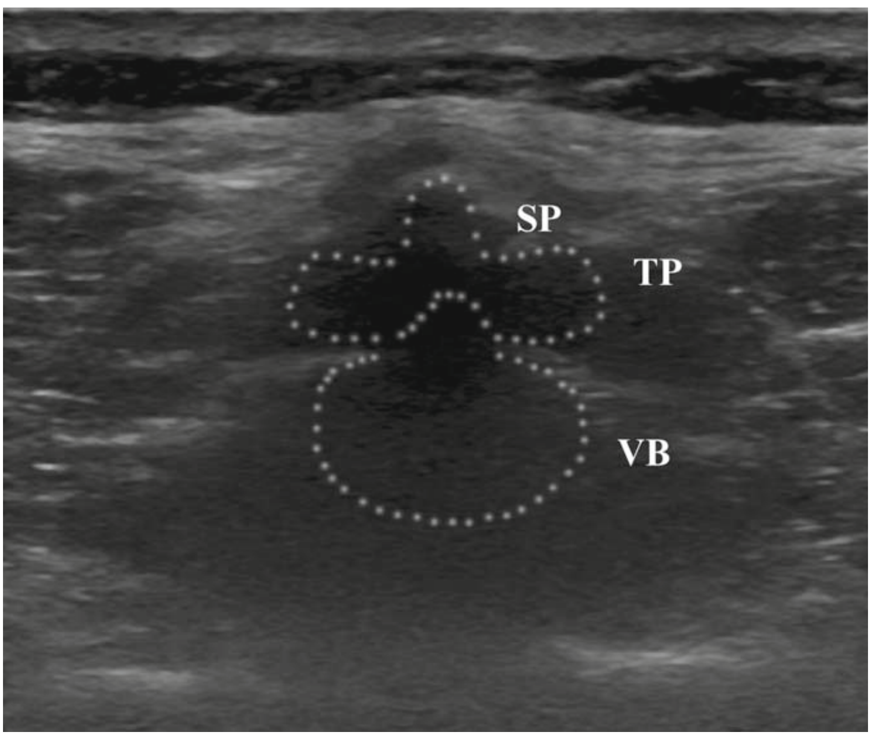

Fig. 1. Ultrasound imaging of the spine in a normal individual. The spinous process (*SP*) is visualized as a small hyperechoic region just underneath the skin. Beneath the spinous process, a large hypoechoic triangle, representing the vertebral body (*VB*), is seen. *TP*, transverse process

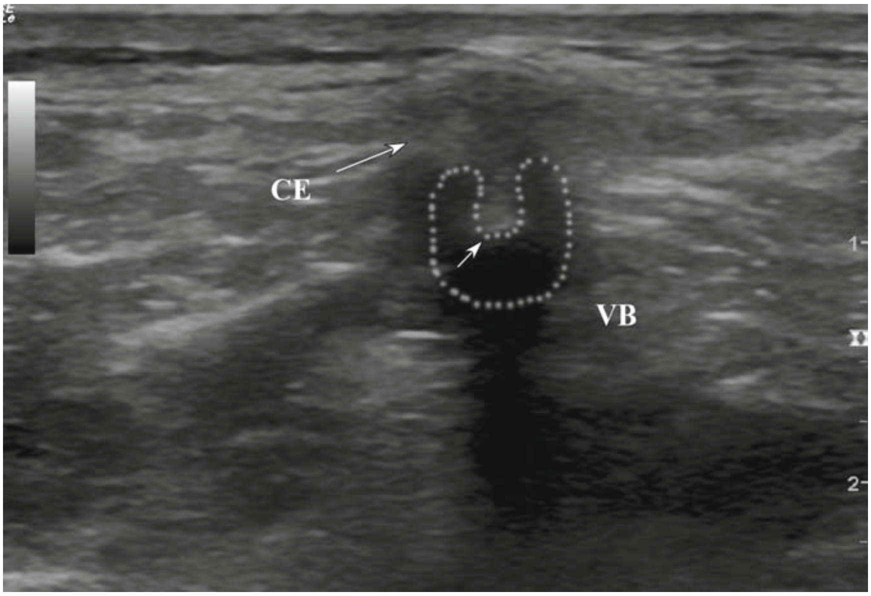

Fig. 2. Ultrasound imaging of the lumbar spine in a patient with spina bifida occulta. Note that the spinous process is not visible and there is a hyperechoic region inside the vertebral body that represents soft connective tissue (*arrow*). Cauda equina (*CE*) is also identifiable as the ringed structures just above the split vertebral body

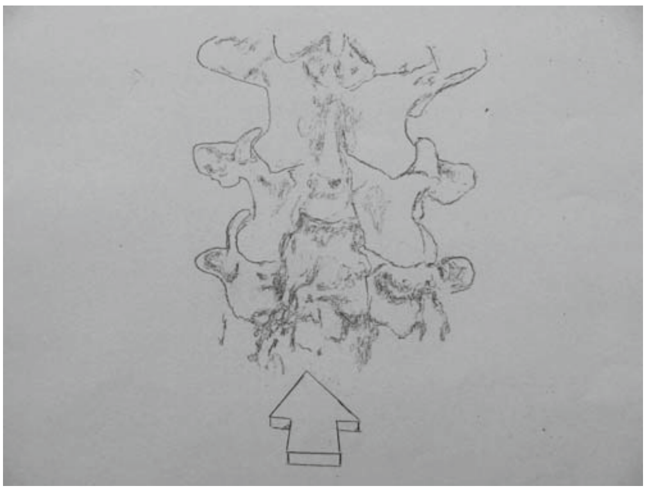

Fig. 3. Schematic representation of the lumbar spine in the patient with spina bifida occulta, showing how ultrasound imaging corresponds to the anatomical structures of the lumbar spine in such a patient. Note that the spinous processes are missing and the vertebral bodies are split (*arrow*)

the skin. Beneath the spinous process, a hypoechoic triangular shadow, corresponding to the vertebral body, was visible. In contrast, in the patient with spina bifida occulta, the spinous process where the disease is located was not visible (Fig. 2). More prominently, the vertebral body was split by an aniso-hyperechoic region, which reflected the connective tissue inside the vertebral body and the deformity of the spinous process (Fig. 2). To further make it clear how the ultrasound imaging corresponded to the anatomical structures of the spine in the patient with spina bifida occulta, a comprehensive structural view of the lumbar spine is shown in Fig. 3. As indicated by the arrow in Fig. 3, the spinous processes are missing in the patient with spina bifida occulta, and the vertebral bodies are split by the incomplete closure of the embryonic neural tube (Fig. 3).

Spina bifida occulta may occasionally coincide with "tethered cord syndrome (TCS)" [5], and the use of neuroaxial anesthesia in "hidden" cases may cause serious neurological complications. In addition to the efficacy of ultrasound imaging in facilitating both peripheral nerve block and neuroaxial anesthesia [6], we have shown here that the use of ultrasound imaging efficaciously enables the diagnosis of "hidden" cases of spina bifida occulta. In other words, ultrasound imaging could potentially be of great help as a scanning tool for the diagnosis of spina bifida occulta before neuroaxial anesthesia is employed.

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Received: November 13, 2008 / Accepted: January 19, 2009