Why Do Obstetric Epidurals Fail? A Novel 3-D Video Analysis

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The key factor to successful placement of epidural anesthesia is the proper orientation of the needle. Epidural placement can be challenging in the obstetric patient due to exaggerated lumbar lordosis and increased body weight, which can obscure landmarks. Epidural placement can be particularly difficult in patients with scoliosis given the rotational component associated with spine curvature. The concepts of needle direction in these situations can be difficult to appreciate. Demonstration using osseous or plastic spine models can be helpful but not always practical at the bedside. Two-dimensional (2D) images of the spine lack depth perception and are not useful for demonstrating needle trajectory. No study has evaluated the utility of 3D visualization concept for understanding epidural techniques in obstetrics.

Methods: A Viking 3D surgical field camera was utilized to obtain close-up 3D images on a spine model depicting the most common reasons for obstetric epidural failure. The 2-channel video recordings were integrated into 3D video images using free web shareware. These videos can be visualized on a 3D-HD screen with polarizing eyewear. Anaglyph 3D videos were also created which can be viewed on conventional iphone, ipad, personal computers, or web using inexpensive paper red-cyan filters. The following scenarios on a spine model were recorded in 3D: normal epidural and CSE needle placement, unilateral catheter migration through intervertebral foramina, failed CSE, and epidural placement in lordotic and scoliotic spines. A 6-question survey was presented to a group of anesthesia trainees before and after viewing the narrated 3D videos of above scenarios.

Results: All anesthesia trainees (15 to date) found the 3D format easy to use and 92% of trainees felt that the 3D videos improved their understanding of epidural anatomy. The average score on the survey improved from 52% before watching the videos to 85% following the videos. The greatest improvement was in CA-1 trainees with minimal epidural experiences, with an average of 42% improvement.

Discussion: 3D videos realistically simulate the trajectory of the epidural needle in a spine model. Needle orientation can be demonstrated for straightforward epidurals as well as common failures in obstetric epidurals. This 3D technology enhances depth perception of the vertebral anatomy. The advantage of this technology is that the videos can be viewed on the web, on ipad, iphone, smartphones and other PC compatible devices, making it a portable educational tool that can be utilized in daily teaching with the aid of inexpensive 3D paper glasses.

*oral presentation: Appropriate eyewear filters will be provided for all audiences in the auditorium to appreciate 3D videos.