

The Power of Color Flow Doppler Ultrasonography Versus Blind Technique in Localization of Epidural Catheter: A Randomized Prospective Study

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Abstract

Background: The success of epidural analgesia hinges on the precise insertion of the needle within the epidural space; failure rates have been reported to reach 32%.

Objectives: We report a new method using color Doppler to help verify the accurate location of the epidural needle tip.

Methods: This is a randomized prospective study. Sixty patients undergoing hysterectomy were enrolled, with 30 patients in each group. Color flow Doppler (CFD) ultrasonography was employed to guide epidural catheter placement. The ultrasound-guided epidural technique was used for patients where challenges in identifying traditional landmarks for epidural space localization were anticipated. The procedure commenced with a spinal epidural technique. After sterile preparation and draping of the area, a curvilinear ultrasound transducer, encased in a sterile sheath, was used to locate the interspinous space. The primary outcome measure focused on flow visualization at different insertion levels. Secondary outcome measures included the duration of catheter implantation, intervertebral level of insertion, and dermatome sensory levels. The study also assessed the quality of epidural analgesia and patients' assessment of analgesic quality using a Verbal Numerical Rating Scale.

Results: The study reported a successful and predominantly safe outcome, with high success rates in flow visualization and effective anesthesia coverage. Flow visualization at the insertion and surrounding levels demonstrated a 100% success rate at all observed points. The Visual Numeric Rating Scale (VNRS) results indicated a median pain score of 2 with an interquartile range (IQR) of 2 - 3, showcasing a generally low level of post-procedural pain among the subjects, reflecting good quality post-operative analgesia. Regarding dermatome sensory levels after 2 hours, the distribution across various levels, including T4, T6, T7, T8, T10, and T12, exhibited a favorable outcome. The highest proportion was observed at T10 (68.3%), suggesting effective anesthesia coverage in the targeted areas. The study demonstrated comparable efficiency between the CFD-guided and blind techniques in terms of procedural aspects. However, notable distinctions were observed in patients' reported pain levels, with the CFD group experiencing lower pain compared to the blind technique group. Additionally, the study highlighted the association between CFD and improved procedural accuracy and safety.

Conclusions: This study advocates for the integration of CFD into routine clinical practice to enhance procedural outcomes and patient safety during hysterectomy surgeries.

Keywords: Ultrasonography, Doppler, Catheter, Analgesia