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# Single-operator real-time ultrasound-guided epidural: A feasibility study using an echogenic Tuohy and an Epidrum™ in a pork spine phantom.

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Department of Health
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**Introduction:** There is increasing interest in real-time ultrasound (US) guidance for neuraxial anaesthesia[1,2,3], especially in patients with technically complex anatomy. However, real-time US-guided epidural insertion has been described as a difficult procedure[1]. We investigate a novel method of single-operator real-time US-guided paramedian epidural insertion into a pork phantom model using a newly available echogenic Tuohy needle (Pajunk TuohySono) and a visual loss of resistance device (Epidrum™).

**Materials and Methods:** 10 anaesthetists experienced in US-guided regional anaesthesia (USGRA) but non-expert in spinal sonography, were taught a technique of epidural insertion using a wide linear array US probe, an echogenic Tuohy needle and an Epidrum™. The phantom was a T12 to L5 section of pork spine with associated musculature, cured in alcoholic hand gel. Participants' first two attempts to access the epidural space on the phantom were recorded and they subsequently completed a structured questionnaire. The primary endpoint was the successful threading of an epidural catheter. Secondary outcome measures included the time taken from needle first on view to visual LOR and the percentage of time the needle was in view.
The quantitative results, together with investigators' observations and participants' feedback, were used to assess feasibility of the technique and highlight strengths and weaknesses. Descriptive statistics (mean, SD) were used for presentation of the normally distributed quantitative data.

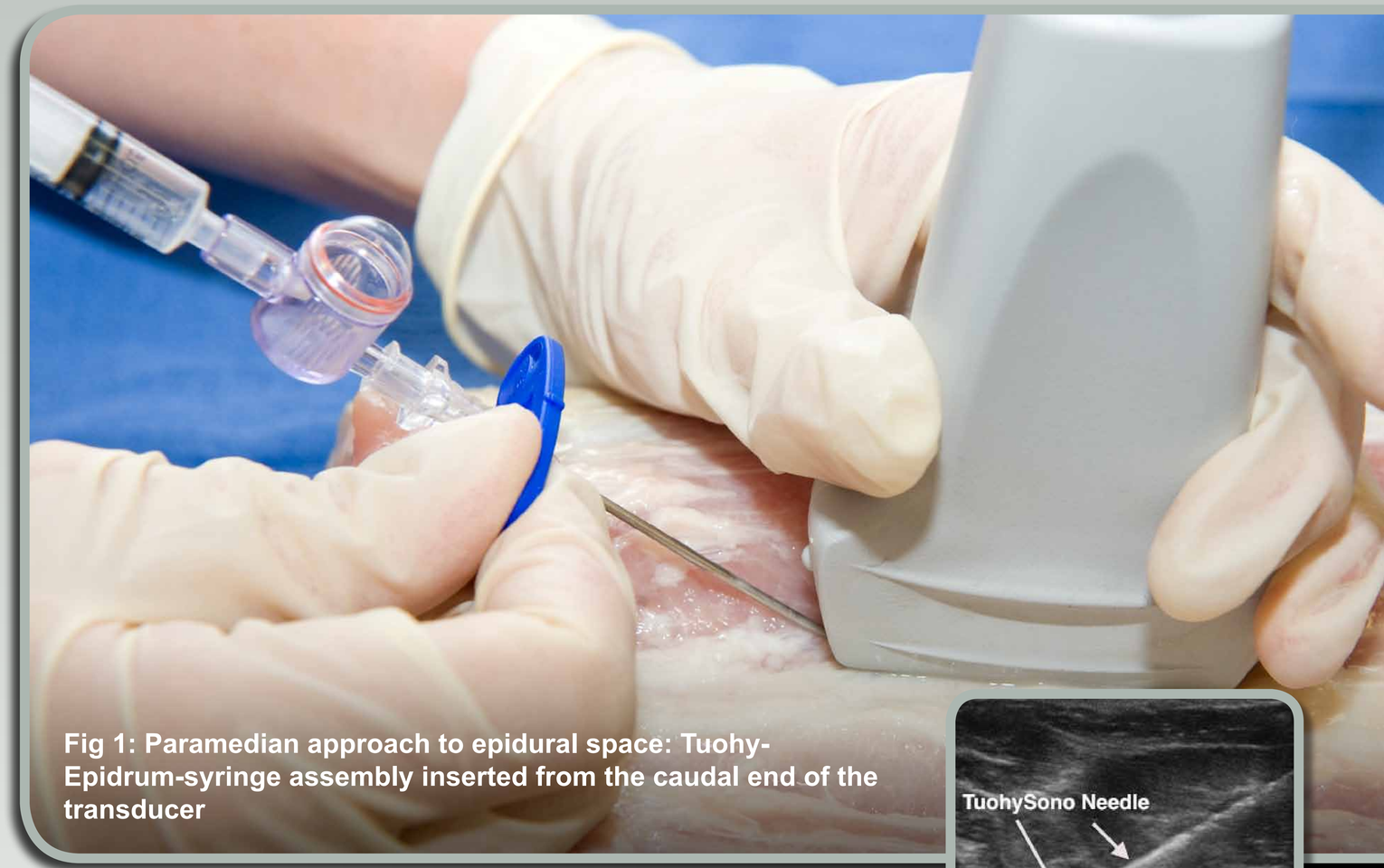

Fig 1: Paramedian approach to epidural space: Tuohy-Epidrum-syringe assembly inserted from the caudal end of the transducer

**Results:** 19/20 attempts resulted in successful threading of an epidural catheter. Mean(SD) time to LOR was 51(27)s. The needle was in view 90(10)% of the time, corresponding with 90% of participants subjectively rating needle visibility as excellent. 60% of participants judged the overall task to be easy or intermediate, despite being non-expert in spinal sonography. All participants reported that they would consider performing real-time US-guided epidural placement on a patient, however some noted that the pork phantom model did not fully simulate real-life and many gave feedback about the practical and ergonomic issues that may increase difficulty in the clinical setting.
Investigators observed that in contrast to traditional USGRA, the technique described is optimally performed with a stationary transducer and manipulation of the Tuohy needle. Additionally, the transition from watching the US screen (real-time) to watching the Epidrum™ (visual LOR) was considered to be a critical step.

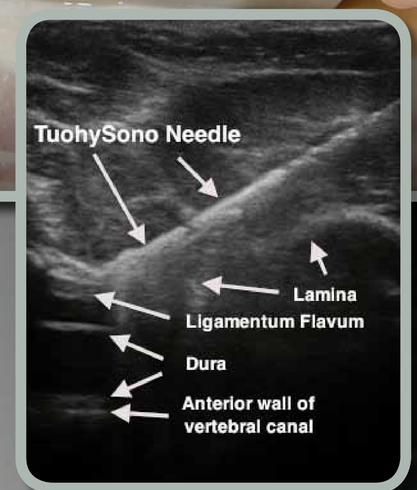


Fig 2: Paramedian approach to the epidural space: US image of TuohySono needle in the pork spine phantom

## Conclusions:

- **Our technique of real-time US-guided epidural insertion using a paramedian approach, echogenic Tuohy needle and Epidrum™ is feasible.**
- **The TuohySono overcame the problem of poor needle visibility at steep insertion angles, making needle guidance easier.**
- **The Epidrum made a single operator technique possible. However, once the needle is accurately aligned at the ligamentum flavum, a traditional "blind" two-handed LOR approach is probably equally valid because the moment of LOR cannot truly be real-time (as it is not possible to simultaneously focus on both the US screen and the Epidrum™).**
- **The ability to manipulate the stiff Tuohy needle to stay in-plane allowed the transducer to be kept stationary, thus maintaining an optimal view of the ligamentum flavum throughout.**
- **This observational study on a pork phantom has provided valuable insights that will improve application of the technique on patients.**
- **Practice on a pork phantom should occur before performing the technique on patients.**
- **Further clinical studies are required.**

**References:**

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2. Tran D, Kamani AA, Al-Attas E, Lessoway VA, Massey S, RohlingRN; Single operator real-time ultrasound guidance to aim and insert a lumbar epidural needle; Can J Anaes 2010; 57: 313-321
3. Lee PJ, Tang R, Sawka A, Krebs C, Vaghadia H; Real time ultrasound-guided spinal anesthesia using Taylors approach; Anes Anal; 2011; 112:1236-8