

Use of Ultrasonography in Regional Anaesthesia: Bangladesh Perspective

Ultrasound refers to sound wave above human range of hearing 20000 or more vibrations per second used for measuring distance and detecting objects. But in the realm of medical imaging that most people are with ultrasound or ultrasonography or diagnostic sonography is used to visualize structures inside the human body from bones to organs, tendons and blood vessel as well as the fetus in pregnant woman.

Ultrasound was developed by Dr. George Ludwig at Naval Medical Research Institute in the late 1940s. The physicist John Wild is known as the father of medical ultrasound for imaging tissue in 1949. In addition Dr. Karl Theodore Dussek of Austria published the first paper on medical ultrasound in 1942, based on his research on transmission of ultrasound investigation of the brain and Professor Ian Donald of Scotland developed practical technology and applications for ultrasound in the 1950s.

The use of ultrasound for regional anaesthesia is relatively new, however interest in this application is growing rapidly. Ultrasound guided nerve blocks were first described as early as 1978, but interest in this field was not grew until the advent of advanced technology in the 1990's. Published reports of ultrasound guided regional anaesthesia have largely focussed on brachial plexus block in the interscalene, supraclavicular, infraclavicular and axillary route. Recent studies evaluating the efficacy of ultrasound guidance for femoral, sciatic, psoas compartment, celiac plexus and stellate ganglion blocks are promising, while ultrasound visualization of the epidural space can facilitate neuroaxial block in children, adults and parturients.

Conventional peripheral block techniques that are performed without visual guidance are highly dependent on surface anatomical landmarks for localization of the target nerve. It is therefore not surprising that regional anaesthetic techniques

are associated with a reported failure rate up to 20% presumably because of incorrect placement of the local anaesthetic needle. Multiple trial and error attempts to locate the target nerve can lead to operator frustration, unwanted patient pain and time delay in the operating room especially in patient with difficulty anatomical landmarks. Imaging technology such as MRI and CT scan can successfully localize neural structures. However ultrasound is the most practical imaging tool for regional anaesthesia as it is portable, relatively easy to learn, moderately priced & does not pose any radiation risks. Ultrasound provides real time imaging guidance during a nerve block procedure.

Advantages of ultrasound

- Reveal the nerve location and the surrounding vascular, muscular, bony and visceral structures.
- Provides real time imaging guidance during needle advancement allowing for purposeful needle movement and proper adjustment in direction & depth.
- Images the local anaesthetic spread pattern during injection.
- Reduces the number of needle attempts for nerve localization which may reduce the risk of nerve injury.
- Improves the quality of sensory block, shortens the onset time of block, and increases success rate compared to nerve stimulator technique.
- Differentiates extra vascular injection from unintentional intravascular injection.
- Differentiates extraneural injection from unintentional intraneural injection.

Limitations of peripheral nerve stimulation (PNS) technique

- Peripheral nerve stimulation (PNS) guidance is useful only a motor response is elicited.

- PNS provides objective but indirect guidance of nerve location.
- Guidance of proper needle placement that is motor response disappears after injection of 1-2 ml of local anaesthetic.
- Motor response achieved at less than 0.5 mA current does not guarantee a successful or complete block.
- PNS does not prevent intravascular, intraneural or pleural puncture.

So use of ultrasound in regional anaesthesia increases success rate, reduces block related complications and dosage of local anaesthetics. More over use of ultrasound in high risk patient scheduled for surgery reduces mortality and morbidity.

In Bangladesh use of ultrasound in regional block is gaining popularity in recent years. The main barrier to widespread use in this country is price of ultrasound machine and lack of trained manpower. For this reason its use is confined to a few corporate & tertiary level government hospitals. Initial installation price may be high but it is ultimately cost effective. We hope that health

ministry and appropriate authority should come forward to spread the use of ultrasound technology in regional anaesthesia throughout the country.

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Prof. Debasish Banik

Department of Anaesthesia, Analgesia & Intensive Care Medicine, Bangabandhu Sheikh Mujib Medical University, Dhaka. Phone- 01911322271, E-mail: profdashdb59@gmail.com

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