WHAT IS YOUR UNDERSTANDING OF SPINAL AND EPIDURAL ATTEMPT?

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Abstract

**Background:** The practice of spinal and epidural anaesthesia is well established the world over for a number of years. Sighting of spinal or epidural is conducted through various approaches at various levels of the spinal column. The number of attempts has its correlation with the post-spinal and epidural complications.

**Aim:** The aim is to gather information about the understanding among the anaesthetists about the spinal/epidural attempt.

**Methods:** A proforma comprising of nine closed loop questions was distributed to all the participants in the study and they were requested to fill it anonymously and place it back in a designated sealed box in anaesthetic office.

**Results:** Twenty proformas were distributed and all of them received back with hundred percent responses. All the participants accepted universally that attempting through another space makes it a second attempt. One of the respondents thought any backward movement means 2nd attempt, the majority of the responders thought it does not count as an attempt. Almost everyone considered another attempt if a needle is completely withdrawn and enters through another puncture site whether through a midline or paramedian approach.

**Conclusion:** Most of the complications after neuraxial blockade are associated with the number of attempts alongside other factors that may play a role. A universal definition of a spinal and epidural attempt may decrease the complications associated with the central neuraxial blockade.

**Key words:** Spinal, Epidural, Single attempt.

**Introduction:**

The practice of spinal and epidural anaesthesia/analgesia is well established the world over for a number of years. Sighting of spinal or epidural is conducted through various approaches at various levels of the spinal column. There is scarce evidence in the existing literature about defining and declaring spinal and epidural attempt. The number of attempts has its correlation with the post-spinal/epidural complications and concomitant administration of anticoagulants. Central neuraxial anaesthesia/analgesia involves the administration of local anaesthetic or opioid medication via spinal, epidural or caudal route. Its advantage in anaesthesia ranges from surgeries of the lower half of the body, to labour analgesia and peri-operative pain control.

The adult vertebral column comprises 33 vertebrae: 7 cervical, 12 thoracic, 5 lumbar, 5 fused sacral and 4 frequently fused coccygeal vertebrae [1,9,11,12].

The spinal column makes the central spinal canal allowing and harbouring all the important structures in it. The spinal canal comprises of structures such as the all-important spinal cord, its blood vessels and nerve roots. Meninges and spaces, cauda equina, fat, lymphatics and ligaments between vertebrae are all part of this canal [9, 11, 12].

The spinal cord is a 45cm long conical to tubular shaped structure, starting at the base of the brain projecting from the skull through foramen magnum, tapers down into the conus medullaris and extends up to first to third lumbar vertebra. Ideally for spinal cord safety, spinal anaesthesia in adults should be attempted at the lowest possible level i.e. below the imaginary Tuffier’s line [9, 12].
During the procedure needle traverses through the interspinous space cutting through skin, subcutaneous tissue, the supraspinous ligament, interspinous ligament and ligamentum flavum [Fig. (2)]. The ligamentum flavum is a thick ligament composed of 2 left and right ligaments that fuse variably in the midline, it is where the give-away or pop-off feeling is experienced by anaesthetist attempting spinal or epidural. Its thickness varies from its attachment at the skull till sacrum and in its relation to the epidural space, it is present just posterior to it and is the final structure that the epidural needle should pierce and gives a sudden loss of resistance as soon as needle passes through it [1, 9, 11, 12].

The epidural space surrounds the dura, more pronounced posteriorly, and extends from the foramen magnum to the sacral hiatus. It is related to the posterior longitudinal ligament anteriorly, pedicles and intervertebral foramina laterally and ligamentum flavum posteriorly. It accommodates nerve roots, arteries, large thin-walled veins, fat and lymphatics. Connective tissue bands and septae may exist in some patients as a result of inflammatory process causing uneven spread of local anesthetic within the space [1, 9, 12]. The average range for loss of resistance is 3-5 cm but it may vary significantly. The overall capacity of the epidural space is much greater in comparison to the spinal space. The spinal nerves cross the entire length of epidural space before appearing out of the intervertebral foramina [9, 11, 12].

The subarachnoid space lies between the pia mater and the arachnoid mater. This layer extends from the cerebral ventricles of the brain to the termination of the dural sac at the second sacral vertebra. It comprises of the spinal cord, nerves, CSF and all important blood vessels that supply the spinal cord.

There are dense venous plexuses in the epidural space and injury to the venous plexus may play a significant role in the development of most unwanted and deleterious complications, i.e. bleeding and hematoma formation [1, 2, 3, 11, 12].

The major complications associated with neuraxial blockade technique are (not considered here are the pharmacological features of the local anaesthetic or any other agent used) [10, 11, 12]:

- Failed attempt
- Pain on injection
- Spinal infections (Epidural abscess, meningitis)
- Spinal bleeding (Vertebral canal hematoma)
- Major nerve damage (spinal cord damage, paraplegia etc.)
- Wrong route injection
- Death where the anaesthetic/analgesic procedure is implicated as causal (Cardiovascular collapse)

We can clearly assume that incidence of above mentioned complications would increase if the number of attempts increases because most of the complications listed above are either because of the technique or patient related factors like secondary to the underlying disease condition.

Skin →Subcutaneous layer →Supraspinous ligament →interspinous ligament → Ligamentum flavum (as shown in Figure. (1)) [11, 12].

We have conducted a prospective cross-sectional study in our institute from the majority of the members of anaesthetic division comprising of consultants, fellows, and residents.

Figure 1: Structures pierced by epidural needle (Touhy needle). By Morgan and Mikhail’s Clinical Anesthesiology, 5th edition, Ch.45, P.942, Fig. 45-4 (reprinted with permission from the publisher) [12].
Materials and Methods

The survey proforma (as shown in the table below) was distributed to all the participants in the study inclusive of all the residents, fellows and consultants.

Inclusion criteria for the participants were to have at least 6 months of anaesthetic experience or 30 spinal/epidural procedures attempted either independently or under supervision.

All the participants were requested to fill it up anonymously and drop it back in a designated sealed box in anaesthetic office.

Proforma

Do you describe following as a single attempt while performing spinal or epidural?

Results

Twenty proformas were distributed and all of these received back with hundred percent responses. All the participants accepted universally that attempting through another space makes it a second attempt as shown in Figure 2. One of the respondents thought any backward movement means 2nd attempt, the majority of the responders thought it does not count as an attempt. Three anaesthetists responded that it's an attempt if they would redirect needle in subcutaneous tissue while majority i.e. n=17 anaesthetists believed that complete withdrawal out of the skin, would make it an attempt, even though redirected through the same skin entry point. While n=3 anaesthetists do not consider this as an attempt.

Almost everyone considered this as another attempt if a needle is withdrawn and enters through another puncture site whether through a midline or paramedian approach.

Figure 2: Positive responses towards survey based questions.

Discussion

The practice of spinal and epidural anaesthesia is well established but what defines an attempt for the particular procedure has not been clearly stated in the literature. The need for defining an attempt becomes even more important when the serious complications associated with the procedure are considered. It does possess some correlation with number of attempts and certain other patient and procedure related factors.

The concept of the neuraxial blockade is very important for an anaesthetist. The selection of patient, considering their age, past medical history, and medications, is of utmost importance in the practice of spinal or epidural techniques. The skill set required for smooth and successful procedure, seniors help and use of technology like ultrasound and fluoroscopy plays a pivotal role and can not be emphasized more [1,2,3,12].

Regional anaesthesia is considered a very safe option but yet the adverse effects and complications associated with it have been under reported. The universal understanding among anaesthetist is that the overall risk is much higher than given in the
The actual incidence of neurological dysfunction resulting from haemorrhagic complications associated with the neuraxial block is unknown. The incidence cited in the literature ranges from <1 in 150,000 to be as high as 1 in 3000. Overall, the risk of clinically significant bleeding increases with age, associated abnormalities of the spinal cord or vertebral column, the presence of underlying coagulopathy, difficulty during needle placement, and an indwelling neuraxial catheter during sustained anticoagulation [1,2,3,4].

Factors that may potentially lead to increased number of attempts can be related both to the patient factors, like difficult spinal anatomy either because of disease condition or age related degenerative changes and lack of proper positioning or cooperation from the patient. It can also be related to the person performing the procedure having lack of familiarity with the particular equipment or either lesser experience in dealing a difficult situation. In most of the situations, help from a more experienced colleague or use of available technology like Ultrasound or fluoroscopy could be of great help [7,9,10].