Article of Special Interest

PARAMEDIAN APPROACH FOR SUBARACHNOID BLOCKADE – A MARVELLOUS TECHNIQUE HAVING LESS ATTENTION.

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ABSTRACT:

At present central neuroaxial blockade, e.g. subarachnoid blockade (SAB) or epidural blockade (EB), especially the former one, is widely used by the clinical anaesthesiologists due to its procedural simplicity, low cost & better physiological benefits and thus reduced complications than that of general anaesthesia (GA). Subarachnoid or epidural spaces can be traversed from the posterior aspect of the body either through a midline approach (MA) or a paramedian approach (PMA). There is another approach described as 'lumbosacral puncture' or Taylor's approach, which actually is a variant of conventional paramedian approach. Theoretically, subarachnoid & epidural spaces can also be approached through the paravertebral foramen or even via an anterior intraoperative approach through the intervertebral discs[1]. The most common & popular technique is the MA. But the PMA (both conventional & Taylor's) is also a very easy & effective technique that can be practiced routinely as well as for some clearly indicated cases. The requirement for this procedure is the same as for the MA except having some ideas about the offmidline anatomy.

Keywords: Blockade, subarachnoid; approach, paramedian.

Historical background:

Dr. August Karl Gustav Bier was credited for the administration of first SAB in 1898[2].

He used 3 ml of 0.5% cocaine intrathecally. Caudal epidural was introduced in 1901 by Ferdinand Cathelin & Jean Sicard independently. Lumber epidural anaesthesia was described first in 1921 by Fiedal Pages & again in 1931 by Achille Dogliotti. At the beginning, SAB & EB had been approached via midline technique. Subsequently, PMA was described by many authors. The "lumbosacral puncture" was first described by Taylor JA in 1940 & truly is a special variant of the conventional PMA[3].

Practical Anatomy of neuroaxial blockade:

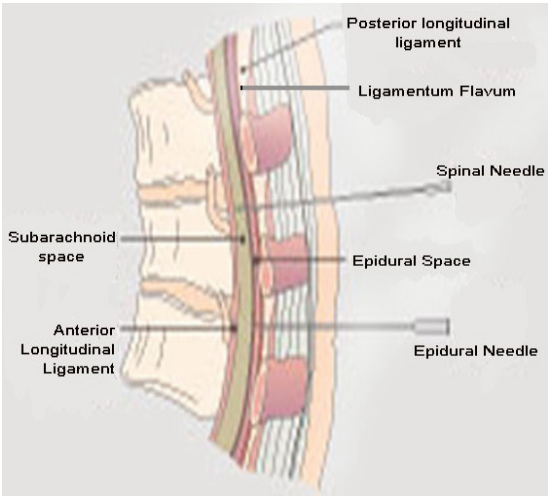

Fig.-1: *Lumbar subarachnoid & epidural spaces Adapted from Behar MJ & colleagues[4]*

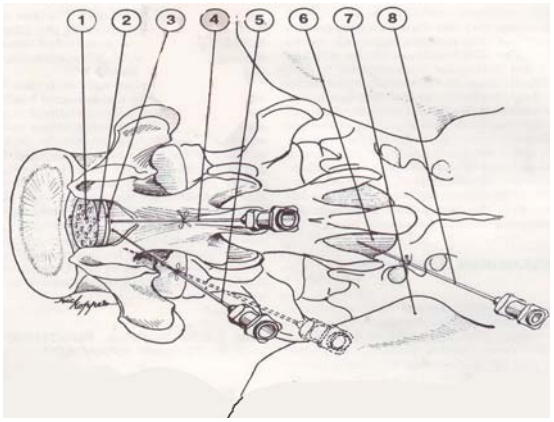

Fig-2: *Midline and Paramedian approach in Lumbar Region:*

1. cauda equina 2. duramater 3. ligamentum flavum 4. midline approach 5. paramedian approach 6. lumbosacral canal 7. posterior superior iliac spine 8. Taylor's approach. Adapted from Miller's Anesthesia.

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Fig 1 & Fig 2 shows the different structures traversed practically in lumbar SAB or EB. Structures pierced by the needle in a MA are as follows: skin, subcutaneous tissue, supraspinous ligament, interspinous ligament, ligamentum flavum, epidural space, dura mater, subdural space, arachnoid mater & subarachnoid space. In PMA, on the other hand, the structures pierced would be skin, subcutaneous tissue, paraspinal dorsal muscle mass, ligamentum flavum, epidural space, dura mater, subdural space, arachnoid mater & finally subarachnoid space. An experienced anaesthesiologist can distinguish the "feeling" of every structure whilst introducing the needle.

Technique of lumber PMA for SAB:

Straight forward puncture: a suitable interspace is chosen in the midline. A skin wheel is raised on any side 1-2 cm away from the mid line. The spinal needle is introduced just lateral to the interspinous gap & directed 10-15 degrees toward the midline. To select the angle of approach it may help to imagine the needle reaching the midline 4-6 cm below the surface. The needle is then advanced along side but lateral to the interspinous ligament in a cephalad & medial direction. The needle then traverses the paraspinal dorsal muscle mass and at the appropriate depth, it will engage the ligamentum flavum. The further advancement is first marked by an increase in the resistance followed by a loss of resistance as the epidural space is entered. Further advancement will cause the needle piercing the duramater & reaching the subarachnoid space. Thus for a SAB in PMA only two "pops" will be encountered, one for the ligamentum flavum & the other for the dura, whereas in MA four "pops" will be encountered, eg, supraspinous ligament, interspinous ligament, ligamentum flavum & dura respectively.

Refinement- The needle is introduced lateral to the superior spinous process itself & is advanced parallel to the spine until the bony end point of the lamina is reached. This provides an indication of the correct depth of the ligamentum flavum. By "walking" the needle along the lamina, in the cephaled fashion, the ligamentum flavum at the cephalic end of the lamina will be located. There is a marked change in consistency as the needle slipped off the "marble like" bone onto the "leather" like ligamentum flavum. Further advancement will place the needle into the subarachnoid space (fig 1 & fig 2).

Indications & advantages of PMA over MA:

PMA has some clean cut indications and advantages over MA. These are summarized below:

- Failure to midline approach by repeated attempts.
- Advanced degenerative joint disease.
- Severe arthritis of vertebral column.
- Kyphoscoliosis.
- Calcified spinal ligaments.
- Previous spinal surgery.
- Difficulty in flexing the spine.
- Non-cooperative patients.
- Hyperaesthetic patients.
- Vertebral interspace difficult to feel, e.g. obese or oedematous patients.
- No assistants available for positioning the patient.

Safety & Success of PMA

The PMA is as quite a safe procedure as that of MA. It can be used for single shot SAB or EB as well as continuous blockade by using spinal or epidural catheters. For SAB, finer needles (25G or 27G) can be introduced easily & conveniently. There are some study reports which show that PMA is sometimes even superior in its merits than that of MA. Leeda M, et al, showed in their study that epidural catheter insertion was significantly faster in the PMA group than that of MA group; a lower incidence of paraesthesia (not significant) in PMA group which is again more in females[5]. Rabinowitz A, et al, revealed in their study with geriatric orthopaedic patients that after the initial attempt, the PMA is associated with an increased success rate, 85% (17) in comparism to MA, 45% (9), though this is not significant clinically (P=0.02)[6]. Regarding position of the patient, sitting is the best suitable and convenient position to perform a successful PMA.

Complications and precautions of PMA

The PMA has no remarkable complications for the procedure itself. The incidence of vascular puncture is the same, 10-15% of cases or somewhat lower than that of MA which was shown by Leeda M, et al, in their study, though it was not clinically significant (P=0.03)[5] . In a case report, Barak M,

et al, reported one notable complication, retroperitoneal hemorrhage & hematoma after a PMA for SAB[7]. Precautions of PMA should be as that of a regional anaesthesia, e.g. patient assessment, informed written consent, coagulation profile etc. If it happens that PMA would be changed into GA, "Informed consent" of the patent would be required again.

DISCUSSION:

After the first introduction of SAB by Bier in 1998, its popularity waxes & wanes & at presents it is an integral part of clinical anaesthesia. Initially, MA for SAB or EB was described followed by PMA & Taylor's approach latter on. But still the MA remains the technique of choice for the main stream anaesthesiologists.

The primary reason in favour of MA is that developmentally midline is the fusion of two sides of the body & hence if a needle is introduced through this route there would be less chance of tissue injury, vascular puncture & nerve damage. Theoretically this might be true but practically PMA has the same incidence of "bloody taps" which is 10-15% for all spinal cases[8] or even less than that in MA[7]. The advantages of PMA over MA are well established; especially it requires no assistant to flex the spine. Complication attributable to PMA is the same as that of MA. Regarding technique it can be accomplished at the same ease, time & confidence as that of MA & even catheter insertion can be done significantly faster than MA[5]. Learning for the beginners is also not so difficult if he or she has some ideas about the paramedian anatomy. In spite of all these favorable points, why this technique is seldom practiced, needs investigations. It might be our long time habit, "old is gold", or lack of enthusiastic trainers and demonstrators to impress the beginners.

CONCLUSION:

The paramedian approach for SAB is really a marvellous technique which is easy to perform with the same skill as for the regional anaesthesia. It has a lot of merits & advantages over the MA. So, PMA deserves much more attention in learning, practicing, teaching & researching in clinical anaesthesiology.

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