IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 13, Issue 11 Ver. IV (Nov. 2014), PP 40-43
www.iosrjournals.org

Combined Sacral Spinal Epidural Anesthesia.

Radhashyam Paria

I. Introduction:

The use of spinal and epidural anesthesia joint together in the subarachnoid and epidural spaces respectively offers an excellent combination of both with the dramatic reduction of their disadvantages. The beneficial effects of both blocks represent the rapid onset and prolongation of anesthesia with profound analgesia both in intra-operative and postoperative period.

The popularity of the combined spinal epidural (CSE) technique is gradually increasing over last three decades. The cause of such enhancement of popularity is based on true that neither spinal nor epidural neuraxial block can abolish completely neural transmission in block region. The raised sensory threshold produced in blocked area by CSE is found to be more than that found in the area blocked by SA or EA alone [1]. Thus, it is found that CSE produces physiologically denser block than either of two techniques alone. High-quality analgesia immediate after operation is the essential part to control surgical stress response to major surgeries.[2] Persistence of pain sensation and badly controlled surgical stress response are frequently associated with spinal or epidural form of anesthesia when they are used alone, although, is absent in combined spinal epidural form of anesthesia when they are used jointly together.

This technique involves intentional subarachnoid puncture along with epidural administration of local anesthetic drug either after replacement of an epidural catheter or single shot technique. This CSE technique provides rapid onset of action, profound regional blockade, prolongation of block and well-controlled surgical stress response with facility to modify or prolong post-operative analgesia. All studies regarding CSE were performed in connection of lumbar vertebrae. Not a single similar study is available in connection of sacral spinal [3,4] and sacral epidural [5] So decision was taken to evaluate merits and demerits of sacral CSF.

II. Methods:

With approval of medical ethical review board and written informed consent for procedure and study, 30 (thirty) patients, aged between 68 (sixty eight) to 85 (eighty five) years, with ASA physical status score of II and III, undergoing lower limbs' surgeries were included in the study.

All patients were subjected to pre-anesthetic assessment. Patients with the history of Psychological disorders, coronary artery disease, uncontrolled hypertension, intracranial mass, head injury, any abnormality of the spine, cutaneous infection, local cellulitis at the site, coagulation disorders, allergy to local anesthetic, history of opioid dependence, or neurological disorders were excluded from the study. The conditions that contraindicate the surgery or epidural anesthesia were considered at the time of the preoperative visit. The patients were convinced and informed in details about the procedure and technical advantages and disadvantages.

In the O.T, peripheral infusion and non –invasive monitoring were started. Anatomical landmarks were identified. We identified the spinous process of fourth lumbar vertebra (L4) and tip of coccyx. Next, we located the mid-point of above two landmarks as third sacral vertebra (S3). The first sacral vertebra (S1) was located as mid-point of L4 and S3. The second sacral vertebra (S2) was found at the mid-point between S1 and S3. The spinous processes of S1 and S2 are found approximately 2.5 cm apart, and their respective foramina lie 1.5 cm caudal and lateral to them. Similarly, S3 foramina lie 1.5 cm caudal and lateral to S3 vertebra.

The above described land marks were further confirmed by visualizing their relations to other structures. L4 is on the line joining the iliac crests. The tip of coccyx lies on the line joining the femoral acetabula. The spinous process of S2 lies at the level of posterior superior iliac spine. It is often detected by a dimple of skin. The S3 lie at the level of posterior inferior iliac spine.

After identification of S1, S2 and S3 foramina, aseptic preparation was done in sitting the position of patients and selected foramens were infiltrated with 6ml of 1% injection lignocaine. We inserted the nerve stimulator needle[6] (0.8 mm x 100 mm 21G Stimuplex A100 needle/ BBraun) through any of the first three pairs of dorsal foramens to acquire sacral epidural.[5] The needle was advanced perpendicularly until it contracted with bone. The depth of needle was noted from grazed nerve stimulator needle and needle was withdrawn a little and again redirected 40 degree to the foramen until it entered the foramen and crossed the intervertebral foramen evidenced with movement of great toe on the same side. Thus we placed the needle correctly in the sacral epidural space. This was also further confirmed by loss of resistance and absence of cerebrospinal fluid. After confirmation of needle placement in sacral epidural space, 20 ml of 0.75% Ropivacaine was injected through the needle (2ml / segment of the vertebra).

After completion of epidural procedure in sitting position, sacral spinal anesthesia [3,4]Quincke type spinal needle (Spinocan © Spinal Anesthesia Needles 27G × 3.5 inches, B Braun) was introduced obliquely towards midline through 2 nd dorsal foramina of sacrum. The spinal needle in the most of the cases touched bone and then needle was withdrawn slightly and redirected either cephalad or caudal to enter the expected foramina and to penetrate the dural sac. After flow of clear CSF, 2ml of 0.5% bupivacaine was injected through the needle.

Heart rate, blood pressure, respiration, and oxygen concentration were recorded. Upper level of sensory block was assessed by pinprick. Modified Bromage scale was used to assess onset and gradation of motor blockade. The time of onset of motor block was defined as the time gap between epidural injection and total loss of motor activity. The onset time of sensory blockade was defined as the interval between epidural injection and bilateral loss of sensation. Duration of sensory block was defined as the time interval between epidural injection and complete recovery of sensation. Hypotension was defined as a fall in systolic blood pressure below 100 mm of Hg. Data collected with the help of predesigned proforma were submitted for statistical analysis. Supplementary oxygen supply was administered at the rate of 3l/min through nasal route. The entire procedure was conducted under keen supervision of non-invasive monitoring system of blood pressure (BP), heart rate (HR) and oxygen concentration (Spo2).

III. Results:

Bilateral lower limbs' block developed immediate after introduction of spinal component of CSEA with sensory involvement of tenth thoracic dermatome. This was evidenced by estimation of sensory block level by pin prick method. The onset of motor block was taken place within scheduled time, estimated by Modified Bromage scale. Their results are cited under heading of nerve block profile in table no 1. Single shot sacral epidural in combination of sacral spinal anesthesia for lower limbs' surgeries offered prolonged post operative analgesia without central depression. The prolongation of anesthesia, contributed

Upper level of sensory block at T10 [10th thoracic dermatome] co-related the hemodynamic inference. Operation was completed with stable hemodynamic status of the body without development of hypoxia or hypotension during this procedure. This hemodynamic stability, produced by the technique of combined spinal epidural anesthesia indicates the limited involvement of specifically sensory and motor block of lumbosacral segments of spinal cord, responsible for lower limbs' innervations. The hemodynamic profile is cited in the table no 1. 30 patients are aged. Their demographic profile is plotted in table no 1. No incomplete or delay block developed in CSEA.

IV. Discussion:

The CSE is the technique of the intentional deposition of a local anesthetic outside and inside the subarachnoid space to enjoy the benefits of both components with minimizing their drawbacks. It was first described by a surgeon, Soresi, in 1937.[7] He used single needle to inject local anesthetic at first in the epidural space and then in the subarachnoid space. Ceralaru, in Romania, used this technique in two lumbar interspaces in 1979.[8] Brownridge, in 1979 used this technique in obstetric anesthesia [9] and reported its use 2 years later[10] Coates and Mumtaz in 1982 described the needle through needle technique.[11,12]

The conventional method of combined spinal epidural anesthesia (CSE) approached through lumbar route is an established technique for analgesia in labor [13] and anesthesia for cesarean section,[14] orthopedic [15], trauma , general , vascular, and gynecological surgery. But the practicability of CSE approached through the dorsal foramen of sacrum has not well discussed. On the basis of such purpose, this combined study was adopted to rectify the disadvantages of both.

Spinal anesthesia is the wide spread popular regional anesthesia with a definite advantage over general anesthesia. It is a well acceptable technique of providing effective analgesia with muscle relaxation over the larger part of the body with intrathecal administration of relatively small dose of local anesthetic. Compared to general anesthesia, it is simple and economical method of anesthesia with immediate postoperative analgesia without severe respiratory depression. These beneficial effects made it worthy alternative to general anesthesia. But it is not free from disadvantages. The fixed duration of anesthesia, unpredictable extension of block height, hypotension and postural puncture headache make it unpopular and objectionable to mark it as the best method of choice. These disadvantages of spinal anesthesia promoted to replace spinal by epidural. The epidural anesthesia is the time-consuming procedure and involves a higher incidence of insufficient or inadequate blockade of the motor nerve roots even after administration of large volume of local anesthetic.

The exact block height in epidural anesthesia can be titrated and can be regulated with supplementary doses of local anesthetic through catheter that may be useful to conduct postoperative analgesia. But the combined spinal epidural anesthesia, administered by the intentional deposition of local anesthetic in both subarachnoid and epidural space in the lumbar region is the most popular and advantageous technique of anesthesia utilizing the benefits of both procedures and minimizing their drawbacks. But such study is not available in relation to the combined sacral spinal epidural anesthesia.

CSE anesthesia is advantageous for high-risk cases and CS owing to the use of small initial dose of spinal anesthesia and afterward extending the block by epidural anesthesia to desired level without involvement of excessive sympathetic block and intercostals paralysis.[16] However, extensive intrathecal spread in CSF is responsible due to compression of the dural sac by epidural injection. The capacious sacral epidural space with 17 communications for free leakage of anesthetic solution undergoes incapable to raise intra-epidural pressure over intrathecal pressure of CSF to divert the local anesthetic from epidural space to subarachnoid space through the existing hole on arachnoid membrane made at the time of sacral spinal anesthesia. Reversely, negative pressure of the epidural space with added solution of local anesthetic may neutralize the intrathecal pressure of CSF with the chance of avoidance of post dural puncture headache.

The lack of such compressive effect on dural sac by the local anesthetic in epidural space restricts the intrathecal block height with less involvement of sympathetic outflow to maintain the hemodynamic status of body and results in minimal reduction of blood pressure or no reduction of blood pressure in perioperative and postoperative period. The contributory analgesic effect of sacral epidural anesthesia provides profound analgesia in addition to sacral spinal analgesia. This is sufficient enough to explain the prolonged postoperative analgesia without central depression.

The simplicity of the technique for perfect identification of the epidural space with the help of a nerve stimulator needle [6] is the acceptable procedure with less damage to surrounding structures. The evidence, produced by the stimulation of nerve by electric current, is an important guide to locate the sacral epidural space.

The lumbar epidural is associated with more extensive cranial spread than caudal spread.[17] The fifth lumbar and first sacral nerve roots undergo delay or incomplete block due to their larger size during the procedure of lumbar epidural anesthesia.[18] However, nerve size is not constant, it is variable individual to individual.[19] Such occurrence does not take place during the technique of the combined sacral spinal epidural anesthesia, owing to spread of local anesthetic from caudal to cephalic direction. L5 and S1 spinal nerve roots, being immersed first of all by local anesthetic both by intradural and extradural local anesthetic as local anesthetic is deposited through first or second dorsal foramen of sacrum.

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Table no 1: Showing Demographic profile, Hemodynamic profile and Nerve block profile of 30 patients	
DEMOGRAPHIC PROFILE	
Sex (M:F)	79.27±5.59
Height (Cm)	159.53±4.48
Weight (Kg)	58.70±3.85
Age (years)	20:10
HEMODYNAMIC PROFILE	
Systolic blood pressure (mm of Hg)	103.87±6.26
Oxygen Saturation (%)	81.37±4.68
Heart Rate (beats/min)	98.83±0.9
NERVE BLOCK PROFILE	
Onset time of sensory block.(min)	2.03±1.32
Onset time of motor block.(min)	3.10±4.35
Duration of sensory block. (min)	319.13±7.41
Duration of motor block.(min)	278.20±12.62
Cephalad extension. (vertebra)	T10