



THE EFFECT OF EPIDURAL VOLUME EXTENSION ON SPINAL BLOCK WITH 0.5% HEAVY BUPIVACAINE IN TOTAL ABDOMINAL HYSTERECTOMY - A RANDOMISED CONTROLLED STUDY

Anaesthesiology

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ABSTRACT

Introduction: One of the indication of total abdominal hysterectomy and bilateral salpingo-oophorectomy is the patient is suffering from menometrorrhagia, excessive or irregular menstrual bleeding that occurs between or during a female's menstrual cycle. Menometrorrhagia is a indication of urogenital malignancy (such as cervical malignancy), uterine fibroids, hormonal discrepancies and endometriosis. Other possible indications for TAHBSO are pelvic inflammatory disease, ovarian cyst, cancer of ovaries, uterus and or cervix. If remains untreated this can lead to anemia.

Aims And Objectives: Compare maximum sensory block level in each group (Smax). Period when Smax was first achieved, Period for 2 segment regression of sensory block from its highest level, Period for block regression to level of T10 dermatome e. Maximum motor blockade achieved, Time to attain maximum motor block, Time for complete regression of motor block(modified Bromage score=6), To compare any difference in haemodynamic parameters(Spo2, mean blood pressure).

Materials And Methods

Study Setting: This study will be conducted in the gynaecology OT Complex of IPGME&R.

Study Period: March 2017-August 2018

Definition Of Problem: Comparative evaluation of the effect of epidural volume extension on spinal block with 0.5% heavy bupivacaine for total abdominal hysterectomy such as

Results And Analyses: Our study showed that the distribution of body weight between Group E and Group S. Body weight was normally distributed, it was found that there was no statistical significance difference between the groups ($p=0.4054$). Distribution of ASA status in groups, In group E 25 patient were.

Summary And Conclusion: This technique is, however, not without its disadvantages, which draws special attention from an anesthesiologist such as rapid rise of spinal block, accidental migration of catheter in intravascular and intrathecal space along with an increased incidence of meningitis. In future We in subsequent case series will try to highlight the efficacy of this novel technique in patients of different setting with compromised cardiac functional status.

KEYWORDS

Epidural Volume Extension, Spinal Block, Bupivacaine and Abdominal Hysterectomy

INTRODUCTION

One of the indication of total abdominal hysterectomy and bilateral salpingo-oophorectomy is the patient is suffering from menometrorrhagia, excessive or irregular menstrual bleeding that occurs between or during a female's menstrual cycle. Menometrorrhagia is a indication of urogenital malignancy (such as cervical malignancy), uterine fibroids, hormonal discrepancies and endometriosis. Other possible indications for TAHBSO are pelvic inflammatory disease, ovarian cyst, cancer of ovaries, uterus and or cervix. If remains untreated this can lead to anemia.

Anaesthesiologists, as perioperative physicians are responsible for proper pain management during the perioperative period, creation of innovative approaches to acute pain management, and extending their care for acute postoperative pain services as well. Provision of effective analgesia for surgical and other medical patients is an important component of this multidimensional role.¹

Pain has been defined as "An unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage".² Pain is not only very distressing to the patients but also causes sympathetic over activity in the postoperative period, often prolonging hospital stay, increasing cost and unanticipated re-admission in hospital. By reducing the physiological and psychological response to tissue injury, satisfactory perioperative analgesia improves the surgical outcome with reduced morbidity, organ dysfunction, need for hospitalization and convalescence, which is a prerequisite for early recovery.³

A variety of neuraxial and peripheral regional analgesic techniques are being used for effective perioperative analgesia. In general, the

analgesia provided by epidural and peripheral techniques is superior to that with only systemic opioids, with reduced morbidity and mortality. Regional anaesthesia offers several advantages over general anaesthesia, provides excellent intraoperative analgesia, blunts stress response to surgery, decreases intraoperative blood loss, lowers the incidence of postoperative thromboembolic events and provides analgesia in early postoperative period. Epidural anaesthesia is a versatile technique widely used for infraumbilical surgeries. Its potential to decrease postoperative morbidity and mortality has been demonstrated by numerous studies.⁴ Epidural anaesthesia and analgesia involves administration of drugs into the epidural space using epidural needle and or epidural catheter which would ultimately block the spinal nerves traversing through the epidural space after emerging from the spinal medulla.

Hypotheses regarding the block of spinal nerves by epidural anaesthesia state that it is either due to action of the epidurally administered local anaesthetic (LA) on the spinal nerves traversing the epidural space or slow diffusion of the drug into the sub-arachnoid space and subsequent action on the spinal roots. The main advantages of epidural analgesia are the level of block and duration of analgesia may be controlled by the anaesthesiologist. Since we can administer LA and other drugs through the epidural catheter either as continuous infusion or as top-up doses, this route can very aptly be used for prolonged postoperative analgesia, an added advantage over spinal anaesthesia.

Regional anaesthesia is a safe and widely used technique since it is devoid of use of many anaesthetic drugs and their metabolism and excretion as in general anaesthesia. The most common drug used in subarachnoid block is bupivacaine. Bupivacaine can be used either as isobaric or hyperbaric solution. The combined spinal-epidural(CSE)

techniques include an initial subarachnoid injection followed by epidural catheter placement and administration of epidural medications for variable extended periods.⁵

Various local anaesthetics are used for epidural anaesthesia. Among them lignocaine, bupivacaine and ropivacaine are most popular. Due to their disadvantages, eg Lignocaine (intermediate duration of action) and bupivacaine (cardiac toxicity), continuous search for newer local anaesthetics is going on.

AIMS AND OBJECTIVES

SPECIFIC OBJECTIVES:

1. To compare maximum sensory block level in each group (Smax)
2. Period when Smax was first achieved
3. Period for 2 segment regression of sensory block from its highest level
4. Period for block regression to level of T10 dermatome e. Maximum motor blockade achieved
5. Time to attain maximum motor block
6. Time for complete regression of motor block(modified Bromage score=6)
7. To compare any difference in haemodynamic parameters. (Spo2, mean blood pressure)

MATERIALS AND METHODS

Study Setting:

This study will be conducted in the gynaecology OT Complex of IPGME&R.

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Definition Of Problem:

Comparative evaluation of the effect of epidural volume extension on spinal block with 0.5% heavy bupivacaine for total abdominal hysterectomy such as

- a. To compare maximum sensory block level in each group
- b. To compare motor block characteristics in each group
- c. To compare the time of regression of sensory block
- d. To compare complete regression of motor block
- e. To compare any difference in haemodynamic parameters (Spo2,HR, mean blood pressure)

Inclusion Criteria:

- a. Females of 30-65 years of age
- b. Patients with ASA physical status I and II
- c. patients with normal range of BMI(18.5-24.9)
- d. patients posted for elective total abdominal hysterectomy

Exclusion Criteria:

- a. Patient refusal to give consent.
- b. Allergy to study drugs
- c. Patients with BMI more than 25
- d. Patients with significant cardiovascular, respiratory, renal, hepatic, metabolic disease
- e. Sepsis
- f. local site infection
- g. spinal abnormality
- h. haemodynamic instability
- i. Failure of block.

Study Variable:

- a. Number of insertion attempts
- b. Time taken for insertion of epidural catheter
- c. Time taken for insertion of normal saline
- d. Heart rate
- e. Blood pressure
- f. SpO2
- g. Duration of sensory block
- h. Duration of motor block
- i. Time to ambulation
- j. Patient positioning
- k. Complications, if any Time of onset of sensory block

Table: Distribution Of Baseline Haemodynamics In Study Groups

	Groups	No of pt.	Mean	Std. Dev.	P. value
HR	E	28	86.18	17.35	<0.0001
Baseline (bpm)	S	28	91.43	13.29	<0.0001
SBP	E	28	132.82	16.33	<0.0001
baseline (mm Hg)	S	28	132.82	16.33	

MAP	E	28	98.58	13.25	<0.0001
Baseline (mm Hg)	S	28	99.04	13.78	
DBP	E	28	82.14	13.09	<0.0001
baseline (mm Hg)	S	28	82.14	13.09	

Comparison Of Number Of Attempts And Bloody Tap In Groups:

Group	N	No of attempts		Bloody tap	
		0	1	0(-)	1(+)
E	28	21	7	25	3
S	28	22	6	27	1

RESULTS AND ANALYSES

We found that to begin with, the following tables and bar diagram describe the age distribution of the patients between Group S and Group E. Variable (age) was found to be normally distributed by Kolmogorov-Smirnov goodness-of-fit test. Applying statistical analysis (Student's unpaired T test), p value is found not to be significant (p= 0.9369). S. Variable (body weight) was normally distributed by Kolmogorov-Smirnov goodness-of-fit test. Applying the Student unpaired T test it was found that there was no statistical significance difference between the groups (p=0.4054).

Our study showed that the distribution of body weight between Group E and Group S. Body weight was normally distributed, it was found that there was no statistical significance difference between the groups (p=0.4054). Distribution of ASA status in groups, In group E 25 patient were ASA1 and 3 patients were ASA 2, whereas in group S all patients were ASA 1 Comparison of No of attempts and Bloody tap(In group E 21 patients single attempt was made, but 7 patients needed more than 1 attempts. In group S, in 22 patients single attempt was made and rest 6 patients needed more than single attempts.)(In group E in 3 patients bloody tap was present, in group S bloody tap was present only in 1 patient).

We found the following Table and bar diagram describe the baseline HR, SBP, DBP and MAP between Group E and Group S. Variables (HR, SBP, DBP, MAP) was normally distributed by Kolmogorov-Smirnov goodness-of-fit test. Applying statistical analysis (Student's unpaired T test), p value was found not to be significant. Comparison of maximum sensory block in groups (Snmax). In group E in 24 patients, the maximum sensory block was T4, in 4 patients it was T5 whereas in group S in all patients it was found to be T4. Comparison of intraoperative HR variation in groups. summarizes the descriptive statistics for heart rates between the two groups, group E and S during intraoperative period. Statistically significant change (p<0.05) in heart rate is not found (Student's t test) among the groups of patients in 0 to 100 minutes time period. Comparison of SBP in groups. the comparison of systolic blood pressure between two groups. Variable (systolic blood pressure) was normally distributed by Kolmogorov-Smirnov goodness-of-fit test. Applying the Student's unpaired T test it was found that there was no statistically significance difference between the two groups (p value < 0.5).

DISCUSSION

Epidural volume extension (EVE's) technique is a unique regional technique, which offers the reliability and rapidity of spinal anesthesia along with flexibility of epidural anesthesia. It also avoids the degree of sympathectomy that accompanies spinal anesthesia when used alone as the dose of drug being used in EVE's technique is very less and hence the severity of hemodynamic compromise is less. At the same time, it avoids the disadvantages of general anesthesia in patients at high cardiac risk by avoiding potent cardiodepressant drugs.

The options in front of us broadly included spinal or general anesthesia. We, however, opted for EVE's technique, since it commands a unique place in the anesthetist's armamentarium. At one side, it had significant dose sparing effect providing the required level of anesthesia and analgesia and does not compromise the hemodynamic profile of the patient. Hence, we went ahead with this technique as it offered us advantage of both regional and general anesthesia, at the same time also avoided the undesirable side effect of both the techniques. Our technique provided the rapidity, density and reliability of spinal anesthesia and gave us the flexibility of epidural anesthesia as we could titrate the level of anesthesia, vary the intensity of block, extend the duration of anesthesia, and deliver postoperative analgesia. It also provided us a backup in the case if spinal anesthesia fails. At the same time, our technique had a clear edge over general anesthesia as we could avoid airway manipulation and accompanying stress response, which could have adversely affected our patient's

cardiovascular status. We were also able to avoid the negative inotropic effect of anesthetic agents and the adverse effect on venous return due to positive pressure ventilation was also avoided. The mild vasodilatation that we could achieve by the subarachnoid block by EVE's technique was beneficial in patients with isolated left ventricular dysfunction.

Lew et al.⁶ found that combined spinal epidural using EVE's technique proved to have a faster motor recovery profile that may have an impact on reducing or bypassing post anesthetic care unit. The advantage of using saline in epidural space was that we could achieve a higher level of block using a given volume of ropivacaine, as a result of which the level of hemodynamic compromise was less. None of our patients had any complaint related to prolonged motor blockade or postoperative urinary retention.

There are several mechanisms described in the literature, which explains this phenomenon the most popular ones being "Volume effect" that postulates that saline in epidural space compresses the theca which results in "squeezing" of cerebrospinal fluid and more extensive spread of subarachnoid block. This effect of injecting epidural saline is time limited and injecting saline will have no effect on the block profile, after 30 min or once two segment regression has begun.^{7,8} This was the reason that we had opted to inject 8 mL of normal saline 5 min after intrathecal injection. This technique proved to have a faster motor recovery profile by at least 60 min.⁹ This again was beneficial in our group of patients, as early ambulation decreases the risk of developing postoperative DVT. This in long term certainly is cost saving for both patient and hospital authorities along with low complication rates and better use of hospital resources.

In our study we compared effect of epidural volume extension on spinal block. In group E we performed spinal anaesthesia either at L3-4 or at L 4-5 with 15 ml NS in epidural space after 15 minutes with bupivacaine heavy 0.5% 2.5 ml plus 0.5ml fentanyl, whereas in group S we performed simple spinal anaesthesia at the abovementioned space with bupivacaine heavy 0.5% 3.5ml.¹⁰

We have come to result that, by performing EVE technique, even if we are using smaller amount of drugs, it is possible to perform total abdominal hysterectomy with less intra and post operative haemodynamic instability, and complications.

SUMMARY AND CONCLUSION

Judicious preloading with crystalloids tailored to individual needs, along with the low dose of spinal anesthetics, which was followed by epidural saline injection, helped us to attain the desired level of block for all our high-risk cases avoiding a precipitous decrease in blood pressure. The epidural catheter placed preoperatively also helped to provide postoperative analgesia thereby decreasing any further cardiac stress arising due to postsurgical pain.

In our study we compared the effect of epidural volume extension on spinal block in two groups giving in one group (group S) plain bupivacaine heavy 0.5% 3ml plus fentanyl 25 microgram (0.5ml), and in another group (group E) we performed CSE in either at L3-4 or L4-5 interspace with plain bupivacaine heavy 0.5% 2ml plus fentanyl 25 microgram (0.5ml). Intraoperative haemodynamics in patients of both groups were compared and it was found better haemodynamic profile (fluctuation of HR, BP, MAP) in group E as compared to group S. Frequency of intraoperative complications such as hypotension was found to be higher in group S, But procedural complications like bloody tap was found to be high in group E. Time to reach maximum sensory level and motor block profile were compared and no significant differences were found but the maximum sensory level was found to be higher in group S as compared to group E. The sensory regression and motor regression time was also found to be faster in group E as compared to group S.

Spinal block with Epidural volume extension of 15 ml of NS in total abdominal hysterectomy causes increase in sensory block level, increase in time to regression of sensory block to T10. Therefore epidural volume extension technique is recommended for total abdominal hysterectomy with benefit of decreased incidence of side effects.

This technique is, however, not without its disadvantages, which draws special attention from an anesthesiologist such as rapid rise of spinal

block, accidental migration of catheter in intravascular and intrathecal space along with an increased incidence of meningitis. In future We in subsequent case series will try to highlight the efficacy of this novel technique in patients of different setting with compromised cardiac functional status.

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