

Modified CSEA With Single Spinal Needle: A New Approach

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Abstract

Modified Combined Spinal Epidural Analgesia (CSEA) with a 25 G Quincke spinal needle was tried in 200 adult patients subjected for lower abdominal or lower extremity surgery. Needle insertion technique advocated by Ali and Samson was used while identifying epidural space with a thin bore spinal needle. Patient's weight related dose of epidural buprenorphine (4 - 8 µg kg-1 body weight) was tried. Modified CSEA could be successfully performed in 90% cases. Weight related dose of epidural buprenorphine (0.15-0.30 mg) in this study, offered almost 20 - 24 h post of pain relief in 58.5% cases without any incidence of respiratory depression, pruritus and post dural puncture headache.

Modified CSEA advocated in the text is a cost effective and less complication prone alternative technique. Single shot, weight related dose of epidural buprenorphine provides considerably long duration of analgesia therefore need of epidural catheter might be obviated.

INTRODUCTION

Combined spinal and epidural analgesia is commonly performed by Double space (DST) or Single space segment technique (SST). Ability to perform CSEA through single intervertebral space has made SST a popular technique. Despite this advantage SST suffers from certain specific complications, technical problems and of course there is the cost factor.

Migration of epidural catheter in subarachnoid space have been reported^{1,2} leading to extensive block^{3,4}. Delayed respiratory depression due to drug entering into subarachnoid space through migrated catheter has also been claimed⁵. Metallic flecks getting deposited in the epidural space while using needle through needle technique have raised concern⁶. Meningitis^{7,8,9}, knotting of catheter¹, inadvertent dural puncture with the wide bore Touhy needle^{10,11,12} are additional problems with currently practiced CSEA technique. Length of spinal needle^{11,13,14,15}, site of hole in Touhy needle at the patient end (back vs end hole) and type of spinal (pencil tip vs. Quincke)^{16,17,18,19,20,21} are some of the unresolved controversies with arguments in favour and against each point. Precipitous fall in blood pressure due to subarachnoid block before catheter is introduced^{22, 23} particularly in Obstetric patients might necessitate immediate resuscitation. In such situation subsequent

introduction of epidural catheter becomes impossible²⁴. Disposable special kit for SST is very costly²⁵ and may not be affordable to all of us. In order to overcome the cost factor two attempts have been made recently by Indian authors but both appear to be cumbersome for routine clinical use^{25,26}. Need to develop and accrue the benefits of CSEA through a simpler, cost-effective and less complication prone technique is therefore felt. A prospective pilot study was undertaken to perform CSEA by single space technique using conventional 25 G Quincke needle, which has not been tried before.

MATERIALS & METHODS

This prospective study was conducted in the Department of Anaesthesiology and Critical Care of Tata Motors Hospital, Jamshedpur, which is a multidisciplinary 540 bed general hospital after the permission from the ethical committee of the hospital.

200 patients of either sex belonging to ASA grade I & II posted for lower abdominal or lower extremity surgery were included in the study. Patients with bleeding disorder, spinal deformity, local infection and gross obesity were excluded from the study.

METHOD

Block was performed in sitting position at L2-4

intervertebral space using No. 25 G Quincke spinal needle. Needle was advanced through an 21G introducer after infiltrating the selected space with 2ml Lignocaine (1%). Epidural space was identified by applying a constant pressure on the plunger of 2ml air filled glass syringe fixed to the hub of spinal needle. Modified insertion technique advocated by Ali and Samson²⁷ was adopted for ease of identification of the epidural space. According to this technique, the dorsum of the operator's left hand rests on the patient's back, while the left thumb advances the spinal needle. Continuous restrain by the left three fingers thus helps in slow continuous advance movement of the spinal needle until the loss of resistance is clearly appreciated once the tip is in the epidural space. Single shot Buprenorphine 4 - 8 microgram Kg-1 body weight in 10ml saline was deposited in the epidural space. For orthopaedic patients weight before injury (as mentioned by the patient) was considered for deciding dose of buprenorphine. Nearest 0.5mg decimal fraction was taken into account while calculating the final dose of buprenorphine (e.g. if calculated dose is 0.155mg then 0.20 mg was taken as the final dose). After depositing buprenorphine in epidural space, needle was further advanced to the subarachnoid space. Bupivacaine 0.5% heavy was used for subarachnoid block (SAB). Patients were immediately placed in supine position. Head down tilt was given if needed. In the event of inadvertent dural puncture (direct dural tap) SAB was performed and the patient was excluded from the study. General anaesthesia was given to the patients where either subarachnoid tap could not be performed (Failed dural tap) or even after depositing local anaesthetic, SAB was ineffective (Failed spinal). All these cases of direct dural tap, failed dural tap and failed spinal were not followed subsequently for the study and were grouped as “unsuccessful CSEA”. Monitoring of ECG, SpO₂, and NIBP and pulse rate was done for all the patients continuously during the course of surgery. Subsequent observation and monitoring was done in the post-operative ward for 24hours by the well informed ward nurse and doctor on duty. Post operative pain was assessed on the Visual Analogue Scale .Morphine 0.2 mg Kg-1 body weight IM as escape analgesia was also given in the post-operative period if additional analgesic was demanded by the patient. Block failure rate (unsuccessful CSEA), duration of post-operative analgesia (time interval between end of surgery and first IM morphine), incidence of complications particularly respiratory depression (i.e. respiratory rate less than 12 breaths/min. or PaCO₂ >45 mm Hg), pruritis and

post-spinal headache were documented. Time of IM injection of Morphine was noted by the attending nurse. Documentation and follow up was done up to 24 hours postoperatively.

OBSERVATIONS & RESULTS

Out of total 200 cases, 142 patients were female and 119 had undergone Obstetric & Gynaecological operations (Table 1 & 2). CSEA could be performed successfully in 180 cases (90%). In rest 20 cases (10%) it was unsuccessful (Table 3): i) Inadvertent direct dural tap in 6 (3%), ii) failed spinal in 12(6%) and iii) technical difficulty in tapping dura (failed dural tap) in 2 cases (1%) (Fig.1). 200 successful CSEA patients were followed post-operatively for 24 hours to assess efficacy of single dose epidural buprenorphine (Table 4). In 117 patients (58.5%) effect of epidural buprenorphine lasted for 20-24 hours. IM morphine was required after 12-20 hours in 80 patients (40%) and after 2h in 3 (1.5%) patients. Minimum and maximum dose of epidural buprenorphine in our series was 0.15 and 0.60 mg. respectively.

Figure 1

Table 1: Demographic profile

n = 200
Female = 142
Male = 58
Weight = 38 - 80 Kg (Mean = 61.7 + 10.51)
Age = 20 - 78 yrs (Mean = 38.85 + 15.44)

Figure 2

Table 2: Profile of Operations

	Number
Obstetrics & Gynecological	
Caesarian Section	88
Hystrectomy (Abdominal)	25
Hystrectomy (Vaginal)	6
Orthopaedic	
Dynamic Hip Screw for Trochantric # femur	12
Amputation below Knee	6
Potts # internal fixation	4
Patellectomy	10
Surgery	
Appendicectomy	30
Inguinal Herniorraphy	19
Total	200

Figure 3

Table 3 : Success & Failure

	n	%
Successful	180	90
Unsuccessful	20	10

Figure 4

Figure 1: Causes Of Unsuccessful CSEA

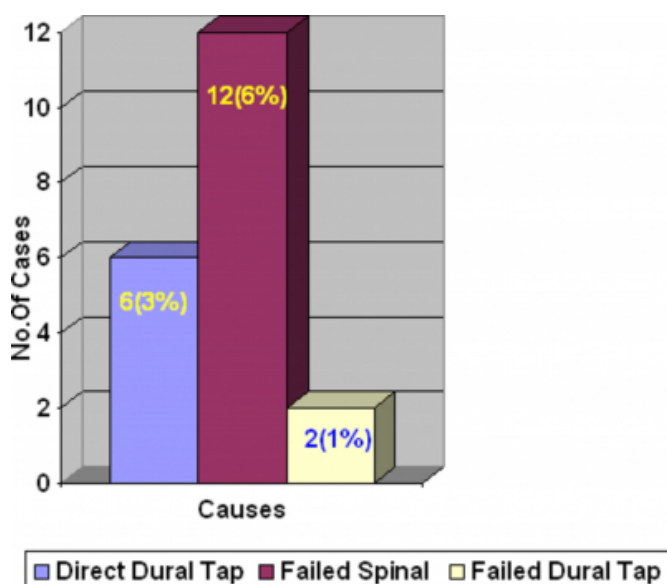


Figure 5

Table 4 : Duration of post-operative analgesia

Duration (in Hours)	n(%)
<2	3 (1.5)
12 – 19	80 (40)
20 – 24	117 (58.5)

There was no incidence of post dural puncture headache (PDPH), pruritis and respiratory depression in this series.

DISCUSSION

CSEA could be successfully performed in 180 patients (90%). In rest 10% patients though we could not perform CSEA (Table 3 & Fig 1), the incidence of failed spinal 6% (n=12) and failed dural tap 1% (n=2) was lower as compared to quoted incidence of 8.3-25%^{11,12} for failed spinal and 3.5-10.6%^{7,9,11,16} for failure to tap the dura with conventional SST-CSEA. The incidence of direct dural tap while locating the epidural space was little higher 3% (n=6)

in present study than the claimed incidence (0.4-2.7%)^{1,7,9} with conventional CSEA. Higher incidence of direct dural tap in our series was due to difficulty in appreciating lack of resistance with very thin bore spinal needle since it was the authors' initial attempt of developing this technique. Higher failure rate (8%) in locating epidural space with smaller gauge (20G) Touhy needle was also reported by Liu et al as compared to 1% failure while using No.17 or 18G Touhy needle³⁰. This however did not pose any additional harm in the present series as the spinal needle used was very thin (cf. Touhy needle). This observation was similar to that of one study by Samaddar. et al⁴³.

Dose of epidural buprenorphine (4 – 8 µg Kg-1 body weight) was decided based on the studies conducted by Y Miwa, et al²⁸. Epidural Buprenorphine (0.3 mg) was found superior to 0.15 mg of buprenorphine by the studies by Lanz E et al²⁹. Interval for the next analgesia was found to be significantly greater after extradural buprenorphine (18.96 hours) by the studies of Rudra A et al²⁰. Epidural Buprenorphine injected at the thoracic level produced good and long-lasting (22.6 +/- 9.9 hours) pain relief by Takata T et al³². Epidural Buprenorphine 0.06 mg mixed with 15-20 ml of 1.5 percent xylocaine to produce postoperative analgesia for a mean period of 26.30 +/- 10.6 hours by Kiran U et al³³. The same dose range of Caudal buprenorphine (4 µg.kg-1 body weight) provided 10.8 h to more than 24 h of analgesia in children, with fewer side effects by Girotra S et al³⁴. In a study by N. Gangopadhyay et al³⁵; excellent and long-lasting pain relief (about 7 days) was observed in the majority (91.38%) of the cases by 3 µg.kg-1 caudal buprenorphine with no serious side effects. A single dose of buprenorphine 2.5 µg.kg - 1 added to bupivacaine via the caudal route resulted in pain relief with a mean duration of 1424 min by Fauzia Anis Khan et al³⁶.

Most of our patients had undergone LSCS (44%) but we used weight related dose of epidural buprenorphine for both LSCS and non LSCS cases without making extra allowance for caesarean cases. In a study by Saxena et al³⁹, the mean duration of analgesia was found to be 388 ± 55 min. after Epidural Buprenorphine 0.3mg. in post LSCS patients.

180 patients were ultimately followed in our series to assess duration of pain relief with single dose epidural buprenorphine. Pain relief was 20-24 hours in 58.5 % (n=117) and 12-19 hours in 40% (n=80) cases (Table 4). Effect of buprenorphine was unsatisfactory in 3 patients (1.5%). They needed IM morphine 2 hours after and then 4

doses in first 24 hours.

Incidence of PDPH in this pilot series was nil which is consistent with the observation of Brownridge^{40,41} who reported no incidence of PDPH in 200 obstetric patients following CSEA, although other authors^{10,42} have observed 0.13 - 2.3% incidence of PDPH using 26/27G needle. None of our patient complained of pruritus. This is consistent with the finding of Saxena et al after Epidural Buprenorphine 0.3mg. in 15 post LSCS patients. Ability to prolong analgesia by incremental dose of buprenorphine through epidural catheter is a definite advantage of conventional CSEA over the technique advocated here. This advantage is however associated with needle and catheter related complications mentioned earlier. High cost of CSEA kit is also another deterrent for using this technique as a routine. Moreover need for analgesia generally is maximum for initial 24 hours, subsequent need is usually taken care by NSAID adequately. The technique advocated here therefore is a suitable alternative to conventional CSEA, while providing reasonably prolonged post-operative analgesia, it eliminated catheter related complication and took care of the cost factor.

CONCLUSION

Modified CSEA through a single space technique using a spinal needle is a cost effective, simple and less complication prone alternative to the conventional CSEA. A single bolus dose of buprenorphine can be deposited through this technique in the epidural space for achieving nearly 24 hours of pain relief without any serious complications. However this technique needs to be further tried and mastered so that the incidence of inadvertent direct dural puncture could be further reduced to comparable levels.

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