

Spinal Fast track – Half dilution of intrathecal local anesthetics, a key for faster recovery after ambulatory day care surgeries – A Case Series

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Abstract

With the incorporation of enhanced recovery pathways into ambulatory day care surgeries, newer modalities for administration of subarachnoid blocks for provision of good anesthesia with rapid recovery and minimum post operative complications are emerging. In a tertiary care suburban

hospital with limited resources and manpower, we describe a protocol for fast tracking recovery after subarachnoid blocks in selected cases posted for ambulatory day care laser surgeries.

Keywords: Enhanced recovery after surgery, Intrathecal local anesthetics, ambulatory anesthesia, saddle block.

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Introduction

With global acceptance of Enhanced Recovery After Surgery (ERAS) protocols resulting in improved patient turnover, reduced hospital stays, better resource utilization and improved outcomes after major surgeries, algorithms to optimize patient experience for day care ambulatory surgeries using evidence-based protocols are being evaluated(1). While day care surgeries are popular in metropolitan cities, the same cannot be said for suburban areas due to less tertiary care centers, scarcity of surgeons and dependence on freelance technicians for equipment transfer between hospitals. Since morning slots are taken up for major surgical procedures or high-risk patients, it is difficult to organize logistics, man power, pre anesthesia check-up and procure necessary investigations resulting in such cases to be taken up in late afternoon contrary to established day care surgical guidelines (2).

Saddle blocks are preferred over conventional subarachnoid blocks (SAB) for perineal surgeries due to lingering motor / sensory deficits but at the cost of patient discomfort due to positioning requiring some sedation to ease the patient. Resorting to Total Intravenous Anesthesia (TIVA) may not always be feasible, due to issues including Post operative nausea and vomiting (PONV), inadequate analgesia, dependence on opioids and requirement for monitoring in post anesthesia care units (PACU) till discharge criteria are met resulting in additional economic burden on patients (3).

Unlike other surgeries, Laser procedures cause repeated skin stimulation due to intermittent pulsed laser beams under mucosa and is always painful. Hence a single dose of opioid may not provide adequate analgesic coverage and may require deepening the plane of sedation if TIVA is used. Under neuraxial anesthesia, the perineal dermatomes are blocked preemptively and the pain due to contact heat decreases exponentially with time (and with ice application) leaving very little after effects, reducing the requirement of post operative opioids after 30-45 minutes.

We describe a series of four cases posted for laser perineal surgeries where intrathecal LA drugs were used to facilitate same day discharge. This study was approved by the institutional ethics committee and written informed consent was obtained from all the patients for the study. The manuscript adheres to applicable EQUATOR guidelines.

Case description

Case 1: An ASA I, 24-year-old male with grade III hemorrhoids was posted for laser hemorrhoidectomy. Under strict aseptic precautions,

SAB was performed at L4-L5 with 2 mL 0.25% hyperbaric bupivacaine (1 ml hyperbaric 0.5% bupivacaine + 0.8 ml sterile distilled water for injection + 0.2 ml CSF aspirate on barbotage) using 27G Quincke spinal needle with bevel end directed caudally and patient in sitting position.

Case 2: A 75-year-old hypertensive and diabetic for 10 years with osteoarthritis of both knees was posted for laser hemorrhoidectomy for grade III hemorrhoids. Under strict aseptic precautions, with patient in lateral decubitus position, SAB was performed at L4-L5 with 27G Quincke spinal needle using 2 mL 0.375% hyperbaric ropivacaine (1 mL 0.75% hyperbaric ropivacaine + 0.8 mL sterile distilled water for injection + 0.2 mL CSF aspirate on barbotage) with bevel end directed caudally.

Case 3: A 65-year-old diabetic for 7 years with perineal fistula was posted for incision and drainage and laser fistulectomy. Under strict aseptic precautions, SAB was performed at L4-L5 with 2 mL 0.25 % hyperbaric levobupivacaine (1 mL 0.5% hyperbaric levobupivacaine + 0.8 mL sterile distilled water for injection + 0.2 mL CSF aspirate on barbotage) using 27G Quincke spinal needle with bevel end directed caudally.

Case 4: A 39-year-old patient without any comorbidities was posted for laser hemorrhoidectomy for grade III hemorrhoids. Under sterile precautions, SAB was performed at L4-L5 using 27G Quincke spinal needle using 1.6 mL 0.5% hyperbaric bupivacaine with bevel end directed caudally.

First three cases reported early recovery from sensory and motor block assessed by standard pin prick and modified Bromage scoring (4). None of the cases recorded any drop in systolic blood pressure < 20% of the baseline. This was anticipated as all the cases were placed in reverse Trendelenburg position at 30° for 5-10 mins before shifting to lithotomy position for surgery to prevent inadvertent cephalic spread beyond T10.

All the patients were started on intravenous paracetamol as soon as sensory regression started with 1mg/ Kg of intravenous tramadol given as rescue analgesic. No sedatives nor opioids were required intraoperatively. Table 1 compares the block characteristics between patients. With exception of the last case, there was significant return of motor function and better patient satisfaction scores (6-point questionnaire – Supplementary data file 1) within the first hour of PACU stay for first 3 cases having complete recovery within 2 hrs. Intravenous crystalloids were given at a dose of 10mL/Kg over thirty

Table 1. Comparison of sub arachnoid block characteristics between four patients.

Parameter	Half Bupivacaine	Half Levobupivacaine	Half Ropivacaine	Conventional Bupivacaine
Age of patient(yr)	24	65	75	39
Diagnosis	Gr III hemorrhoids	Peri anal fistula	Gr III hemorrhoids	Gr III hemorrhoids
Procedure	Laser hemorrhoidectomy	Laser fistulectomy	Laser hemorrhoidectomy	Laser hemorrhoidectomy
ASA class	I	III	III	I
Drug dose	5 mg	5 mg	5 mg	8 mg
Spinal needle	27 G Quincke	27 G Quincke	27 G Quincke	27 G Quincke
Position for SAB	Sitting	Lateral decubitus	Lateral Decubitus	Sitting
Time taken for sensory block to reach T 10**	5 mins	8 mins	5 mins	2 mins
Degree of motor block (Bromage)	3	3	3	4
Duration of procedure	25 mins	30 mins	35 mins	35 mins
Hemodynamic instability	No	No	No	No
Time for recovery for motor and sensory	110 mins	105 mins	95 mins	280 mins
Time for discharge from PACU**	110 mins	105 mins	95 mins	290 mins
Time for discharge from Hospital**	130 mins	130 mins	115 mins	310 mins
Post operative paracetamol administered (IV)	1gm	1gm	1gm	1gm
Post operative Tramadol administered.	0	0	0	0
Whether any post operative opioid used	No	No	No	No
Patient Satisfaction Score*	15/18	14/18	15/18	12/18
Surgeon Satisfaction	Excellent	Excellent	Excellent	Excellent

* Patient satisfaction score is calculated from subjective assessment from a 6-point questionnaire with responses graded as poor, Ok, good and excellent or numerically as 0, 1, 2 and 3 respectively.

** All time measurements are from time of administration of subarachnoid block.

minutes and then set at maintenance dose thereafter till complete recovery from block. All four patients were discharged from wards within 1 hour after shifting from PACU and reviewed after 2 weeks.

Discussion

Most laser perineal surgeries performed at our institute take less than 30 minutes and so we are developing protocols with emphasis on expeditious recovery time and cost savings. Saddle blocks, caudal anesthesia, local infiltration, and sedation techniques have all been described for such procedures with same day discharges (5). Each technique has its pros and cons (6).

However, this technique of providing half diluted intrathecal local anesthetics appear to satisfy both patient and surgeon expectations by providing a preemptive pain control with adequate sphincter and lower limb relaxation with ultrashort duration of action without major hemodynamic changes and PONV. These include surgeries for perineal regions including hemorrhoidectomies, fistulectomies and even minor genito-urinary surgeries where TIVA or nerve blocks might be unsatisfactory for providing adequate sphincter relaxation. Saddle blocks can be considered beneficial due to specific spread of hyperbaric drugs around L5, S1 and S2. But even then, the patients complain of pain or discomfort during positioning due to the lower

limb sparing preventing adequate relaxation to position for lithotomy.

In our set up, only bupivacaine, levobupivacaine and ropivacaine are available for intrathecal use. All are hyperbaric medications with a predictable dermatomal spread. We don't prefer using isobaric preparations due to following:

- 1) These isobaric preparations have densities measured at room temperature (20-25°C) but since they are administered in the subarachnoid space at 37°C, they are likely to behave as hypobaric preparations (7).
- 2) Most perineal surgeries require dense blockade at L5 to S2 dermatomal levels which may be hard to achieve if there is less diffusion of drugs from L3-L4 space.
- 3) Most isobaric LA drugs come in 20 mL vials or ampoules which result in a wastage of significant quantity of medication adding to increased cost for the patient.
- 4) Several studies have shown greater hemodynamic instability with isobaric compared to hyperbaric preparations which may be an indirect consequence of temperature dependent hypobaricity described earlier (8).

Based on available evidence on the action of neuraxial LA, the duration of analgesia and relaxation is dose dependent, whereas

degree of blockade is dictated by volume as far as hyperbaric preparations are involved. This may be partly due to differing LA concentrations at various levels due to different rates of diffusion and movement of drug based on gradient in baricity. The same may not be true for isobaric drugs as they may have lesser spread to other dermatomes and hence greater drug concentrations available around the level of dural puncture. Table 2 shows block characteristics with other short acting intrathecal local anesthetic drugs from literature.

The rationale for diluting hyperbaric LA with sterile distilled water was so that the resulting solution would still be hyperbaric. This was confirmed by measurement of specific gravity by refractometer in biochemistry lab. The average value from all 8 samples was 1.019. This is still hyperbaric compared to estimated CSF specific gravity of 1.004-1.006 (9).

Using different intrathecal LA drugs allowed for a rough comparison regarding speed of recovery between different drugs. In general, 5 mg of bupivacaine and levobupivacaine and 3.75 mg of ropivacaine had similar duration of action with complete recovery within 120 mins

compared to 280 mins for 8 mg of bupivacaine for the last patient. Due to reduced dosage, both duration and degree of block was reduced with patients experiencing sensory block > motor block > blockade of autonomic nervous system. This explains the absence of any major decline in systolic blood pressure in any of the cases (10).

All the cases were administered spinal anesthetic using 27G Quincke spinal needle (as pencil point Whitacre needles were unavailable via local purchase) to minimize the chances of PDPH as far as possible. Whitacre needles of same / smaller calibre would reduce the risk even further (11). Early ambulation followed by early intake of food encouraged faster discharge from wards as criteria was met earlier.

Although it is premature to draw conclusions from a few cases, a properly designed randomized controlled trial comparing different drugs, doses, and adjuvants with different subsets of surgeries will be able to provide a valid conclusion as to the duration, level of blockade, recovery time and hemodynamic changes.

Table 2 Block characteristics with other short acting intrathecal local anesthetics.

Drug	Dosage (intrathecal)	Recovery from motor block (median)	Recovery from sensory block (median)	Complications
Mepivacaine	40 mg		170	• TNS
Prilocaine	40 mg	92	100	• TNS • Urinary retention
Articaine	60 mg	135	165	
Chloroprocaine	40 mg	75	105	

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