



## Case Series

## Fractionated dose of hyperbaric bupivacaine for hemodynamic stability and prolonged duration of anaesthesia in high-risk geriatric patients undergoing unilateral hip surgeries under subarachnoid block- A case series

Arun Aravind<sup>1,\*</sup>, Rasmi Kodipurayil<sup>1</sup>, Melvin Cyriac<sup>1</sup>

<sup>1</sup>Dept. of Anaesthesiology, Dr.Moopen's Medical College, Wayanad, Kerala, India



## ARTICLE INFO

## Article history:

Received 08-03-2023

Accepted 07-04-2023

Available online 05-06-2023

## Keywords:

Fractionated dose spinal

Hemodynamic stability

Hip surgeries

Geriatric patients

Bupivacaine

High risk

## ABSTRACT

Poor cardiopulmonary reserve, multiple comorbidities and polypharmacy in geriatric patients result in significant hemodynamic changes after the subarachnoid block (SAB) which are often unpredictable and requires administration of fluids, vasopressors, invasive monitoring and ICU admission leading to poor post operative outcome especially in patients belonging to American Society of Anaesthesiologists Physical Status (ASA PS) 3 & 4. Fractionated dose of hyperbaric bupivacaine for preferential unilateral lower limb blockade is found to have excellent hemodynamic stability and more duration of action making it a better alternative to the bolus dose in unilateral hip surgeries in high-risk geriatric patients. Here is a case series of 20 high risk geriatric patients who successfully underwent unilateral hip surgeries under fractionated dose of spinal anaesthesia with a stable perioperative hemodynamics.

This is an Open Access (OA) journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License](https://creativecommons.org/licenses/by-nc-sa/4.0/), which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: [reprint@ipinnovative.com](mailto:reprint@ipinnovative.com)

## 1. Introduction

Surgeries on fracture hip are commonly performed under subarachnoid block (SAB) and usually encountered in geriatric population. Poor cardiopulmonary reserve, multiple comorbidities and polypharmacy in these patients leads to significant hemodynamic changes after the SAB which are often unpredictable and requires administration of fluids, vasopressors and invasive monitoring.<sup>1,2</sup> Such hemodynamic changes can be detrimental and further administration of fluids can worsen the underlying conditions leading to poor post-operative outcome in these patients. Fractionated dose of hyperbaric bupivacaine for preferential unilateral lower limb blockade with  $2/3^{rd}$  dose given initially followed by  $1/3^{rd}$  dose after 3 to 5 minutes is found to have excellent hemodynamic stability and more duration of action making it a better alternative to the

bolus dose in unilateral hip surgeries in high-risk geriatric patients. Here we present a case series of 20 geriatric patients of ASA PS 3 & 4 who successfully underwent unilateral hip surgeries under fractionated dose of SAB with a stable perioperative hemodynamics.

## 2. Case Series

Twenty patients with age more than 80 years who had intertrochanteric (IT) fracture /Fracture neck of femur were planned for Proximal Femoral Nail Antirotation (PFNA2)/Hemiarthroplasty. Among whom 14 patients had IT fracture and remaining 6 with fracture of neck of femur and 12 were females. Out of the 20 patients 13 belonged to ASA PS 4 including recent myocardial infarction with severe left ventricular dysfunction, cardiomyopathies, acute on chronic kidney injury on dialysis and chronic obstructive pulmonary disease with type 2 respiratory failure. 6 patients had uncontrolled diabetes and 3

\* Corresponding author.

E-mail address: [drarunaravindcmc49@gmail.com](mailto:drarunaravindcmc49@gmail.com) (A. Aravind).

with accelerated hypertension. All of them had multiple comorbidities and were on multiple drugs. All of them were evaluated with complete hemogram, renal function tests, electrocardiogram, serum electrolytes, coagulation profile and echocardiography. Consent regarding anaesthesia risk and plan of anaesthesia were explained and documented prior to surgery.

All the patients were premedicated with 0.5mg of midazolam intravenously to relieve the anxiety and positioned laterally with affected limb dependent after administering 20mg/kg inj. Paracetamol and with the help of 4 assistants to minimise movement at hip to reduce the pain associated with positioning. A total of 2.5 ml of 0.5% hyperbaric bupivacaine with 60 microgram inj. buprenorphine as adjuvant was given to all patients to produce preferential unilateral subarachnoid block. Two third of the drug was given initially (1.5ml) and the stylet was reintroduced. Heart rate and blood pressure were measured at 1 minute interval. Any significant hemodynamic changes were treated with 20 microgram boluses of phenylephrine. Level of sensory blockade was also assessed to ensure adequate level of surgical anaesthesia. One third of drug was given 3 minutes after stabilisation of hemodynamics followed by removal spinal needle. In one patient a third dose of 0.5ml was given in addition to two doses to achieve T10 level of surgical anaesthesia. Patients were continuously monitored and positioned supine 5 minutes after the second dose of spinal drug. All the patients had stable hemodynamics except one patient who was having minimal hypotension which required administration of 40 mcg of phenylephrine. None of the patients developed bradycardia or significant hypotension and vitals remained within 20% of baseline in all the patients. Usual time duration for PFNA2 was around 2 hours and two surgeries lasted for 4 hours and 45 minutes and no other anaesthetic techniques were supplemented during this period to extend anaesthesia. All the patients had analgesia lasting more than 9 hours in the postoperative period (maximum 16 hours). All patients had uneventful recovery during postoperative period and discharged on 5<sup>th</sup> postoperative day.

### 3. Discussion

Hip fractures are very common in elderly patients warranting early fixation to ensure faster recovery and minimise associated morbidity. Advanced age along with multiple comorbidities, poor cardiopulmonary reserve and polypharmacy pose significant challenges to the anaesthesiologists in perioperative management.<sup>3</sup> Even though there are no added mortality benefits, neuraxial anaesthesia is well accepted in geriatric patients because of less stress response, better postoperative analgesia, reduction in pulmonary complications and better peripheral circulation.<sup>1</sup> Cardiovascular instability including

hypotension and arrhythmias are the major concerns of neuraxial anaesthesia especially in geriatric high-risk patients.<sup>4</sup>

Fractionated dose of SAB drug is observed to have less hemodynamic changes and more duration of blockade compared to bolus dose.<sup>5,6</sup> As the volume administered in fraction produces less area of sympathetic blockade and hence the hemodynamic changes produced will be minimal. Furthermore, as the height of blockade is also comparatively lower, the effect on respiratory mechanics also will be minimal making it more useful in patients with poor pulmonary reserve and also, we can use more volume of drug without hemodynamic instability which again can increase the duration of anaesthesia. In our cases we used a total of 2.5 ml of SAB drug given in two fraction of 1.5 ml and 1ml respectively. The second fraction of drug administered blocks the same fibres which were already blocked by the first dose hence resulting in more intense block of nerve fibres leading to prolonged duration of anaesthesia and analgesia.<sup>7</sup>

In the study conducted by Minville V and colleagues it was found that continuous SAB with lower volume of drug produced less hemodynamic changes compared to bolus dose.<sup>8</sup> Parturients who underwent caesarean section under fractionated dose of SAB is found to have stable hemodynamics and prolonged analgesia compared to those who received bolus dose.<sup>9–11</sup> Being more hemodynamically stable with prolonged analgesia proven from various studies we thought of utilisation of the same to anaesthetise high risk geriatric patients who are at risk of these complications. Same was also supported by studies conducted by Kader AARA, et al. and Srivastava N et al<sup>12–14</sup> in adult patients undergoing lower limb surgeries. To reduce the hemodynamic effects further we used preferential unilateral blockade technique to reduce the extend of sympathetic blockade.

Similar to graded epidural blockade fractionated spinal anaesthesia can be given in multiple fractions to get even more hemodynamic stability and longer duration of action making it a better alternative to epidural as well as general anaesthesia in various surgeries especially lower limb surgeries in high-risk geriatric patients. The time required to achieve sensory block and motor block were not assessed in our study. So randomised controlled trials need to be conducted to establish this fact and to have more clarity on the doses, number of fractions and occurrence of any adverse events in high-risk geriatric patients.

### 4. Source of Funding

None.

### 5. Conflict of Interest


None.

## References

1. Sivevski AG, Karadjova D, Ivanov E, Kartalov A. Neuraxial Anesthesia in the Geriatric Patient. *Front Med (Lausanne)*. 2018;5:254.
2. Critchley LA. Hypotension, subarachnoid block and the elderly patient. *Anaesthesia*. 1996;51(12):1139–43.
3. Guay J, Parker MJ, Gajendragadkar PR, Kopp S. Anaesthesia for hip fracture surgery in adults. *Cochrane Database Syst Rev*. 2016;2(2):CD000521.
4. Sowmya NL, Rao MVR, Ram A. Comparison of Fractionated versus Bolus Dose Injection of Drug in Spinal Anaesthesia for Lower Limb Surgeries. *Int J Sci Res*. 2020;9(1):1729–33.
5. Nugroho AM, Sugiarto A, Chandra S, Lembahmanah L, Septica RI, Yuneva A. A Comparative Study of Fractionated Versus Single Dose Injection for Spinal Anesthesia During Cesarean Section in Patients with Pregnancy-Induced Hypertension. *Anesth Pain Med*. 2019;9(1):85115.
6. Badheka J, Oza V, Vyas A, Baria D, Nehra P, Babu T. Comparison of fractionated dose versus bolus dose injection in spinal anaesthesia for patients undergoing elective caesarean section: A randomised, double-blind study. *Indian J Anaesth*. 2017;61(1):55–60.
7. Fahmy NR. Circulatory and anaesthetic effects of bupivacaine for spinal anaesthesia fractionated vs. bolus administration. *Anaesthesiol*. 1996;3:85.
8. Minville V, Fourcade O, Grousset D, Chassery C, Nguyen L, Asehnoune K, et al. Spinal anesthesia using single injection small-dose bupivacaine versus continuous catheter injection techniques for surgical repair of hip fracture in elderly patients. *Anesth Analg*. 2006;102(5):1559–63.
9. Badheka JP, Oza VP, Vyas A, Baria D, Nehra P, Babu T. Comparison of fractionated dose versus bolus dose injection in spinal anaesthesia for patients undergoing elective caesarean section: A randomised, double-blind study. *Indian J Anaesth*. 2017;61(1):55–60.
10. Kabir KK, Gandhi MK, Arora K, Tiwari K. Comparative study between fractionated and single bolus dose of local anaesthetic in elective lower segment caesarean section. *Indian J Clin Anaesth*. 2019;6(3):386–90.
11. Manjula RV, Devi VS, Swathi A, Kumar KD, Surender P. A Prospective Randomised Double-Blind Comparative Study of Bolus versus Fractionated Dose Injection in Spinal Anaesthesia for Pregnant Women undergoing elective Caesarean Section. *Indian J Anesth Analg*. 2018;5(11):1840–5.
12. Kader A, Hekal KA, Ragheb YA, Magdy A. Single-shot spinal anesthesia with heavy bupivacaine in two regimens versus continuous spinal anesthesia in elderly patients undergoing hip surgery: a prospective randomized controlled study. *Tanta Med J*. 2018;46(2):99–107.
13. Srivastava N, Ahluwalia P, Jheeta GS, Singh G. Bolus dose versus fractionated dose injection of hyperbaric bupivacaine in spinal anaesthesia among adult patients undergoing lower limb surgery: A prospective study. *Indian J Clin Anaesth*. 2020;7(2):238–44.
14. Derakhshan P, Faiz SHR, Rahimzadeh P, Salehi R, Khaef G. A Comparison of the Effect of Fractionated and Bolus Dose Injection on Spinal Anesthesia for Lower Limb Surgery: A Randomized Clinical Trial. *Anesth Pain Med*. 2020;10(5):e102228. doi:10.5812/aapm.102228.

## Author biography

**Arun Aravind**, Assistant Professor  <https://orcid.org/0000-0002-8097-1362>

**Rasmi Kodipurayil**, Assistant Professor  <https://orcid.org/0009-0005-1268-167X>

**Melvin Cyriac**, Assistant Professor  <https://orcid.org/0000-0002-7182-5435>

**Cite this article:** Aravind A, Kodipurayil R, Cyriac M. Fractionated dose of hyperbaric bupivacaine for hemodynamic stability and prolonged duration of anaesthesia in high-risk geriatric patients undergoing unilateral hip surgeries under subarachnoid block- A case series. *Indian J Clin Anaesth* 2023;10(2):190-192.