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Case Series

Fractionated Spinal Anaesthesia in Elderly Patients with Comorbidities – A Case Series

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Abstract

Background: Elderly patients undergoing orthopedic lower-limb surgeries frequently have multiple comorbidities, placing them at risk of perioperative hemodynamic instability under conventional single-bolus spinal anaesthesia. Fractionated spinal anaesthesia (FSA) has been described as a technique that minimizes abrupt sympathetic blockade and hemodynamic fluctuations, while prolonging block duration.

Aim: To evaluate haemodynamic response, onset and duration of sensory and motor block, and duration of postoperative analgesia in elderly patients receiving FSA for unilateral hip surgery.

Methods: A retrospective analysis was performed on five geriatric patients with hip fractures. All underwent standardized preoperative evaluation and received a pericapsular nerve group (PENG) block before receiving fractionated spinal anaesthesia using hyperbaric bupivacaine with fentanyl. Hemodynamic variables, sensory-motor block characteristics, and analgesia duration were recorded.

Results: All patients maintained hemodynamic stability. Heart rate remained within 10% of preoperative values, while systolic and diastolic blood pressure remained within 20% of baseline. No patient required vasopressor bolus. Sensory block onset averaged 2 minutes; duration ranged 3–3.25 hours. Motor block duration was ~2.1–2.7 hours. First analgesic requirement occurred at ~7–9 hours.

Conclusion: Fractionated spinal anaesthesia is safe and provides stable hemodynamics with prolonged block in elderly high-risk patients undergoing unilateral lower-limb surgery.

Keywords: Fractionated Spinal Anaesthesia, Elderly, Hip Fracture, Hemodynamic Stability, Case Series.

Introduction

Hip fracture surgeries in elderly patients are routinely performed under subarachnoid block (SAB). However, conventional bolus dosing may induce rapid sympathetic blockade, leading to sudden hypotension, especially in patients with compromised cardiopulmonary reserve and multiple comorbidities [1].

These patients often present with ischemic heart disease (IHD), hypertension, valvular disorders, chronic obstructive pulmonary disease (COPD), or poorly compensated heart failure. In such individuals, even small hemodynamic shifts may be poorly tolerated [2].

Fractionating the spinal anaesthetic dose is proposed to mitigate abrupt sympathetic blockade, which in turn improves hemodynamic stability and prolongs analgesia. The method typically involves giving two-thirds of the dose initially, followed by the remainder after a brief interval (usually 45 seconds), allowing controlled cephalad spread [4].

This case series analyzes haemodynamic stability, sensory-motor block patterns, and analgesia duration in elderly hip-fracture patients undergoing unilateral lower-limb surgery with fractionated spinal anaesthesia.

Aim:

To assess the following during fractional spinal anaesthesia in elderly patients:

- Haemodynamic parameters

- Onset and duration of sensory block
- Onset and duration of motor block
- Duration of analgesia

Objective: To evaluate the systemic haemodynamic response and anesthetic effect of fractionated spinal anaesthesia in elderly patients with comorbidities undergoing unilateral hip surgery.

Inclusion Criteria

1. Elderly patients with hip fracture
2. Patients with multiple comorbidities

Exclusion Criteria

1. Patients on anticoagulation
2. Lack of informed consent

Materials and Methods

Study Design: Retrospective analysis of five patients operated between October 2023 and December 2023.

Preoperative Evaluation

- Detailed history & physical examination
- 2D echocardiography
- Written informed consent
- NPO 6 hours
- IV access with 20G cannula
- Guarded fluid therapy

All patients received PENG block using 20 mL 0.5% ropivacaine to facilitate positioning.

Intraoperative Technique

- Standard monitors: SpO_2, NIBP, ECG
- SAB at L3–L4 using 23G Quincke needle
- Drug: 0.5% hyperbaric bupivacaine 2.5 mL + fentanyl 25 µg (0.5 mL) = 3 mL total
- Case 4 received 2.5 mL due to respiratory issues

Fractionation method:

- 2 mL initial dose
- Pause 45 seconds with syringe attached
- Remaining 1 mL injected

Patients then placed supine with mild (5–10°) Trendelenburg.

Monitoring:

Hemodynamic parameters were recorded:

- Every 2 min × first 10 min
- Every 5 min × next 10 min
- Every 10 min × up to 90 min

Sensory-motor onset/duration and time to first analgesic were documented.

Case Descriptions

Case 1

- Male, 66 yrs, right neck of femur fracture, posted for bipolar hemiarthroplasty.
- Comorbidities: epilepsy, IHD, hypertension.
- EF 35%, mild–moderate MR.
- Remained stable throughout.

Case 2

- Female, 70 yrs, right intertrochanteric fracture; PFN planned.
- Comorbidities: IHD, hypertension, COPD.
- History: PTCA ×2.
- EF 40%.
- Stable perioperative course.

Case 3

- Female, 69 yrs, left intertrochanteric fracture; CRIF + DHS.
- History: mental retardation, untreated IHD.
- EF 35–40%.
- Stable throughout.

Case 4

- Male, 78 yrs, neck of femur fracture; bipolar hemiarthroplasty.
- Comorbidities: HTN, asthma, respiratory infection, AF.
- Dose reduced to 2.5 mL.
- Transient HR rise; stabilized after block.

Case 5

- Male, 86 yrs, right intertrochanteric fracture; PFN.
- Comorbidities: RHD, AF, moderate MS.
- EF 45–50%.
- Stable perioperative course.

Results

- Sensory block onset: ~2 min
- Sensory duration: 3–3 hr 25 min
- Motor block onset: ~7–9 min
- Motor duration: 2 hr 10 min – 2 hr 40 min
- First analgesic dose: 7–9 hr

Hemodynamics remained within physiologic limits:

- HR < 10% variation
- SBP, DBP within 20% of baseline
- No vasopressors required

Observations

- Total drug volume 3 mL (except Case 4: 2.5 mL).

- Patients remained comfortable during positioning and procedure.
- Hemodynamics stable in all cases; AF patient settled post-block.
- No mephentermine or other vasopressor was needed.
- Sensory–motor block comparable to conventional SAB.

Discussion

Fractionated spinal anaesthesia introduces a gradual onset of sympathetic blockade. The initial smaller volume prevents sudden hypotension; subsequent fraction continues effect without exaggerated vasodilatation [2].

Arun Aravind et al. reported superior hemodynamic stability and prolonged anesthesia with fractionated hyperbaric bupivacaine in geriatric unilateral hip surgeries [1]. Olsen et al. demonstrated prolonged duration, reduced vasopressor need, and better hemodynamic profiles [3]. These findings closely correlate with our case series. Hence, FSA appears beneficial particularly in elderly patients with valvular disease, IHD, pulmonary disease, or other major systemic illnesses.

Conclusion

Fractionated spinal anaesthesia:

- Provides greater hemodynamic stability
- Reduces fall in HR, SBP, DBP, MAP
- Prolongs sensory & motor block
- Lengthens postoperative analgesia

Thus, it is a valuable alternative to bolus SAB in high-risk geriatric patients undergoing unilateral lower-limb procedures.

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