

# A Case of Combined Spinal-epidural Anaesthesia and Fascia Iliaca Compartment Block in an Elderly Patient with Multiple Co-morbidities: A Tailored Approach to High-risk Hip Fracture Surgery

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## ABSTRACT

Co-morbidities and frailty augment the physiological changes associated with ageing, making the elderly more susceptible to perioperative complications related to surgical interventions. With this in mind, the planning of anaesthesia management needs to be carried out with caution, aiming at risk reductions that would include cardiopulmonary instability, postoperative cognitive dysfunction, and neuromuscular complications. Authors hereby, report a case of an 83-year-old male patient who underwent orthopaedic surgery and bring to the fore the challenges encountered in perioperative management. The patient with multiple co-morbidities was subjected to a detailed preoperative assessment using a comprehensive geriatric assessment. The anaesthetic approach was tailored to this patient with a reduction in drug doses, preference for Regional Anaesthesia (RA), and the use of neuroprotective agents. Intraoperatively, careful cardiopulmonary monitoring was facilitated. He received an epidural and spinal anaesthesia to decrease opioid use. Postoperative precautions were taken regarding delirium and pulmonary disorders. He stayed well postoperatively and was discharged to the rehabilitation centre for follow-up. Elderly patients have characteristic features and problems during anaesthesia. Proper management in the perioperative period involves thorough preoperative assessment, judicious selection of the chosen anaesthetic techniques, and appropriate postoperative vigilance. Any approach to managing the elderly patient undergoing anaesthesia and surgery should take into account a holistic approach to anaesthesia and surgical care, while keeping safety at the forefront and emphasising the improvement of prognosis for recovery in this fragile group.

**Keywords:** Atrial septal defect, Diabetes mellitus, Haemodynamic monitoring, Hypertension, Multimodal analgesia, Neuraxial anaesthesia, Postoperative care, Pulmonary artery hypertension, Treatment outcome

## CASE REPORT

An 83-year-old male {American Society of Anaesthesiology Physical Status {(ASA-PS II)} was admitted complaining of extreme pain in the left leg and an inability to sit and walk, following a fall at home two days before. The pain had an acute onset immediately after the fall, was severe and sharp in nature, remained persistent and progressively worsened with movement or attempts to bear weight, and was non radiating. He had no head injury and had no vomiting or bleeding. Clinical evaluation and imaging findings established the diagnosis of a left intertrochanteric fracture. He suffered from Osteoporosis and frailty for 10 years. He had hypertension for 15 years, on telmisartan 40 mg, diabetes mellitus for 10 years and was on human Actrapid insulin and an Atrial Septal Defect (ASD) with a left-to-right shunt and was on clopidogrel 75 mg and atorvastatin 40 mg. He had severe hearing impairment, making communication challenging. He was weakly built, with a Body Mass Index (BMI) of 23 kg/m<sup>2</sup>. There was tenderness over the left hip. Cardiovascular examination demonstrated a faint systolic murmur over the precordium. He had a pulse of 82 beats per minute and blood pressure of 140/80 mmHg. A mild basal crepitus in the lungs was heard on auscultation, possibly due to pulmonary congestion. The patient had an oxygen saturation of 92% on room air.

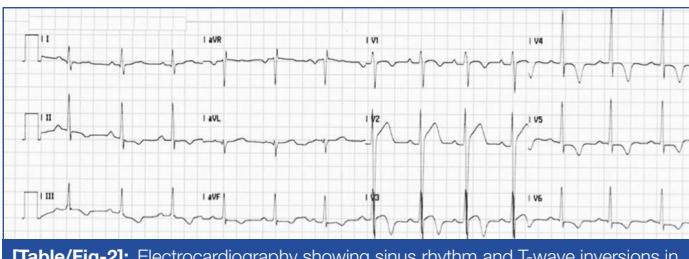
### Laboratory and Imaging Work-up

A thorough diagnostic work-up was performed to evaluate baseline physiological status and assess the perioperative risks. Laboratory investigations are detailed in [Table/Fig-1].

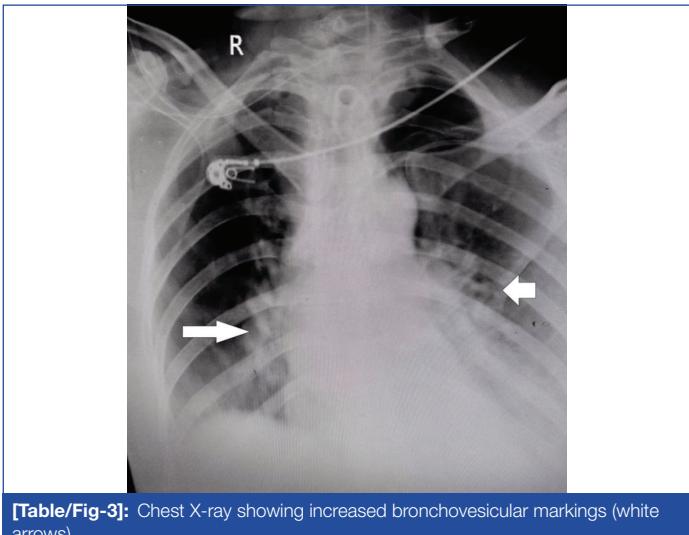
Investigations	Result	Normal range	Remarks
Haemoglobin	9.6 g/dL	12-16 g/dL	Anaemia.
Creatinine	1.7 mg/dL	0.6-1.2 mg/dL	Mildly elevated; nephrology consultation sought.
Cardiac Enzymes	Elevated	<0.03 ng/mL (Troponin I)	Indicative of myocardial strain.
Prothrombin Time/ International Normalised Ratio	12/1.0	12/1.0	Suitable for RA.

[Table/Fig-1]: Laboratory investigations of the patient.

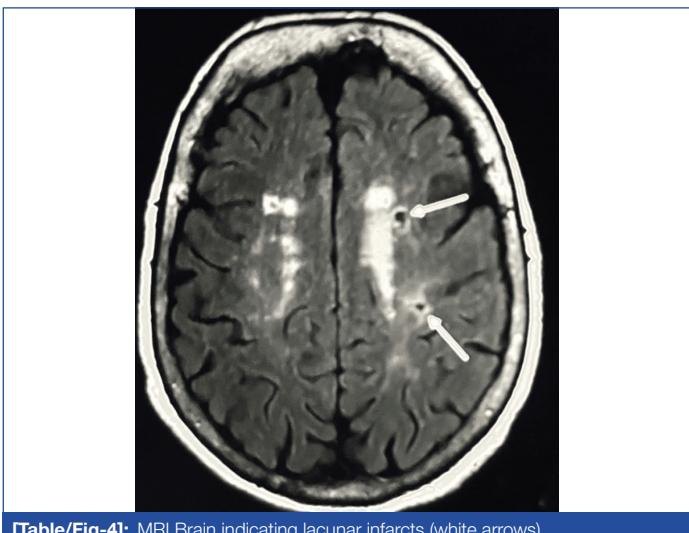
Electrocardiography revealed sinus rhythm and T-wave inversions in leads III, Augmented Voltage Left (aVL), V1, V3, V4, V5, and V6, raising the suspicion of underlying ischaemic changes [Table/Fig-2]. An echocardiogram revealed a small ASD with a left-to-right shunt of 6 mm, ejection fraction of 55% (normal left ventricular systolic function), grade III diastolic dysfunction, moderate mitral regurgitation, severe tricuspid regurgitation, and severe Pulmonary Artery Hypertension (PAH). Chest X-ray showed increased bronchovascular markings, suggesting chronic pulmonary congestion [Table/Fig-3]. Magnetic Resonance Imaging (MRI) of the brain revealed chronic ischaemic changes in the bilateral frontoparietal white matter, old lacunar infarcts, and age-related cerebral atrophy [Table/Fig-4]. Ultrasonography of the abdomen revealed increased renal cortical echogenicity, indicating chronic renal changes [Table/Fig-5].



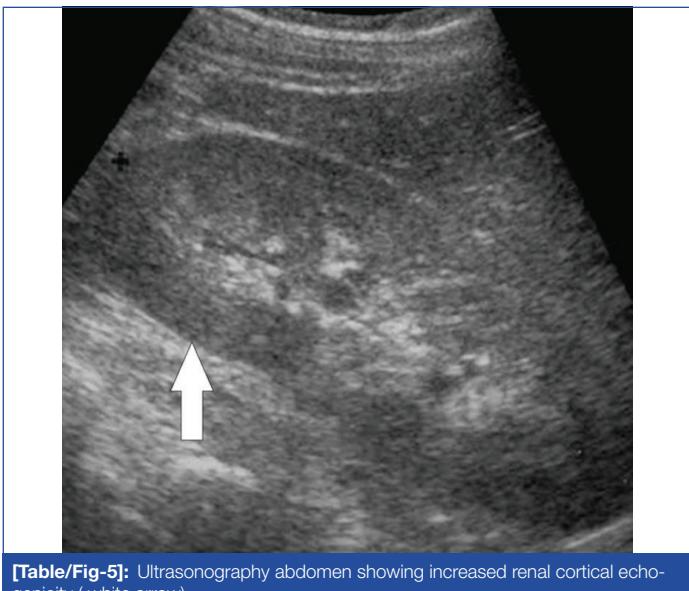
[Table/Fig-2]: Electrocardiography showing sinus rhythm and T-wave inversions in leads III, aVL, V1, V3, V4, V5 and V6.



[Table/Fig-3]: Chest X-ray showing increased bronchovesicular markings (white arrows).



[Table/Fig-4]: MRI Brain indicating lacunar infarcts (white arrows).



[Table/Fig-5]: Ultrasonography abdomen showing increased renal cortical echogenicity (white arrow).

## Preoperative Considerations

Due to his old age and co-morbid conditions, he had a multidisciplinary team of anaesthesiologists, cardiologists, nephrologists, and orthopaedic surgeons involved in the management. Tab. Clopidogrel 75 mg was withheld five days before surgery, and he was managed with bridging anticoagulation therapy, using Low-Molecular-Weight Heparin (LMWH) administered subcutaneously until 12 hours before the procedure to maintain antithrombotic protection while minimising perioperative bleeding risk. Given the severe PAH, the risk of cardiac decompensation, and borderline respiratory function, general anaesthesia was deemed high-risk. Hence, a Combined Spinal-epidural Anaesthesia (CSEA) technique was chosen to be supplemented with a Fascia Iliaca Compartment Block (FICB) to provide optimal positioning for CSEA. The procedure and the expected risks and outcomes were explained to the patient and his family. The patient was kept nil per os for eight hours.

## Anaesthetic Management

Upon entering the operating room, monitoring was initiated with continuous electrocardiogram, non invasive blood pressure, and pulse oximetry. After local infiltration, a 20-gauge arterial cannula was placed in the right radial artery and invasive arterial blood pressure monitoring was initiated. These were essential because of the patient's substantial cardiovascular co-morbidities. Two intravenous cannulas, an 18-gauge and a 20-gauge, were inserted. Fluid resuscitation was done with utmost caution, considering age and comorbid conditions. A preload of 250 mL Ringer's lactate was given without causing fluid overload in consideration of the PAH.

Under strict asepsis, an ultrasound-guided FICB was administered preoperatively in the supine position to facilitate comfortable positioning for neuraxial anaesthesia. This significantly reduced movement-associated pain due to the left-sided femoral fracture. Following this, with the patient sitting, the lower back was prepared with povidone-iodine and chlorhexidine, and sterile drapes were applied. The patient was placed with an arched back to achieve the best lumbar flexion. The 2% lignocaine, 2 mL, was infiltrated at the insertion site to minimise discomfort during needle placement. The epidural block was performed using the loss-of-resistance-to-air technique to locate the epidural space. A 16-gauge Tuohy needle was inserted into the L2-L3 intervertebral space. Once the epidural space was identified, an epidural catheter was passed through the needle and advanced 3-4 cm into the space. Spinal anaesthesia was administered post-placement of the epidural catheter. A 25-gauge Quincke needle was introduced into the space between the vertebral levels of L3 to L4 (using the midline approach), with a sharp "give-way" feeling noted as it perforated the subarachnoid space. The anaesthetic solution administered consisted of 1.6 mL of 0.5% hyperbaric bupivacaine and 25 mcg of fentanyl. Checks were conducted to assess sensory and motor blockade. The sensory block was evaluated using the pin-prick method, and the motor block was graded using the modified Bromage scale. In about 5-7 minutes after administration of spinal anaesthesia, it was confirmed that the sensory block was till T8 dermatome.

Invasive blood pressure, heart rate, and oxygen saturation were closely monitored throughout the procedure due to the patient's co-morbidities. The intraoperative vitals remained stable, with blood pressure ranging between 110-130/70-80 mmHg, heart rate between 70-85 beats/min, and oxygen saturation consistently maintained at 98-100% on room air/oxygen supplementation. A Dynamic Hip Screw (DHS) was applied to reduce and stabilise the fracture by a lag screw and a sliding compression plate to maintain the femoral head and neck in an aligned position and healing position. Normothermia was maintained intraoperatively using warmers (set at 38°C) along with the administration of warmed intravenous fluids. Blood loss during surgery was around 300 mL. Postsurgery, the patient was shifted to a high-dependency unit for monitoring.

Postoperative management aimed to address the patient's complex needs and optimise recovery. A multimodal approach to pain control was adopted with an infusion of 0.125% bupivacaine via the epidural catheter and paracetamol to avoid excessive opioid usage risks, both of which can precipitate respiratory depression and delirium. Prophylaxis against deep vein thrombosis was started with LMWH 40 mg to prevent thromboembolic complications. Respiratory physiotherapy and incentive spirometry were instituted early to decrease the risks of pulmonary complications. He was encouraged to begin physical therapy on the first postoperative day with gradual weight-bearing exercises to facilitate mobility and avoid complications such as pressure ulcers and venous stasis. Given the history of cardiovascular diseases, cardiac status was monitored closely in the postoperative period for early indication and management of any heart failure and arrhythmia. On the seventh day after surgery, he was discharged from the hospital in stable condition with an uneventful recovery.

## DISCUSSION

Anaesthetic management in the elderly patient is a protracted and nuanced process that must be meticulously planned and individualised. Such complexity is enormously compounded in those patients with multiple co-morbidities. The physiological changes of advanced age, such as reduced cardiovascular, pulmonary, renal, and neurological reserves, make this population extremely susceptible to even subtle perturbations during the perioperative course [1]. One of the most significant challenges with geriatric anaesthesia is to ensure haemodynamic stability and to have as little impact on already fragile organ systems as possible. General Anaesthesia (GA), although commonly employed, is fraught with danger in the elderly because of its systemic implications, such as myocardial depression, compromised gas exchange, and enhanced risk of postoperative cognitive dysfunction and delirium. In patients with PAH and diastolic dysfunction, haemodynamic alterations related to induction, airway manipulation, and emergence from GA can lead to acute decompensation, arrhythmias, or right heart failure. The compromised renal function in this group of patients significantly modifies the pharmacokinetics of many of these anaesthetic agents; thus, there is a higher potential for drug accumulation and prolonged effects [2].

The RA has marked benefits in the elderly. Regional techniques avoid airway instrumentation and systemic depressants, providing superior haemodynamic control and targeted analgesia with minimal compromise in respiration. CSEA was selected to enable adequate anaesthesia and titrate postoperative analgesia more effectively via the epidural catheter. Spinal anaesthesia provided a quick onset and sufficient depth of blockade for surgery. The epidural component provided the facility to prolong the duration of

analgesia or provide breakthrough pain in a controlled fashion [3]. The selection of CSEA was judicious, given the presence of severe PAH, wherein the prevention of significant changes in preload and afterload is crucial. The sympathetic block with a gradual approach ensures less sudden haemodynamic falls. Preloading was done conservatively using only 250 mL of Ringer's lactate to prevent fluid overload and pulmonary congestion, as excessive fluids could exacerbate PAH, worsen oxygenation, and precipitate heart failure- highlighting that careful fluid titration is essential in such high-risk patients [3,4].

Adding ultrasound-guided FICB before positioning for neuraxial anaesthesia provided an added advantage. In addition to allowing pain-free positioning, which is especially important in patients with hip fractures, it also reduced the requirement for systemic opioids. Elderly patients are especially prone to opioid side effects like respiratory depression, sedation, delirium, and ileus. Therefore, regional blocks provide a twofold advantage: maximising patient comfort and minimising opioid-related morbidity [5]. Intraoperatively, invasive arterial pressure monitoring offered real-time haemodynamic evaluation and directed fluid and vasoactive treatment with accuracy. This was especially useful under the patient's tenuous haemodynamic state and vulnerability to rapid decompensation. Hypothermia, a frequent complication in geriatric surgical patients secondary to impaired thermoregulation, was preventively avoided with warm i.v. solutions and external warming devices [1,6].

The synergy of ultrasound-guided FICB and CSEA offered maximal anaesthetic coverage, pain relief, and intraoperative stability in an extremely high-risk elderly patient. Such high-risk geriatric cases present multiple anaesthetic challenges, ranging from fragile cardiovascular status with severe PAH and valvular dysfunction to altered pharmacokinetics due to renal impairment and advanced age. Additional concerns include fluid overload sensitivity, postoperative delirium or cognitive dysfunction, potential airway difficulties from frailty or hearing impairment, and the necessity for meticulous temperature regulation and invasive monitoring. This case outcome shows how individualised anaesthetic approaches that emphasise organ protection, accuracy, and minimal invasiveness can dramatically improve outcomes even in frail and elderly patients with significant co-morbidities. A summary and comparison of the clinical characteristics, anaesthetic techniques, and essential lessons learned from the current case alongside similar published studies involving high-risk geriatric patients undergoing hip or lower limb surgeries have been presented in [Table/Fig-6] [7-9]. This comparative overview highlights RA approaches, their efficacy, safety profiles, and perioperative management strategies tailored to complex patient co-morbidities.

Case	Case summary	Anaesthetic technique	Takeaway for the current case
Current case	An 83-year-old frail male presented with a left intertrochanteric fracture following a fall. He had hypertension, diabetes mellitus, ASD with left-to-right shunt, severe PAH, grade III diastolic dysfunction, moderate MR, severe TR, chronic kidney disease, anaemia, and significant hearing impairment. Cardiac enzymes were elevated; ECG showed ischaemic changes. Echo revealed EF 55%. MRI brain showed chronic ischaemic changes and old infarcts. Clopidogrel was withheld preoperatively.	Combined Spinal-Epidural Anaesthesia (CSEA) with preoperative FICB for patient positioning. Intraoperative invasive monitoring and cautious fluid therapy. Postoperative epidural infusion with 0.125% bupivacaine and multimodal analgesia.	In elderly, multimorbid patients with cardiac and pulmonary compromise, CSEA with FICB offers a safer alternative to GA. Preoperative FICB facilitates optimal positioning. Multidisciplinary perioperative planning and postoperative monitoring are critical for favourable outcomes.
Ali FM et al., 2024 [7]	Randomised controlled pilot study on 20 adult patients undergoing acetabular fracture surgery. Compared ultrasound-guided SFICB (Group B) with i.v. fentanyl (Group F) to facilitate neuraxial positioning. Evaluated post-intervention VAS, sitting angle, positioning quality, opioid requirement, comfort, and complications.	Group B received ultrasound-guided SFICB; Group F received i.v. fentanyl. Both underwent CSE after positioning. SFICB led to significantly lower VAS scores, better sitting angles, and superior positioning quality.	SFICB provides superior analgesia and improves positioning for neuraxial anaesthesia over systemic opioids. The technique is especially beneficial in patients with high pain sensitivity due to pelvic or acetabular fractures, allowing safer and more effective spinal/epidural placement.

Begum SA et al., 2020 [8]	A prospective comparative study of 70 geriatric patients undergoing lower extremity surgeries was randomised to CSEA (Group A) or spinal anaesthesia (Group B). Both groups were similar in demographics and ASA status. Compared perioperative pulmonary parameters (RR, SpO <sub>2</sub> , EtCO <sub>2</sub> , PEFR, BHT), duration of anaesthesia, block onset times, side effects, and postoperative VAS.	Group A received CSEA; Group B received SA. CSEA was associated with significantly longer block onset but resulted in fewer side effects and lower VAS scores post-operatively. Pulmonary parameters were similar between groups.	CSEA is a safe and effective alternative to spinal anaesthesia in elderly patients, offering prolonged analgesia and fewer side effects without compromising pulmonary stability. It may be preferable in high-risk geriatric populations undergoing lower limb surgery.
Tummala V et al., 2015 [9]	Randomised comparative study of 60 high-risk geriatric patients (ASA III-IV) undergoing hip surgeries. Group A (CSEA) received low-dose spinal bupivacaine with fentanyl and incremental epidural top-ups. Group B received standard-dose spinal anaesthesia with fentanyl. The onset, analgesia quality, motor block, haemodynamic stability, and duration were compared.	Group A received CSEA using low-dose spinal bupivacaine and epidural top-ups; Group B received conventional spinal anaesthesia. Both groups achieved good analgesia, but the CSEA group had significantly fewer hypotensive events and longer analgesia duration.	CSEA is preferable in high-risk elderly patients undergoing hip surgery, as it reduces the risk of hypotension and provides flexibility to titrate block level and duration. It enhances haemodynamic stability while ensuring adequate surgical anaesthesia.

[Table/FIG-6]: Comparison of anaesthetic techniques in high-risk geriatric hip fracture cases[7-9].

## CONCLUSION(S)

The present case highlights the need for individualised, multidisciplinary perioperative planning in the elderly patient with complicated co-morbidities. An individualised strategy, integrating preoperative optimisation, invasive monitoring, RA (CSEA and FICB), and postoperative strategies for pain control, temperature control, and early mobilisation, can effectively minimise morbidity. Although RA is unlikely to eliminate postoperative delirium or reduce mortality risk, it is connected with intraoperative and recovery advantages. Finally, perioperative success depends on teamwork, evidence-based anaesthetic decisions, and active postoperative management to maximise outcomes in fragile geriatric patients.

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### AUTHOR DECLARATION:

- Financial or Other Competing Interests: None
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. Yes

### PLAGIARISM CHECKING METHODS:

- Plagiarism X-checker: Aug 07, 2025
- Manual Googling: Sep 28, 2025
- iThenticate Software: Sep 30, 2025 (3%)

### ETYMOLOGY:

Author Origin

### EMENDATIONS:

6

Date of Submission: Aug 04, 2025

Date of Peer Review: Sep 01, 2025

Date of Acceptance: Oct 02, 2025

Date of Publishing: Feb 01, 2026