

Segmental thoracic spinal anaesthesia as part of a combined spinal-epidural technique for open cholecystectomy in an 88-year-old man with sepsis, acute kidney injury and prior stroke.

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Authors:

Anna James, (ORCID ID:0009-0004-2761-4501), JR, Anaesthesiology

K.R.Ravi, (ORCID ID:0009-0003-2490-6413), Associate Professor & HOD/IC, Anaesthesiology

Rosu Mary John, (ORCID ID:0009-0003-2588-5466), Assistant Professor, Anaesthesiology Department of Anaesthesiology, Al Azhar Medical College and Super Speciality Hospital, Thodupuzha.

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Website:
theanaesthesiologist.com

Corresponding Author:

KR Ravi, Associate Professor & HOD/IC, Department of Anaesthesiology, Al Azhar Medical College and Super Speciality Hospital, Thodupuzha.
Email: ravikaripayil59@gmail.com

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ABSTRACT

Acute cholecystitis complicated by intra-abdominal sepsis, multiorgan dysfunction and stage 3 acute kidney injury poses a considerable anaesthetic challenge in elderly patients, particularly when combined with a background of prior stroke and delirium. We describe the perioperative management of an 88-year-old man admitted with vomiting, progressive weakness and altered sensorium, subsequently found to have acute cholecystitis with septic shock, bilateral basal lung crepitations, and stage 3 acute kidney injury. Given the combination of pulmonary compromise and high neurological risk from a previous cerebrovascular accident with recent delirium, a segmental thoracic spinal anaesthesia technique—a low-dose subarachnoid block restricted to the thoracic dermatomes required for upper abdominal surgery, combined with a thoracic epidural catheter—was used in preference to general anaesthesia for open cholecystectomy, with vasopressor support to offset the residual sympathectomy-related hypotension. The patient remained haemodynamically stable throughout a 3-hour procedure and was transitioned to epidural analgesia postoperatively. This case illustrates that segmental spinal anaesthesia, by restricting neuraxial block to the minimum number of dermatomes needed for surgery, can be a safe and rational alternative to general anaesthesia in high-risk elderly patients with combined pulmonary and neurological vulnerability undergoing emergency upper abdominal surgery.

Keywords: Segmental spinal anaesthesia;Thoracic spinal_anaesthesia; Combined spinal-epidural;Cholecystectomy;Sepsis;Elderly;MODS

Introduction

Acute cholecystitis complicated by sepsis, multiorgan dysfunction and acute kidney injury poses a considerable anaesthetic challenge in elderly patients, particularly with a background of prior stroke and delirium. General anaesthesia risks pulmonary complications and delirium in such patients, whereas a conventional spinal may cause profound hypotension. Segmental thoracic spinal anaesthesia, a low-dose subarachnoid block restricted to the dermatomes required for surgery, has been used for abdominal surgery in critically ill patients [1] and for laparoscopic cholecystectomy [2], and thoracic-level spinal anaesthesia dates back more than a century [3]. We describe its use, combined with a thoracic epidural catheter, for open cholecystectomy in an 88-year-old man.

Case Report

Presentation

An 88-year-old man presented with one day of repeated non-bilious vomiting, severe nausea, inability to tolerate oral intake, rapidly progressive generalised weakness, reduced speech and altered sensorium, though he remained responsive to verbal commands. There were no focal neurological deficits. He had no known hypertension, diabetes mellitus, coronary artery disease or tuberculosis.

Four years earlier he had a cerebrovascular accident with right hemiparesis and full recovery, and antiplatelet therapy was stopped after 3 months. A recent MRI brain showed an old left parietal infarct and lacunar infarct. Antiplatelets were restarted on admission and withheld later in anticipation of surgery. He had TURP 3 years back and uneventful. He was a smoker for 10 years.

Vomiting settled within 24 hours, but on the second day he developed fever, diffuse abdominal tenderness, bilateral crepitations, reduced urine output, breathlessness, wheeze, abdominal distension and delirium. He was disoriented and lethargic (GCS 13/15, E4V4M5), with a pulse of 118/min (thready), BP 130/80 mmHg, respiratory rate 26/min with accessory muscle use, temperature 101.8°F and SpO₂ 91% on room air (96% on 4 L/min by facemask). The airway examination showed MP2 but edentulous. Chest examination revealed reduced basal air entry with bilateral basal crepitations and wheeze. Heart sounds were normal.

Investigations

Table 1. Key laboratory findings during the illness and the postoperative course.

Parameter	During the illness	Postoperative course
Haemoglobin(gdL)	14.4 to 10.0	10.0 to 11.9
Leukocyte count(/mm ³)	13,800-18,400 (neutrophils 79-91%)	15,400 to 8,300
Platelet count(mm ³)	Nadir 87,000	—
CRP(mg/L)	Peak 337.2	—
Creatinine(mg/dL)	1.3 to a peak of 3.4 (KDIGO stage 3AKI)	3.3 (day 2) to 1.4 (discharge)
Blood glucose(mg/dL)	128-342	—
Arterial blood gas	pH 7.415; pCO ₂ 227.1 mmHg; HCO ₃ 17.0 mmol/L; BE -5.6 mmol/L; lactate 2.64 mmol/L	
Electrolytes	—	Na ⁺ 136 mmol/L; K ⁺ 4.5 mmol/L

AKI, acute kidney injury; BE, base excess; CRP, C-reactive protein; KDIGO, Kidney Disease: Improving Global Outcomes.

Anaesthetic management

Given the severe pulmonary compromise (bilateral infiltrates and active wheezing) and high neurological risk from recent delirium superimposed on an old cerebrovascular accident, segmental thoracic spinal anaesthesia combined with a thoracic epidural catheter was selected in preference to both general anaesthesia and a conventional single-shot lumbar spinal. This approach avoided mechanical ventilation-related complications, preserved airway dynamics, allowed clear intraoperative neurological monitoring and, by restricting the block to the segments required for surgery, limited sympathetic blockade in a patient already vasodilated from sepsis.

Premedication comprised intravenous midazolam 1.5 mg (titrated down in 0.5 mg increments in view of the patient's age), glycopyrrolate 0.2 mg as an antisialagogue, pethidine 50 mg for analgesic support, ondansetron 4 mg as an antiemetic, dexamethasone 8 mg for anti-inflammatory cover, one ampoule of deriphylline for bronchodilation, and a small titrated dose of propofol 10 mg for sedation. With the patient in the lateral position under aseptic precautions, an 18G Tuohy needle was used to identify the epidural space at T9-T10, and a catheter was fixed at 10 cm. A test dose of 3 mL of 2% lignocaine with adrenaline (1:200,000) excluded intravascular or intrathecal placement. The segmental spinal was then performed at T10-T11 with a 25G Quincke needle via a median approach [4]. After free flow of clear CSF, a deliberately small dose of 2 mL of 0.5% hyperbaric bupivacaine with 10 µg dexmedetomidine was given intrathecally, to restrict the sensory block to the thoracic segments needed for surgery.

To counteract sympathectomy-induced vasodilation in a patient with active sepsis, a noradrenaline infusion (80 mcg/mL) was started pre-emptively at 3 mL/hour and titrated to maintain mean arterial pressure >65 mmHg. Surgery lasted approximately

3 hours. Haemodynamics remained stable throughout under targeted vasopressor support, aided by the limited dermatomal spread of the block, which spared sympathetic outflow to the lower limbs and helped preserve venous return. Before transfer out of the operating room, an epidural top-up of 5 mL of 0.0625% bupivacaine (diluted from 0.25%) with 3 mg of morphine was administered for prolonged, segment-targeted thoracic analgesia.

Outcome and follow-up

The patient tolerated open cholecystectomy under segmental spinal anaesthesia with an epidural catheter and was transitioned smoothly to epidural analgesia. He received two units of packed red blood cells (postoperative days 1 and 2) and was successfully weaned off noradrenaline. Fluids were strictly restricted on day 1 and liberalised as he improved. No additional IV analgesics were needed. The epidural catheter was removed on day 3, with the Ryle's tube and Foley catheter still in place. The acute kidney injury resolved and electrolytes were normal (Table 1). He was discharged conscious, oriented and haemodynamically stable, able to sit independently and tolerate an oral diet.

DISCUSSION

This case highlights the anaesthetic dilemma posed by concurrent respiratory and neurological vulnerability in a very elderly, septic surgical patient. General anaesthesia with mechanical ventilation carries recognised risks of postoperative pulmonary complications in patients with bibasal crepitations and active wheezing, while airway instrumentation and the physiological stress of general anaesthesia can precipitate or worsen delirium in patients with cerebrovascular disease. A conventional single-shot lumbar spinal typically produces a sensory and sympathetic block from the sacral segments up to

the mid-to-low thoracic dermatomes [5-7], which in a hypovolaemic, septic patient can cause sudden and profound hypotension as sympathetic outflow to the splanchnic bed and lower limbs is abolished all at once.

Segmental spinal anaesthesia avoids this problem by injecting a small, carefully calculated dose at or close to the dermatomal level required for surgery, here the T10-T11 interspace for an upper abdominal procedure [8,9]. The block is confined largely to the thoracic segments needed, while sympathetic tone to the lower limbs and pelvis is relatively preserved. The advantages directly relevant to this patient were:

- Greater haemodynamic stability and easier vasopressor titration: with fewer dermatomes blocked, falls in systemic vascular resistance and preload are smaller and more predictable, so the residual sympathectomy could be offset with a modest pre-emptive noradrenaline infusion.
- Preservation of cardioaccelerator sympathetic fibres when the block is kept below the upper thoracic segments, reducing the risk of severe bradycardia from blockade of the T1-T4 cardiac sympathetic outflow.
- Sparing of lower-limb and pelvic sympathetic and motor function, avoiding prolonged immobility and urinary retention and permitting earlier mobilisation.
- A lower intrathecal local anaesthetic dose (2mL of 0.5% hyperbaric bupivacaine) than a standard spinal, allowing more predictable offset.
- Compatibility with a combined spinal-epidural technique: the catheter allowed the block to be extended or supplemented and provided titrated postoperative analgesia without relying on systemic opioids, valuable in elderly patients at risk of delirium and respiratory depression.
- Avoidance of airway instrumentation and positive-pressure ventilation, preserving spontaneous ventilation and allowing continuous neurological assessment.

The principal remaining risk was haemodynamic instability from sepsis-related vasodilation, dehydration and the partial sympathectomy that any neuraxial block produces. This was anticipated and managed with a pre-emptive vasopressor infusion titrated to mean arterial pressure. Segmental thoracic spinal anaesthesia has also been compared with general anaesthesia in a randomised trial for breast cancer surgery [10].

CONCLUSION

This case supports segmental spinal anaesthesia, as part of a combined spinal-epidural technique, as a safe and rational alternative to both general anaesthesia and conventional spinal anaesthesia in carefully selected high-risk elderly patients with combined pulmonary and neurological compromise undergoing emergency upper abdominal surgery. Restricting the block to the segments needed limits sympathectomy and vasopressor requirement, but pre-emptive vasopressor support should still be considered in septic, dehydrated patients. The epidural catheter allows the block height to be titrated and provides prolonged, targeted postoperative analgesia, reducing reliance on systemic opioids in patients at risk of delirium. The surgical approach (here open rather than laparoscopic, to avoid compounding stresses such as pneumoperitoneum) should be chosen jointly with the surgical team.

Conflict of Interest: NIL

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