Case Series

Central Neuraxial Anaesthesia for Exploratory Laparotomy: A Case Series

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Article history: Received 04 May 2026, Reviewed 18 May 2026, Accepted for publication 20 June 2026

ABSTRACT

Background: Exploratory laparotomy is frequently performed for a variety of abdominal conditions, traditionally under general anaesthesia. However, the use of regional anaesthesia has gained increasing attention due to its potential benefits, including improved postoperative pain management and faster recovery.

Methods: A case series was conducted on 20 adult patients scheduled for exploratory laparotomy over a three-month period, of whom 18 were included following the exclusion of 2 patients with incomplete data. Anaesthetic techniques employed included spinal anaesthesia, epidural anaesthesia, and combined spinal-epidural (CSE) anaesthesia. Key parameters assessed included intraoperative analgesia, intra- and postoperative complications, and patient satisfaction.

Results: Of the 18 included patients, 12 (66.7%) were male and 6 (33.3%) were female, with a mean age of 59 years (range 46–80). Indications included perforated peptic ulcer disease (44.4%), intestinal obstruction (33.3%), mesenteric cyst (11.1%), and ovarian malignancy (11.1%). Epidural anaesthesia was used in 10 patients (55.6%), CSE in 7 (38.9%), and spinal anaesthesia in 1 (5.6%). Four patients (22.2%) required supplemental intraoperative analgesia due to discomfort during bowel manipulation. Transient hypotension occurred in 2 patients (11.1%), whilst 4 (22.2%) experienced postoperative nausea and vomiting. No patient required conversion to general anaesthesia.

Conclusion: Regional anaesthesia for exploratory laparotomy represents a viable alternative to general anaesthesia in carefully selected adult patients, though larger prospective studies are warranted to validate these findings.

Keywords: Anaesthesia, Laparotomy, Spinal, Epidural, Combined spinal-epidural anaesthesia.

How to cite this article

Ilo IS, Ilo DI, Chukwu IS, Nduka EC, Nwachukwu KC. Central Neuraxial Anaesthesia for Exploratory Laparotomy: A Case Series. The Nigerian Health Journal 2026; 26(2):945 – 951.
https://doi.org/10.71637/tnhj.v26i2.1415

Print ISSN: 0189-9287 Online ISSN: 2992-345X

INTRODUCTION

The use of regional anaesthesia techniques for surgery, obstetrics, and postoperative pain management has increased considerably in recent years.[1] Exploratory laparotomy is a surgical procedure frequently performed for a variety of conditions affecting the abdominal cavity, and is associated with significantly higher mortality, particularly in critically ill patients.[2] Various factors can affect the outcome of patients undergoing exploratory laparotomy, including age, ASA status, duration of symptoms, comorbidities, presence of sepsis, and organ dysfunction. The use of neuraxial anaesthesia for exploratory laparotomy has emerged as a means of improving patient outcomes.[2] There is limited literature on the use of regional anaesthesia for exploratory laparotomy; however, it may represent a viable alternative to general anaesthesia for abdominal surgery, particularly in selected high-risk patients.[3]

Regional anaesthesia offers several advantages over general anaesthesia, including superior pain control, a lower risk of respiratory complications through avoidance of endotracheal intubation and mechanical ventilation, a more favourable haemodynamic profile, and a potential reduction in postoperative delirium among selected elderly patients[1,4] It also facilitates faster recovery, earlier mobilisation, and a reduced length of hospital stay.[1,5] General anaesthesia with endotracheal intubation, whilst affording a secured airway, carries the risks of dependence on mechanical ventilation, atelectasis, and residual effects of anaesthetic and muscle relaxant agents.[3,6]

Regional anaesthesia for exploratory laparotomy gained prominence during the COVID-19 pandemic as a strategy to minimise aerosol generation during induction of general anaesthesia, with reported outcomes demonstrating reduced complications and enhanced recovery.[7,8] This report describes the institutional experience with neuraxial anaesthesia in patients who underwent exploratory laparotomy for various indications. The study aimed to evaluate the feasibility and potential benefits of neuraxial anaesthesia as the primary anaesthetic technique for exploratory laparotomy.

MATERIALS AND METHODS

Study Design: This was a prospective case series conducted over a three-month period from December 2025 to February 2026.

Study Setting

The study was conducted at the Federal Medical Centre (FMC), Umuahia, Abia State, Nigeria, a tertiary referral hospital serving Abia State and neighbouring states in South-Eastern Nigeria. The institution houses a functional surgical suite and an anaesthesia department equipped to provide neuraxial anaesthetic techniques.

Study Population: The study population comprised adult patients scheduled for exploratory laparotomy at the study institution during the study period.

Inclusion Criteria

- Adult patients (aged 18 years and above)
- Scheduled for exploratory laparotomy
- No history of previous spinal surgery
- No contraindication to neuraxial anaesthesia
- Provision of written informed consent

Exclusion Criteria

- Patients with bleeding diathesis or on anticoagulant therapy
- Patients who declined participation
- Patients with incomplete data records

Sample Size: Given the descriptive nature of this case series and the limited availability of eligible patients within the study period, a convenience sample of all eligible patients presenting for exploratory laparotomy during the three-month study period was recruited. Twenty patients were initially enrolled; two were subsequently excluded due to incomplete data, yielding a final analytical sample of 18 patients.

Sampling Methodology: Consecutive sampling was employed. All patients who met the eligibility criteria and presented for exploratory laparotomy during the study period were recruited sequentially until the end of the study period.

Study Variables

Primary Outcome: Feasibility of neuraxial anaesthesia as the primary anaesthetic technique for exploratory laparotomy, defined by successful completion of surgery without conversion to general anaesthesia.

Secondary Outcomes / Study Variables

- Patient demographics (age, sex)
- Comorbidities and ASA physical status classification
- Diagnosis and indication for surgery
- Type of neuraxial technique employed (spinal, epidural, or CSE)
- Intraoperative haemodynamic parameters (systolic BP, diastolic BP, mean arterial pressure, pulse rate, oxygen saturation)
- Need for supplemental intraoperative analgesia
- Intraoperative sedation score

Print ISSN: 0189-9287 Online ISSN: 2992-345X

- Postoperative complications (postoperative nausea and vomiting [PONV], hypotension)
- Duration of surgery
- Hospital length of stay (HLS)
- Patient satisfaction score

Data Collection Tool and Validation: A structured data collection proforma was developed by the investigative team, drawing on established parameters used in similar published case series on neuraxial anaesthesia for abdominal surgery. The proforma captured preoperative, intraoperative, and postoperative variables. Patient satisfaction was assessed using a Visual Analogue Scale (VAS): a 10 cm horizontal line anchored at 0 (not satisfied at all) on the left and 10 (completely satisfied) on the right. The VAS is a widely validated and extensively used tool for subjective outcome assessment in anaesthesia and surgical research.

Study Procedures / Data Collection

Preoperative Assessment: All patients underwent preoperative review. The chosen anaesthetic technique was explained in detail, and written informed consent was obtained. Baseline haemodynamic parameters — systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP), pulse rate, and oxygen saturation (SpO_2) — were recorded.

Preoperative Preparation: Intravenous access was secured using a wide-bore 18G cannula. Intravenous preloading was performed with normal saline at 10–15 ml/kg prior to initiation of neuraxial blockade.

Anaesthetic Technique: The choice of neuraxial technique — spinal anaesthesia alone, epidural anaesthesia alone, or combined spinal-epidural (CSE) — was guided by the anticipated duration of surgery.

All procedures were performed with the patient in the sitting position under strict aseptic technique. The L2–L3 interspace was identified and infiltrated with 1% lidocaine for skin and subcutaneous anaesthesia.

- Spinal anaesthesia alone: A 25G spinal needle was advanced into the subarachnoid space, confirmed by free flow of clear cerebrospinal fluid (CSF). Hyperbaric bupivacaine 0.5% (16mg) with fentanyl 12.5 μg was injected, with the dose titrated to patient height.
- Epidural anaesthesia alone: An 18G Tuohy needle was used to identify the epidural space via the loss-of-resistance to air technique. An epidural catheter was threaded and secured. Activation was achieved using 15 ml of local anaesthetic solution (7.5 ml of 0.5% plain bupivacaine combined with 7.5 ml of 2% plain lidocaine).
- Combined spinal-epidural (CSE): The epidural space was first identified with an 18G Tuohy needle as described above. A 27G spinal needle was then introduced through the Tuohy needle using the needle-through-needle technique. Correct subarachnoid placement was confirmed by free flow of clear CSF, not under pressure. Hyperbaric bupivacaine 0.5% (16mg) with fentanyl 12.5 μg was injected. An epidural catheter was subsequently threaded and secured. Epidural top-up was administered at 45 minutes using 10 ml of local anaesthetic (5 ml of 0.5% plain bupivacaine combined with 5 ml of 2% plain lidocaine).

Following block placement, the patient was positioned supine. Haemodynamic monitoring was performed every two minutes for the first ten minutes, then every five minutes thereafter. The height of the sensory block was assessed using cold sensation. Surgery commenced once adequate sensory and motor block was confirmed. Supplemental oxygen was administered at 2–5 L/min via nasal prongs throughout the procedure.

Data Analysis: Data were analysed using descriptive statistics with Microsoft Excel. Categorical variables were summarised as frequencies and percentages. Continuous variables were expressed as mean with standard deviation (SD) or median with interquartile range (IQR), as appropriate. The level of statistical significance was set at $p < 0.05$, with a 95% confidence interval.

Ethical Consideration: This study involved human participants and was approved by the Health Research Ethics Committee of the Federal Medical Centre, Umuahia, Abia State, Nigeria, prior to data collection (Approval Number: FMC/QEH/G.596/Vol.10/970; Date of Approval: November 2025). The study was conducted in accordance with the Declaration of Helsinki. All patients provided written informed consent prior to enrolment. Confidentiality of participant data was maintained throughout the study, with data stored securely and accessible only to the research team.

RESULTS

Twenty patients were enrolled into the study out of which 2 were excluded due to incomplete data, 12 were male 67%, while 6 were female 33%, The mean age was 59± 8 with age range between 46-80yrs.

Majority were classified as ASA IV 61% (11). Four patients (22.2%) were done as elective while 14 (78%) were done as emergency procedures. Fifty percent (9) had no co-morbidity, 33.33% (6) had hypertension,

Print ISSN: 0189-9287 Online ISSN: 2992-345X

11.11% (2) had diabetes while 5.56% (1) was classified as others. Indications for surgery are shown in table 1. Majority of patients (44.44%) had peptic ulcer disease (PUD) perforation.

Neuraxial blocks done were Spinal 5% of the participants, Epidural 56%, and combined spinal epidural 39%.

Four patients (22%) had need for additional analgesia due to abdominal discomfort following bowel manipulation, two of the patients had ovarian malignancy, and two had intestinal obstruction. All the patients that received additional analgesia had CSE anaesthesia. Ketamine in aliquots of 15mg was administered to three patients, with a maximum dose of 45mg while one patient received pentazocine 30mg. None of the patients required conversion to General anaesthesia.

Two patients (11%) had transient hypotension (table 2) after the block (one patient had CSE, while the other had spinal) this was managed with intravenous ephedrine 5mg bolus in two aliquots. PONV were observed in 4 (22%) patients, and this was treated with intravenous ondansetron 4mg administered.

Patient satisfaction was assessed using Visual analogue scale, all the patient scored at least 7, while 16 patients (89%) desire to be awake in future surgery.

The duration of hospital stay ranged from 6 to 14 days with a mean of 9±1.8days.

Table 1. Patient Demographics, Comorbidities, and Perioperative Data.

Age Years)	Gender	ASA	Comorbidity	Diagnosis	Anaesthesia	Surgery duration(min)	HLS (days)
65	M	IV	Hypertension	PUD perforation	Epidural	90	8
52	F	II	None	Mesenteric cyst	CSE	130	7
46	F	III	Others	Ovarian malignancy	CSE	170	10
57	M	IV	Diabetes	PUD perforation	Epidural	80	9
62	M	III	None	PUD perforation	CSE	84	12
67	M	IV	Hypertension	PUD perforation	Epidural	90	7
61	M	IV	None	intestinal obstruction	Epidural	180	10
53	F	I	None	Intestinal obstruction	CSE	150	9
49	M	IV	Hypertension	Intestinal obstruction	Epidural	140	8
53	F	III	None	Ovarian malignancy	CSE	126	9
60	M	IV	Hypertension	PUD perforation	Epidural	96	11
61	M	III	None	PUD perforation	Spinal	85	10
58	F	IV	None	Mesenteric cyst	CSE	180	14
54	M	IV	None	Intestinal obstruction	epidural	125	10
70	M	IV	Hypertension	PUD perforation	Epidural	97	9
53	F	III	Diabetes	Intestinal obstruction	CSE	120	9
62	M	IV	None	PUD perforation	Epidural	100	10
80	M	IV	Hypertension	Intestinal obstruction	Epidural	110	13

Table 2. Surgical pathologies, incidence of hypotension, and requirement for additional analgesia according to anaesthetic technique.

Variable	Category	n (%)
Surgical pathology	Peptic ulcer perforation	4 (44.4)
	Intestinal obstruction	3 (33.3)
	Mesenteric cyst	1 (11.1)
	Ovarian malignancy	1 (11.1)
Hypotension	Spinal (Yes)	1 (9.1)
	Spinal (No)	10 (90.9)
	Epidural (Yes)	0 (0.0)
	Epidural (No)	1 (100.0)
	Combined spinal–epidural (Yes)	1 (50.0)

Print ISSN: 0189-9287 Online ISSN: 2992-345X

	Combined spinal–epidural (No)	1 (50.0)
Need for additional analgesia	Spinal (Yes)	1 (9.1)
	Spinal (No)	10 (90.9)
	Epidural (Yes)	0 (0.0)
	Epidural (No)	1 (100.0)
	Combined spinal–epidural (Yes)	4 (80.0)
	Combined spinal–epidural (No)	1 (20.0)

DISCUSSION

This study demonstrated that neuraxial anaesthesia can be successfully employed for both elective and emergency exploratory laparotomy in carefully selected patients with peptic ulcer perforation, mesenteric cyst, ovarian malignancy, and intestinal obstruction. The absence of intraoperative complications and the low incidence of adverse events in our series suggest that neuraxial anaesthesia may be a safe and feasible alternative to general anaesthesia in appropriately selected patients. These findings are consistent with previous reports that have demonstrated the feasibility of awake laparotomy under neuraxial anaesthesia, particularly among patients considered high risk for general anaesthesia.[2,3]

High-risk patients have multiple comorbidities that increase the risks of complications and adverse effects such as haemodynamic instability, gastrointestinal disturbances, renal impairment, and postoperative cognitive dysfunction or delirium. These comorbidities may alter pharmacokinetics and pharmacodynamics, making drug choices and dosing for general anaesthesia difficult, with prolonged duration of action of some agents. This can lead to prolonged hospital stays and recovery times, adding to the overall burden on both the patient and the healthcare system.[1,4]

Neuraxial anaesthesia has emerged as a promising alternative to general anaesthesia in high-risk surgical patients undergoing elective and emergency abdominal surgery.[2,3] Spinal anaesthesia has well-established advantages, including reduced drug dosage, rapid onset, profound sensory and motor block, absence of systemic drug effects, avoidance of tracheal intubation, and decreased need for opioid administration.[1,5]

Patient selection for regional anaesthesia for exploratory laparotomy must be thorough. Factors to consider include haemodynamic stability, coagulation status, and patient willingness to remain awake during the procedure.[3] While neuraxial anaesthesia can be considered for patients with peritonitis, it requires careful evaluation of the patient's condition and meticulous planning to mitigate risks and ensure the best possible outcomes.[9]

Somboonviboon et al. reported a successful case of low-dose spinal anaesthesia for urgent laparotomy in a patient with severe myasthenia gravis.[10] Kateregga et al. subsequently found in their feasibility study that laparotomy performed under spinal anaesthesia was safe and effective.[11]

The requirement for supplemental analgesia in 22% of our patients, particularly those with ovarian malignancy and intestinal obstruction, suggests that peritoneal irritation remains a limitation of central neuraxial anaesthesia (CNA). This observation is consistent with reports that some patients undergoing awake laparotomy under neuraxial anaesthesia may experience intraoperative discomfort requiring supplemental analgesia or sedation.[7] Careful patient selection and readiness to administer adjunct analgesics are therefore essential. By contrast, Farda and Bashir Nawazish reported that only 6.7% of patients required additional analgesia in their retrospective study of 196 emergency laparotomies performed under spinal anaesthesia.[12]

In our study, all cases were successfully completed under neuraxial anaesthesia without conversion to general anaesthesia. This outcome was similarly reported by Leoni et al.,[2] in whose series all patients likewise completed surgery without conversion. Farda and Bashir Nawazish, however, reported a 5.6% conversion rate, possibly attributable to their exclusive use of spinal anaesthesia, with prolonged operative duration as the primary reason for conversion.[12] The expected duration of spinal anaesthesia is approximately 180 ± 20 minutes; it is therefore important to factor the anticipated duration of surgery into the choice of neuraxial technique for exploratory laparotomy.

Romanzi et al. documented a 5.7% conversion rate attributable not to operative time but to the patient's inability to tolerate neuraxial anaesthesia.[7]

We observed transient hypotension in only two of our patients (11%) following neuraxial anaesthesia — one after combined spinal-epidural (CSE) and one after

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spinal anaesthesia alone. This compares with a reported rate of 6.1% (12 patients) in the series by Farda and Bashir Nawazish.[12] Hypotension during spinal anaesthesia results from sympathetic blockade, and the risk is compounded by inadequate intravascular volume, which may be present particularly in abdominal emergencies where patients are already hypovolaemic.[9,13] In contrast, Leoni et al. did not observe hypotension in any of their patients, though bradycardia was noted in one patient.[2]

Hospital stay in our cohort averaged 9 days, slightly longer than the 6–7 days reported in other series.[2,7] This may reflect differences in patient comorbidity profiles, as 61% of our patients were classified as ASA IV. Despite this, patient satisfaction was high, with most expressing a preference for awake surgery in the future.

Combined spinal-epidural anaesthesia has also been described in a case report of robotic liver resection for hepatocellular carcinoma in a patient with severe comorbidities, with a good outcome.[3] A significant increase in the use of neuraxial anaesthesia for abdominal surgery was observed during the COVID-19 pandemic to reduce the risk of aerosol spread during airway manipulation. For this reason, the Royal College of Anaesthetists promoted the use of regional anaesthesia during the pandemic.[8]

There are longstanding concerns regarding the use of regional anaesthesia in septic patients; however, published evidence indicates that the incidence of central nervous system infection following neuraxial anaesthesia in patients with ongoing bacteraemia is very low, ranging from 0.007% to 0.6%.[9,14] Four of our patients experienced nausea and vomiting during surgery, whereas Leoni et al. reported no postoperative nausea and vomiting (PONV), having administered prophylactic ondansetron to all patients.[2]

We used neuraxial anaesthesia in patients with acute abdominal pathology requiring urgent surgical intervention (bowel ischaemia, perforation with acute peritonitis, or occlusion). Our study suggests a possible role for regional anaesthesia as the primary anaesthetic technique for emergency laparotomy, though careful consideration is required — including patient willingness to undergo awake laparotomy and haemodynamic stability.

LIMITATIONS: The small sample size, single-centre design, and absence of a control group limit generalizability.

IMPLICATIONS OF THE FINDINGS OF THE STUDY : This study adds to the limited evidence base supporting neuraxial anaesthesia for exploratory laparotomy in sub-Saharan Africa. However, the findings highlight the need for multicentre randomised controlled trials comparing neuraxial with general anaesthesia in low- and middle-income country settings. Future studies should incorporate multivariable analysis to identify predictors of prolonged hospital stay, and should evaluate outcomes in high-risk subgroups including elderly, septic, and oncological patients.

CONCLUSION

Central Neuraxial anaesthesia in selected patient is a viable alternative to general anaesthesia for exploratory laparotomy in patients with PUD perforation, mesenteric cyst, ovarian malignancy or Intestinal obstruction with mild intraoperative complications and good patient outcome.

Declarations

Authors' contribution: ISI (Conceptualization, Methodology, Investigation, Writing – original draft, Writing – review & editing, Supervision), DII (Data curation, Investigation, Writing – original draft), ISC: Investigation, Resources, Writing – review & editing), ECN (Formal analysis, Validation, Writing – review & editing), KCN (Investigation, Resources, Writing – review & editing)

Funding: None

Conflicts of Interest: None

Disclosure in AI use: Declaration on Use of Artificial Intelligence. During preparation of this manuscript, the author(s) used Claude (Anthropic) to assist with verification of reference accuracy and formatting of citations according to the Vancouver referencing style. The AI tool was not used for data analysis, interpretation of results, or generation of scientific content/conclusions. All references were subsequently checked by the author(s) for accuracy and appropriateness, and the author(s) take full responsibility for the content of the manuscript, including the accuracy of all citations.

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Print ISSN: 0189-9287 Online ISSN: 2992-345X

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Print ISSN: 0189-9287 Online ISSN: 2992-345X