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Case Report

Anaesthesia Section

Anaesthetic Management of a Retroperitoneal Paraganglioma: A Case Report

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ABSTRACT

Retroperitoneal tumours, especially paragangliomas, pose peculiar challenges in their surgical and anaesthetic management, as they are hormonally active due to the release of catecholamines. These tumours are typically located adjacent to critical structures, particularly the Inferior Vena Cava (IVC), aorta, and celiac trunk, making their resection hard, due to the risk of haemodynamic instability in the course of surgery. This case report of a 47-year-old male epitomises the importance of a multidisciplinary approach in the management of a retroperitoneal paraganglioma. He had a history of neurogenic bladder and had undergone embolisation of the retroperitoneal mass previously. General Anaesthesia (GA) with thoracic epidural catheterisation was employed as the anaesthetic modality for the surgical removal of the tumour. Invasive monitoring techniques, such as arterial lines and central venous catheters, were used to manage possible surges in catecholamines, haemodynamic shifts, and substantial blood loss during resection of this tumour. The intraoperative hypertensive crisis was managed with nitroglycerine and continuous monitoring and epidural analgesia ensured smooth recovery in the postoperative period. The case points out the necessity of careful preoperative evaluation, advanced intraoperative techniques, and alert postoperative care in handling complex retroperitoneal tumours like paragangliomas.

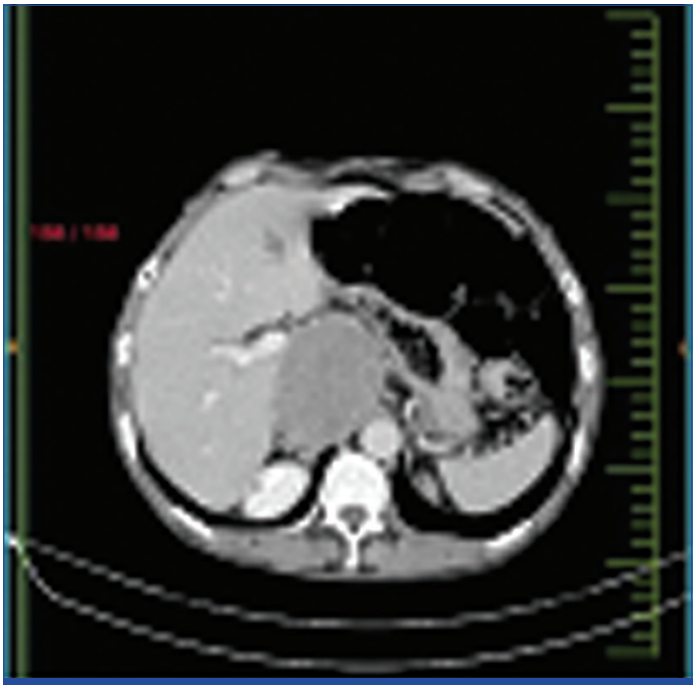
Keywords: Catecholamine crisis, Retroperitoneal tumours, Thoracic epidural anaesthesia

CASE REPORT

A 47-year-old male came to the Emergency Department complaining of dull, aching pain localised to the right hypochondrium for 45 days. The pain was insidious and gradually progressive. Exacerbating and relieving factors were not recognised. He denied any associated symptoms like nausea, vomiting, fever, jaundice, or changes in bowel or bladder habits. There was no history of significant weight loss, anorexia, or gastrointestinal bleeding. He was not a known case of diabetes mellitus, hypertension, bronchial asthma, or tuberculosis. He was diagnosed with a neurogenic bladder for seven years, with a history of intermittent catheterisation. He was conscious, alert, and haemodynamically stable. His vital signs were normal. There were multiple non-tender, globular nodules of neurofibromatosis around 2×2 cm over the chest, abdomen, upper limbs, and bilateral lower limbs. Systemic examination showed that air entry was equal on both lungs, a regular heart rate, normal heart sounds, and no murmurs. Abdominal examination was unremarkable, with a soft and non-tender abdomen, no guarding or rigidity, and bowel sounds present in all four quadrants.

A Contrast-Enhanced Computed Tomography (CECT) scan of the abdomen demonstrated a well-circumscribed hypodense lesion in the right retroperitoneum located in the suprarenal region, as seen in [Table/Fig-1]. The imaging patterns with a characteristic enhancement suggested a neoplastic aetiology.

Routine blood tests were within normal limits, including haemoglobin at 12.1 g/dL, a total leukocyte count of 7100/µL, and normal platelet counts. Serial renal function tests remained stable for creatinine and electrolytes, except for transient hypocalcaemia. The liver function tests revealed elevated transaminases (ALT 159 IU/L and AST 274 IU/L) and hypoalbuminaemia (albumin 2.4 g/dL). Urinalysis was negative for significant sediment abnormalities but mildly positive for protein. A peripheral smear revealed normocytic normochromic red blood cells, normal white blood cells, and an adequate number of platelets. Haemoparasites were absent. The coagulation profile was within the normal range, and catecholamine levels in the body were measured before surgery by collecting urine over 24 hours.



[Table/Fig-1]: CECT of the abdomen.

The results showed:

Epinephrine: 50 µg/24 hrs;

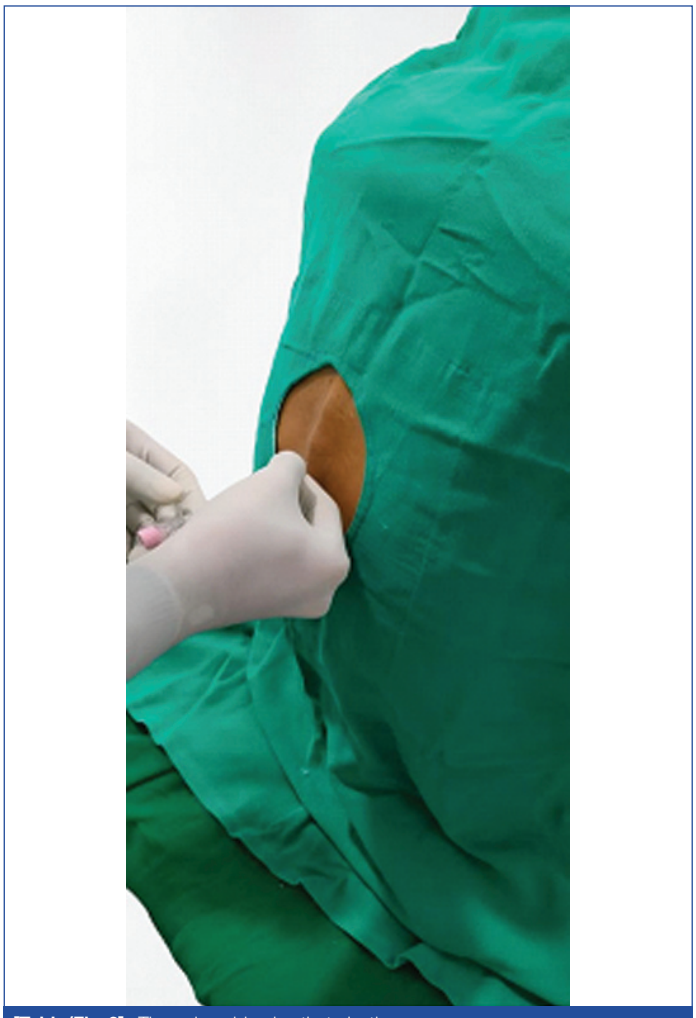
Norepinephrine: 140 µg/24 hrs;

Dopamine: 600 µg/24 hrs.

Histopathological analysis of the biopsy specimen confirmed the diagnosis of paraganglioma. The tumour was closely related to major vascular structures, including the IVC, aorta, and celiac trunk, posing a high surgical risk. Risk assessment indicated that the manipulation of the tumour would likely lead to an intraoperative hypertensive crisis through the release of catecholamines. Preoperative optimisation included alpha-adrenergic blockade with phenoxybenzamine for hypertensive management. Supplemental nutrition was recommended to overcome his low albumin level.

An elaborate anaesthetic plan was designed that included invasive haemodynamic monitoring and Thoracic Epidural Analgesia (TEA) for perioperative pain control. The patient was informed about the procedure, risks of complications, and possible outcomes, and written informed consent was obtained.

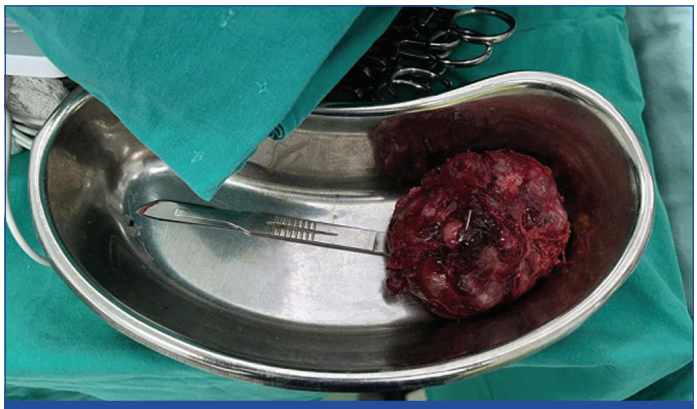
The patient was kept nil per os for six hours before the procedure. In the operating room, routine American Society of Anaesthesiologists (ASA) standard monitors, including Non-Invasive Blood Pressure (NIBP), pulse oximetry, and a five-lead Electrocardiogram (ECG), were applied. Baseline vitals were recorded, which revealed a heart rate of 76 bpm, blood pressure of 140/80 mmHg, and SpO_2 of 98% on room air. Intravenous access was established using an 18-G cannula. For perioperative analgesia, an epidural catheter was inserted at the T10-T11 interspace, under strict aseptic precautions, as seen in [Table/Fig-2]. The patient was placed in the sitting position. An 18-G Tuohy needle was used to locate the epidural space by the technique of loss of resistance. A catheter was inserted into the space, which was fixed in position. A test dose of 3 mL of lignocaine with adrenaline was administered to check catheter placement.



[Table/Fig-2]: Thoracic epidural catheterisation.

The GA was induced with glycopyrrolate 0.2 mg, midazolam 2 mg, propofol 100 mg i.v., and fentanyl 100 µg i.v. Muscle relaxation was achieved by administering 8 mg of vecuronium i.v.. preoxygenation was done with 100% oxygen for three minutes. An 8.0 mm cuffed endotracheal tube was used for intubation. Chest auscultation and capnography ensured successful intubation. A 20-G arterial line was placed in the right radial artery under ultrasound guidance for continuous blood pressure monitoring. A triple-lumen central venous catheter was inserted in the right internal jugular vein, guided by ultrasound using the Seldinger technique, for Central Venous Pressure (CVP) monitoring. An epidural infusion of 0.25% bupivacaine at 8 mL/hour was initiated. Sevoflurane was used for maintenance of anaesthesia in a 50:50 oxygen-nitrous oxide mixture, and intermittent boluses of vecuronium were given. Blood pressure was monitored closely, especially during tumour manipulation, as the release of catecholamine caused a surge in blood pressure. Nitroglycerin was titrated to manage episodes of hypertension without compromising perfusion.

Surgery began with a chevron incision to open up the retroperitoneum. Dissection was done on the posterior aspect of the IVC, where the tumour was found near major vascular structures like the aorta and celiac trunk. Estimated blood loss was around 1400 mL, with one unit of packed red blood cells transfused. Crystalloids and colloids were given to maintain adequate intravascular volume. Frequent analysis of arterial blood identified metabolic acidosis, which was managed with sodium bicarbonate. After tumour excision and haemostasis, the surgical site was lavaged, and abdominal drains were inserted. The incision was closed in layers. The excised tumour is seen in [Table/Fig-3].



[Table/Fig-3]: Excised tumour.

At the end of surgery, neuromuscular blockade was reversed with neostigmine (2.5 mg) and glycopyrrolate (0.5 mg). Extubation was done after adequate reversal of neuromuscular blockade was confirmed. The patient was transferred to the Intensive Care Unit (ICU) for monitoring. Pain relief was managed with an epidural infusion of 0.125% bupivacaine at 6 mL/h. The epidural infusion was stopped on postoperative day 3, and the catheter was removed. Wound care was done daily. The abdominal drain was removed on postoperative day 5.

DISCUSSION

Retroperitoneal tumours, such as paragangliomas, pose unique challenges in management in both surgery and anaesthesia, due to their proximity to vital structures such as the IVC, aorta, and celiac trunk, and with catecholamine release potential that can be of hormonal activity. The anaesthetic approach was tailored to these needs by employing General Anaesthesia (GA), TEA, and invasive monitoring. TEA has been well-known for providing stable perioperative pain relief. TEA prevents sympathetic outflow block, thereby leading to better haemodynamics with successful analgesia and reduced surgical stress [1]. TEA minimises the need for systemic opioids and opioid-related side-effects such as respiratory depression, nausea, and ileus, making recovery faster. In addition, it has been shown that TEA promotes postoperative respiratory mechanics and reduces diaphragmatic splinting, thus allowing early mobilisation and promoting better lung function [2]. TEA has been utilised for the management of retroperitoneal surgeries, showing good analgesia and haemodynamic stability [3,4].

Ultrasound guidance for arterial and central venous catheterisation has gained preference due to numerous advantages over traditional landmark-based techniques. Real-time visualisation increases first-pass success rates, decreases procedural time, and reduces complications such as hematoma formation, arterial puncture, or pneumothorax. A lot of research literature exists regarding its use

Author and year	Case presentation	Treatment	Anaesthetic challenges	Outcome
Kumar RA et al., (2020) [4]	A 29-year-old male presented with a 2-year history of abdominal fullness and discomfort. He was anaemic with a large vascular abdominal mass, diagnosed histologically as paraganglioma/phaeochromocytoma. Cardiological evaluation showed catecholamine-induced cardiomyopathy with reduced Ejection Fraction (EF).	Pre-operative alpha and beta blockade; blood transfusion to correct anaemia; wide excision of tumour with prophylactic bilateral ureteric stenting; partial excision due to adhesion to major vessels.	Pre-existing cardiomyopathy (EF 39%), catecholamine secreting tumour, risk of haemodynamic instability, massive blood loss risk, invasive monitoring, and potential need for postoperative ventilation.	Successful intraoperative management with vasopressors and fluids; extubated on the same day post-operative with good recovery; no acidosis, hypoxia, or hypothermia noted.
Sekiguchi S et al., (2023) [10]	52-year-old male smoker with Chronic Obstructive Pulmonary Disease (COPD); asymptomatic paraganglioma detected; tumour 55 mm in diameter posterior to pancreatic head, adjacent to IVC; multiple large bullae on chest imaging.	Planned laparoscopic resection converted to open laparotomy; combined resection of tumour and pancreatic head; intraoperative alpha/beta blockade; respiratory care with limited tidal volume.	COPD with bullae (risk of barotrauma), hypercapnia due to catecholamine-driven hypermetabolism, intraoperative hypertension/crisis, blood pressure surge after induction, no pre-operative alpha blockade.	Postoperative noradrenaline was required; extubated immediately postoperatively with stable respiratory status; good recovery; discharged without circulatory or respiratory complications.
Ennaoui A et al., (2023) [11]	Middle-aged patient with right adrenal mass (~32×29×42 mm); hypertension (170/80 mmHg) on alpha-blockade; diagnosed intraoperatively as paraganglioma.	Laparoscopic excision via celioscopy; GA with propofol, fentanyl, sevoflurane; intraoperative invasive monitoring; postexcision hypotension treated with fluids, vasopressors, hydrocortisone.	Severe intraoperative hypertension (225/110 mmHg) during tumour manipulation; postexcision hypotension due to receptor downregulation.	Uneventful recovery; extubated in Intensive Care Unit (ICU); no postoperative haemodynamic events; discharged on postoperative day 8 with confirmed paraganglioma.
Park SL et al., (2017) [12]	55-year-old woman with history of pancreatic pheochromocytoma; 12 cm pelvic paraganglioma with bone/muscle invasion; hypertensive during embolisation.	Hemipelvectomy with massive transfusion; preop doxazosin/propranolol; intraoperative nitroprusside, labetalol, phenylephrine, norepinephrine for BP control.	Malignant hypertension during embolisation/surgery; hypotension after tumour resection due to bleeding and catecholamine withdrawal; massive transfusion.	ICU admission postoperativel; extubated on second day; no recurrence; normal catecholamine levels 1 month postoperatively.
Current case	47-year-old male with neurogenic bladder, multiple cutaneous neurofibromas, and dull right hypochondrial pain; 24-hour urine showed elevated dopamine; diagnosed with retroperitoneal paraganglioma near major vessels.	Pre-operative phenoxybenzamine and nutritional optimisation; resection via chevron incision; GA with TEA; intraoperative nitroglycerin used for BP control.	Invasive monitoring; hypertension during tumour handling; metabolic acidosis; risk due to tumour's proximity to IVC, aorta, and celiac trunk.	Postoperative ICU care; stable recovery; no complications; drain removed on day 5.

[Table/Fig-4]: Anaesthetic challenges and outcomes faced in similar reports [4,10-12].

in improving outcomes and ensuring higher safety [5,6]. Arterial and CVP monitoring are key aspects in patient care perioperatively, especially when significant blood loss or haemodynamic alterations are expected. Slight changes in arterial blood pressure can be continuously monitored. These help in the measurement of CVP, directing fluid resuscitation, and the assessment of intravascular volume status. Central lines also provide reliable access to vasoactive medications to ensure blood pressure and cardiac output are maintained adequately. Arterial blood gas analysis allows for the appropriate correction of acid-base disturbance and electrolyte imbalances [7,8].

Sevoflurane is known for its quick onset and smooth induction, as well as its rapid recovery profile. At low concentrations, there is minimal cardiovascular effect. Hence, it is ideal for patients who undergo surgeries that demand haemodynamic stability. Favourable safety profiles, in contrast to other volatile agents, result in less tissue solubility and less irritation of the airways [9].

Our anaesthetic regimen was innovative in that it merged TEA, GA and invasive monitoring in an individualised strategy designed specifically for the specific challenges of retroperitoneal tumour resection. This multimodal approach maximised haemodynamic stability, reduced opioid administration, improved pain management, and minimised perioperative stress responses. By coupling these innovative practices, we delivered safer, more efficient anaesthesia care in an environment where catecholamine spikes and proximity to major vessels were significant risks. The anaesthetic challenges and outcomes encountered in similar cases are described in [Table/Fig-4] [4,10-12].

CONCLUSION(S)

This case underlines the necessity of individualised anaesthetic care in complex retroperitoneal tumour surgeries. GA, TEA, invasive haemodynamic monitoring, and ultrasound-guided vascular access were pivotal in managing the specific challenges created by the anatomical site and physiological effects of the tumour. Invasive monitoring was beneficial for real-time monitoring and prompt intervention in haemodynamic alterations. Thorough selection of anaesthetic techniques and agents ensured patient safety and reduced perioperative complications. This case highlights the importance of personalised anaesthetic strategies in the handling of high-risk operations for retroperitoneal tumours.

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