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Pheochromocytoma Unmasked: An Unexpected Discovery During Pre-Anesthetic Evaluation in a Child with Femoral Shaft Fracture

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Abstract

Pheochromocytoma is a rare catecholamine-secreting tumor that may mimic perioperative pain- or anxiety-related sympathetic activation, placing undiagnosed patients at risk of catastrophic hemodynamic events during anesthesia. A 12-year-old boy scheduled for titanium elastic nailing of a femoral shaft fracture was noted to have persistent tachycardia and hypertension in the preoperative holding area. Despite sedation with midazolam, analgesia with fentanyl, and an effective femoral nerve block, his heart rate and blood pressure remained elevated. Focused caregiver history revealed several months of excessive sweating, heat intolerance, and refusal to wear clothes, prompting urgent endocrinology consultation, cancellation of surgery, and further evaluation. Ultrasonography and contrast-enhanced CT demonstrated bilateral adrenal masses (left 8 × 6 cm; right 2.7 × 2.5 cm), and 24-hour urinary normetanephrine was markedly elevated (15,422.6 µg/day), confirming bilateral pheochromocytoma.

After preoperative alpha- followed by beta-blockade, the child underwent laparoscopic bilateral adrenalectomy under invasive hemodynamic monitoring. Histopathology confirmed pheochromocytoma with intermediate-risk features. He later underwent femoral fixation uneventfully under neuraxial anesthesia. This case underscores that persistent sympathetic activation unexplained by pain or anxiety warrants evaluation for secondary causes and highlights the diagnostic value of pre-anesthetic vigilance and caregiver observations in pediatric patients.

Keywords: Pheochromocytoma; Pre-anesthetic evaluation; Pediatric hypertension; Catecholamine crisis; Femoral fracture; Clinical vigilance; Bilateral adrenal tumor; Perioperative diagnosis; Heat intolerance; Caregiver history

Introduction

Pheochromocytoma, a catecholamine-secreting tumor arising from adrenal medullary chromaffin cells, is among the most formidable challenges in perioperative medicine.[1] Although rare—0.5–2 cases per million children annually—its clinical impact is disproportionately high.[2] Accounting for only 0.1–0.6% of pediatric hypertension, undiagnosed tumors can precipitate fatal hemodynamic crises under anesthesia.[3] Excess secretion of epinephrine, norepinephrine, and dopamine produces hypertension, tachycardia, and diaphoresis—often misattributed to anxiety or pain in pediatric trauma settings,[4] risking arrhythmias, ischemia, or cardiac arrest.[5]

Children seldom display the classic adult triad of headache, palpitations, and diaphoresis.[6] Instead, they manifest subtle cues—irritability, sweating, or heat intolerance—frequently mistaken for behavioral issues. Such deceptive presentations demand clinical vigilance and attentive communication with caregivers.

Historically called *"the great mimic,"* pheochromocytoma can masquerade as pain, anxiety, or thyroid dysfunction, making early diagnosis dependent more on perceptive observation than technology.[7] While improved awareness has reduced intraoperative catastrophes,[8] incidental detections during anesthetic evaluation remain rare yet profoundly instructive. In pediatric trauma, tachycardia and hypertension are often dismissed as stress responses.[9] Thus, the pre-anesthetic area becomes not merely a staging space but the frontline of clinical discovery.[10]

This report describes a 12-year-old boy scheduled for femoral fracture fixation, in whom persistent hypertension and tachycardia despite anxiolysis and analgesia led to the incidental discovery of bilateral pheochromocytoma. The key diagnostic clue arose from the mother's recollection of profuse sweating and aversion to clothing—an elegant reminder that sometimes, the most decisive diagnostic tool is not a monitor but a mindful question. In the realm of perioperative medicine, it reminds us that **every unexplained vital sign has a story behind it — and sometimes, it is the story that saves the life.**

1. Case Presentation

A 12-year-old boy presented to the emergency department after a road traffic accident with a closed fracture of the left femoral shaft. He had no prior medical illness or family history of hypertension or endocrine disorders. Following stabilization, he was scheduled for Titanium Elastic Nailing System (TENS) fixation under anesthesia. Written informed consent was obtained from the parents for both management and case publication (Institutional Review Board exemption for retrospective reporting). This case report was prepared in accordance with the CARE (Consensus-based Clinical Case Reporting) guidelines to ensure comprehensive and transparent reporting.

Although the child underwent routine peri-admission evaluation, the initial tachycardia and hypertension were attributed to trauma-related sympathetic activation. The key diagnostic turning point occurred during the immediate pre-induction reassessment in the preoperative holding area, where the hemodynamic profile remained persistently elevated despite comfort-oriented interventions. This prompted focused caregiver history, revealing long-standing diaphoresis, heat intolerance, and aversion to clothing, leading to cancellation of surgery and initiation of endocrine workup.

1.1 Preoperative evaluation

In the preoperative holding area, the child appeared anxious but cooperative. His heart rate was 116/min and blood pressure 150/90 mmHg. Assuming this was a stress response, intravenous midazolam (1 mg) and fentanyl (50 µg) were given, followed by an ultrasound-guided femoral nerve block with 15 ml of 0.25% bupivacaine and 4 mg dexamethasone. The block provided good analgesia, and the child appeared relaxed; however, his heart rate persisted at 110–120/min, and BP remained 150–160/90 mmHg. This mismatch between comfort and sustained hypertension prompted consideration of secondary causes.

1.2 History from the caregiver

On focused questioning, the mother reported that for several months her son had been sweating profusely even at rest, frequently refused to wear clothes, and complained of feeling unusually hot in otherwise comfortable environments. She also described intermittent episodes of flushing and irritability without clear triggers. These features—previously attributed to behavior—were now considered consistent with catecholamine excess. After immediate telephonic consultation with an endocrinologist, the planned orthopedic procedure was deferred, and further evaluation was advised. The sequence of perioperative observations and decision-making is summarized in **Table 1**.

1.3 Diagnostic Workup

Abdominal ultrasonography demonstrated bilateral suprarenal masses. Contrast-enhanced computed tomography (CT) confirmed heterogeneously enhancing adrenal lesions (8 × 6 cm on the left and 2.7 × 2.5 cm on the right) with areas of necrosis and calcification, raising a strong suspicion of bilateral pheochromocytoma. Biochemical testing showed markedly elevated 24-hour urinary normetanephrine (15,422.6 mcg/day), while metanephrine and 3-methoxytyramine remained within normal limits. Transthoracic echocardiography demonstrated normal ventricular function. Physical examination revealed multiple café-au-lait macules over the lower back, suggesting a possible association with neurofibromatosis type 1 (NF1).

1.4 Preoperative optimization

Medical preparation began with prazosin (2.5 mg twice daily, titrated to 5 mg) for alpha-blockade, a high-salt diet, and liberal fluids. After 10 days, BP stabilized at 110–120/70 mmHg with mild postural hypotension. Propranolol (20 mg thrice daily) was added for rate control, and symptoms of sweating and irritability improved. Medical preparation began with prazosin (2.5 mg twice daily, titrated to 5 mg) for alpha-blockade, a high-salt diet, and liberal fluids. After 10 days, BP stabilized at 110–120/70 mmHg with mild postural hypotension. Propranolol (20 mg thrice daily) was added for rate control, and symptoms of sweating and irritability improved.

1.5 Surgical management

After optimization, the patient underwent laparoscopic bilateral adrenalectomy under general anesthesia. Standard ASA monitors were supplemented with invasive arterial and central venous lines. Anesthesia was induced with fentanyl (2 µg/kg), propofol (2 mg/kg), and rocuronium (0.8 mg/kg).

To attenuate sympathetic surges, esmolol (1 mg/kg) and 10% lignocaine spray were used during intubation. Maintenance included sevoflurane in an oxygen–air mixture. Transient hypertensive episodes during tumor handling were controlled using nitroglycerin and esmolol infusions, and magnesium sulfate was administered to blunt catecholamine release.

The surgery proceeded uneventfully with minimal blood loss. The patient was extubated in a deep plane and shifted to the pediatric intensive care unit for postoperative observation. Analgesia included paracetamol, ketorolac, and a fentanyl infusion (25 µg/h). Hydrocortisone replacement was initiated postoperatively to prevent adrenal insufficiency. Histopathology confirmed bilateral pheochromocytomas, with the left-sided tumor showing a Pheochromocytoma of the Adrenal gland Scaled Score (PASS) of 4, suggesting intermediate malignant potential.

1.6 Subsequent orthopedic interventions

Following stabilization, the child underwent TENS nailing of the femur under combined spinal–epidural anesthesia without complications. Hemodynamics remained stable throughout. Postoperative 24-hour urinary normetanephrine decreased to 459 µg/day, confirming biochemical remission. He was discharged on hydrocortisone replacement and scheduled for lifelong endocrinology follow-up with periodic catecholamine screening and genetic counseling for NF1.

Discussion

Pheochromocytomas are catecholamine-secreting tumors from adrenal chromaffin cells; extra-adrenal variants are termed paragangliomas.[11] Despite their rarity — estimated at 2 to 8 cases per million annually — these tumors represent one of the most perilous causes of secondary hypertension, particularly in the pediatric population.[12] Although the adult form is typically sporadic, nearly 40% of pediatric cases are hereditary, associated with syndromes such as NF1, multiple endocrine neoplasia type 2 (MEN 2), and von Hippel–Lindau disease (VHL).[13] Pediatric pheochromocytomas differ substantially from adult presentations in terms of laterality, genetic predisposition, and symptom patterns.

Unregulated secretion of norepinephrine, epinephrine, and dopamine produces sustained or paroxysmal hypertension, tachycardia, diaphoresis, and pallor.[14]

The predominant catecholamine determines the hemodynamic profile: norepinephrine causes persistent hypertension, epinephrine results in episodic tachycardia, and dopamine-secreting tumors may remain clinically silent.[15] In children, symptoms such as irritability, excessive sweating, or heat intolerance often precede hypertension and are easily dismissed as behavioral. In this case, the mother's observation of profuse sweating and aversion to clothing became the diagnostic turning point.[16] Such subtle features, though seemingly benign, reflect the sympathetic overactivity induced by circulating catecholamines.

Diagnostic Pathway

In perioperative medicine, the discovery of pheochromocytoma is often serendipitous. Many cases remain undiagnosed until anesthesia induction triggers an acute catecholamine surge, leading to severe hypertension, arrhythmias, myocardial ischemia, or even cardiovascular collapse. The mortality of unrecognized pheochromocytoma during anesthesia has historically reached 70–80%, emphasizing the importance of pre-anesthetic suspicion.[17] In this case, the discrepancy between the child's calm, pain-free state and persistent tachycardia-hypertension became the turning point. The anesthesiology team's decision to pause and question the physiology rather than the behavior exemplifies sound clinical reasoning. The decision to defer surgery, pending endocrine evaluation, was life-saving.

Current Endocrine Society guidelines recommend biochemical confirmation using plasma-free or 24-hour urinary fractionated metanephrines, which provide sensitivity exceeding 97%.[18] Imaging with CT or magnetic resonance imaging (MRI) then localizes the tumor. Our patient showed markedly elevated urinary normetanephrine (15,422.6 mcg/day) and bilateral adrenal masses on CT. The presence of café-au-lait spots supported NF1 association.[19] This diagnostic sequence—from physiological anomaly to biochemical and radiological proof—highlights that vigilance and reasoning remain central to perioperative safety. Differential diagnoses such as thyrotoxicosis, anxiety-induced sympathetic activation, and essential hypertension must be systematically excluded **(Table 2).**

This case also highlights an important practical gap: even when pre-anesthetic evaluation is formally completed at admission, trauma-related sympathetic activation can camouflage secondary causes. The holding area reassessment—performed immediately before induction—served as a final safety checkpoint where persistent, context-incongruent vital signs triggered the correct diagnostic pathway.

Preoperative optimization

The foundation of successful surgical outcomes lies in thorough preoperative medical preparation. Alpha-adrenergic blockade with agents such as prazosin, doxazosin, or phenoxybenzamine for 10–14 days reverses catecholamine-induced vasoconstriction, expands intravascular volume, and stabilizes blood pressure.[20] Once adequate alpha-blockade is achieved—indicated by mild postural hypotension—beta-blockers like propranolol are added to control reflex tachycardia, avoiding unopposed alpha stimulation.[21] Liberal salt and fluid intake further optimize hemodynamic stability. The patient's improved sleep, reduced sweating, and calmer behavior reflected effective catecholamine suppression.[22]

Intraoperative strategies

Anesthetic management of pheochromocytoma excision requires anticipation of extreme hemodynamic shifts. The greatest risks occur during induction, intubation, tumor manipulation, and adrenal vein ligation.[23] Drugs that stimulate the sympathetic system (ketamine, pancuronium, succinylcholine) are avoided, while agents like propofol, sevoflurane, and rocuronium maintain cardiovascular stability.[24] Continuous arterial and central venous pressure monitoring is essential. Intraoperative hypertension can be managed with nitroglycerin, esmolol, and magnesium sulfate, which attenuate catecholamine release and protect against arrhythmias. After tumor excision, hypotension may occur from sudden catecholamine withdrawal and vasodilation, warranting judicious fluids and vasopressors.[25,26] In this case, meticulous preoperative optimization and vigilant intraoperative control ensured an uneventful course.

Postoperative considerations

Following bilateral adrenalectomy, glucocorticoid replacement becomes essential to prevent adrenal insufficiency.[27] Long-term surveillance should include annual urinary metanephrines for at least a decade, as hereditary cases carry a recurrence risk up to 30–40%.[28] Genetic counseling for NF1, RET, and VHL mutations is recommended in all pediatric cases.[29] Our patient achieved full biochemical remission and tolerated subsequent orthopedic surgery under regional anesthesia uneventfully, underscoring that timely detection and staged multidisciplinary management transform outcomes from crisis to cure.

Educational insights

This case offers several instructive lessons for anesthesiologists and perioperative physicians. First, **persistent sympathetic activation despite adequate analgesia and sedation should always prompt evaluation for hidden endocrine causes** such as pheochromocytoma, rather than being dismissed as anxiety or pain. Second, **caregiver narratives can provide diagnostic clues beyond monitors or laboratory data.**

In pediatric cases, behavioral patterns like heat intolerance or unusual sweating may reveal systemic pathology. Third, **preoperative alpha-adrenergic blockade remains the cornerstone of safe surgical management.** Proceeding without adequate blockade carries high intraoperative mortality due to catecholamine surges. Finally, **multidisciplinary coordination between anesthesiology, endocrinology, and surgery is essential.** Early communication and shared planning transform potentially fatal crises into well-managed outcomes. Ultimately, this case reinforces that **the pre-anesthetic evaluation is not merely procedural but diagnostic—an opportunity to uncover hidden diseases through vigilance, curiosity, and compassionate listening.**

Strengths and limitations

This case uniquely illustrates the diagnostic value of anesthesiologist-led preoperative assessment in identifying occult endocrine disorders. The major strength lies in the timing and context of detection — the tumor was suspected not during an endocrinology evaluation but during routine pre-anesthetic preparation for orthopedic surgery. The persistence of hypertension and tachycardia despite anxiolysis and regional analgesia prompted a deeper inquiry, demonstrating the diagnostic power of physiological reasoning combined with human observation. The caregiver's narrative - often overlooked in fast-paced surgical settings - played a pivotal role in unmasking the disease, emphasizing the importance of empathetic communication as part of clinical acumen. Additionally, this case reinforces the interdisciplinary synergy between anesthesiology, endocrinology, and surgery, where timely coordination prevented a potential intraoperative catastrophe.

A limitation of this report is the absence of advanced genetic confirmation due to logistic constraints, which could have further clarified the hereditary link to NF1. Moreover, as a single case, its conclusions cannot be generalized; however, the insights are educationally transferable, highlighting the need for heightened vigilance whenever hemodynamic findings seem incongruent with clinical context.

Conclusion

This case underscores the timeless truth that medicine is as much an art of observation as it is a science of investigation. In this child, unexplained hypertension and tachycardia — initially mistaken for anxiety — led to the discovery of **bilateral pheochromocytoma**, averting what could have been a fatal intraoperative event. For the anesthesiologist, **vigilance begins before induction.** The absence of a clear etiology for abnormal vital signs should never be ignored, especially when physiological data conflict with clinical presentation. Equally, **caregiver observations** — such as a mother's account of unusual sweating or intolerance to heat — can provide diagnostic clues that no monitor can display.

Ultimately, this case underscores that **every patient encounter is an opportunity for discovery.** A few moments of curiosity, guided by clinical intuition and compassionate dialogue, transformed what could have been a routine orthopedic procedure into a life-saving diagnosis — exemplifying the art and science of modern perioperative medicine.

Conflict of Interest

The authors declare no conflicts of interest.

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Ethical Approval

Institutional Review Board exemption was granted for retrospective reporting of this case. Written informed consent for clinical management and publication was obtained from the patient's guardian.

Compliance with Reporting Guidelines

This case report has been prepared in accordance with the CARE (Consensus-based Clinical Case Reporting) Guidelines, as recommended by the EQUATOR Network.

Author Contributions

Dr. Kartik Sonawane, Dr. Palanichamy Gurumoorthi
K.S.: Conceptualization, Methodology, Software, Formal analysis, Investigation, Resources, Data curation, Writing- Original draft preparation, Visualization
P.G.: Supervision, Writing - Review & Editing

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Timeline / Stage	Clinical Findings or Action	Interpretation / Decision
Day 0	A 12-year-old boy presented with a closed femoral shaft fracture after RTA; scheduled for TENS nailing.	Routine orthopedic case planned under anesthesia.
Preoperative Room	Persistent HR 116–120/min, BP 150/90 mmHg despite analgesia and sedation (midazolam + fentanyl + femoral block).	Unexplained tachycardia and hypertension; not consistent with anxiety or pain.
Parental History	Mother revealed months of excessive sweating, restlessness, and refusal to wear clothes due to heat intolerance.	Strong suspicion for catecholamine-secreting tumor (pheochromocytoma).
Immediate Action	Surgery canceled; endocrinology consultation obtained telephonically.	Advised further evaluation for secondary hypertension.
Investigations	Ultrasound: bilateral suprarenal masses; CT: left 8×6 cm, right 2.7×2.5 cm adrenal lesions; Urinary normetanephrine 15,422.6 mcg/day.	Diagnosis: Bilateral pheochromocytoma.
Optimization (10 days)	Alpha-blockade (prazosin up to 5 mg BD), salt and fluid loading, followed by propranolol.	Achieved stable BP (110–120/70 mmHg), mild postural hypotension.
Surgery 1	Laparoscopic bilateral adrenalectomy under invasive monitoring; hemodynamics managed with esmolol, NTG, and magnesium.	Successful tumor resection without crisis.
Postoperative Course	Smooth recovery, hydrocortisone initiated; normetanephrine reduced to 459 mcg/day.	Biochemical and clinical stabilization achieved.
Surgery 2	TENS nailing was performed under combined spinal-epidural anesthesia.	Hemodynamically stable intraoperatively and postoperatively.

Table 1. Timeline of Events and Key Clinical Decisions

TENS – Titanium Elastic Nailing System; RTA – Road Traffic Accident; HR – Heart Rate; BP – Blood Pressure; USG – Ultrasonography; CT – Computed Tomography; NF1 – Neurofibromatosis Type 1.

Table 2. Differential diagnoses for persistent tachycardia, hypertension, and sweating in a child

Possible Diagnosis	Typical Clinical Features	Distinguishing Findings / Investigations	How Ruled Out or Differentiated in This Case
Pain or Anxiety Response	Tachycardia, transient BP rise, sympathetic activation; improves with sedation and analgesia	Normal catecholamines; resolves after anxiolysis/analgesia	Persistent hypertension and tachycardia despite midazolam, fentanyl, and nerve block ruled this out.
Thyrotoxicosis (Hyperthyroidism)	Weight loss, tremors, heat intolerance, anxiety, sweating, tachycardia	Elevated T_3, T_4, suppressed TSH	Normal thyroid profile excluded thyrotoxicosis.
Essential (Primary) Hypertension	Usually mild to moderate elevation; family history is common	Normal renal and endocrine studies; often asymptomatic	Unlikely in a 12-year-old with episodic sympathetic symptoms and no family history.
Renal Parenchymal or Vascular Disease	Elevated BP, possible edema, hematuria, abnormal renal function	Abnormal RFT, renal Doppler, or ultrasound findings	Normal renal function tests and renal imaging ruled out renal causes.
Neuroblastoma (Catecholamine-secreting Tumor)	Occurs in <10 yrs; abdominal mass, weight loss, irritability, high catecholamines; dopamine-predominant	Elevated vanillylmandelic acid (VMA); imaging shows non-adrenal mass	Tumors localized to the adrenal glands and a normetanephrine-predominant pattern favored pheochromocytoma.
Cushing Syndrome	Central obesity, striae, growth retardation, and hypertension	Elevated cortisol, suppressed ACTH, abnormal dexamethasone suppression test	Absence of cushingoid features and normal cortisol levels excluded this.
Drug-Induced Sympathetic Activation (e.g., pseudoephedrine, amphetamines)	Hyperactivity, tachycardia, sweating; history of stimulant or decongestant use	Positive toxicology or medication history	No history of drug intake or exposure.
Autonomic Dysreflexia (in spinal injury)	Severe hypertension, bradycardia, flushing, sweating below injury level	Requires a spinal cord lesion above T6	No spinal injury; mechanism not applicable.
Panic or Anxiety Disorder	Episodic palpitations, tremors, sweating, sense of doom; normal BP between attacks	Psychological evaluation; normal catecholamines	Sustained hypertension and high urinary normetanephrines excluded psychogenic causes.
Pheochromocytoma / Paraganglioma	Episodic or sustained hypertension, palpitations, sweating, flushing, heat intolerance	Elevated plasma or urinary metanephrines; adrenal mass on imaging	Markedly high urinary normetanephrine + bilateral adrenal masses confirmed the diagnosis.

BP – Blood Pressure; HR – Heart Rate; TSH – Thyroid-Stimulating Hormone; RFT – Renal Function Tests; ACTH – Adrenocorticotropic Hormone; VMA – Vanillylmandelic Acid.

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