Pulmonary Embolism Following Percutaneous Nephrolithotomy: A Rare Case Report

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ABSTRACT

Percutaneous nephrolithotomy (PCNL) is one of the most common treatment options for renal stones in Nepal. Common complications include perioperative bleeding, urine leak from a nephrocutaneous fistula, pelvicalyceal system injury, and pain; these are individually graded by various authors and contribute to significant variability in reported overall PCNL complication rates. We report the case of a previously healthy 53-year-old female who developed acute pulmonary embolism (PE) following left prone mini percutaneous nephrolithotomy. Computed tomography pulmonary angiography confirmed an acute thrombus in the right descending pulmonary artery. The patient underwent immediate thrombolysis, leading to an uneventful postoperative recovery. This case highlights the critical importance of early diagnosis and prompt, efficient management of pulmonary embolism after PCNL, and underscores the need for timely intervention to achieve favourable outcomes.

KEY WORDS

Percutaneous nephrolithotomy; pulmonary embolism; complication; venous thromboembolism.

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INTRODUCTION

Since its first description in 1976, percutaneous nephrolithotomy (PCNL) has become the surgical procedure of choice for renal stones ≥ 2 cm [1,2]. It is generally well tolerated and considered safe; however, like any surgical intervention, it carries a specific set of complications, ranging from minor (e.g., transient haematuria, urinary leakage) to major (e.g., bleeding requiring embolization, sepsis, organ injury) [2,3]. Pulmonary embolism (PE) and myocardial infarction are reported in less than 3% of PCNL cases [3]. Minor complications may occur in up to approximately 25% of patients [2].

Given the rarity of PE post-PCNL—particularly in mini-PCNL procedures and in patients without classic venous thromboembolism (VTE) risk factors—awareness of this complication is critical for timely recognition. We present such a case and provide a review of relevant literature, discussing management and prevention considerations.

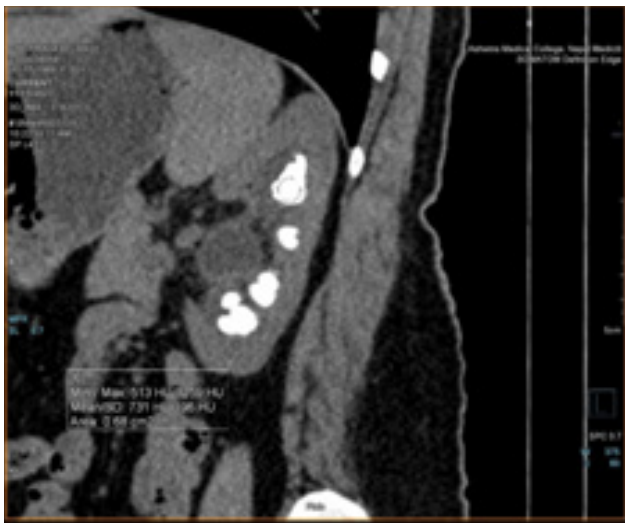
CASE PRESENTATION

A 53-year-old female was admitted to our department with a history of pain in the left flank and fever for 5 days. The pain radiated to the lower back and left inner aspect of the thigh, and increased in severity for 2 days. She had fever without chills and rigors, which was relieved by taking paracetamol. She also complained of burning during urination and increased urinary frequency. She had the past history of left open nephrolithotomy 15 years ago and double J stent placement for left nephrolithiasis with moderate hydronephrosis 5 years ago. She was diabetic, hypertensive, and hypothyroid and is under medication for these condition.

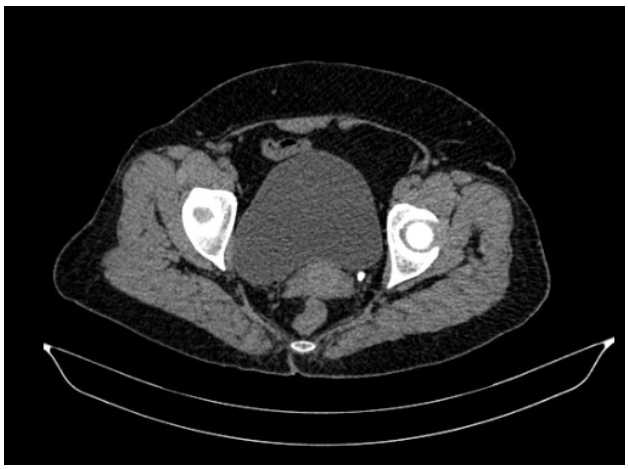
On abdominal examination, it was soft, nontender, and there was no palpable lump or organomegaly. Left renal angle was tender. A provisional diagnosis of left nephrolithiasis was made.

Routine urine analysis was sent, which showed plenty of red blood cells and pus cells. Renal function tests were normal and other baseline investigations were within normal limits.

Her urine culture was positive for E. coli and computed tomography scan demonstrated multiple calculi (at least 5) within the calyces of left kidney measuring 19.7 x 13.2mm (attenuation value : +731 HU), 11.6 x 8.1mm (attenuation value : 803 HU), 14.2 x 12.0mm (attenuation value : +919 HU), 17.7 x 14.7mm (attenuation value : +734 HU) and 16.5 x 14.5mm (attenuation value : +811 HU). Calculus measuring 6.3 x 4.9mm (attenuation value : +813 HU) was noted at the left VUJ with mild dilatation of left ureter and pelvicalyceal system.(Figure. 1)



(a)



(b)

Figure 1:

(a) Sagittal view of non-contrast CT showing multiple calculi within the calyces of the left kidney.

(b) Axial view of non-contrast CT demonstrating a calculus at the left vesicoureteric junction (VUJ) with mild dilatation of the left ureter and pelvicalyceal system.

The patient was initially treated with a course of intravenous antibiotics tailored according to urine culture and sensitivity.

Subsequently, she underwent a left ureteroscopy followed by 6 Fr ureteric catheterization and left mini percutaneous nephrolithotomy (mini-PCNL) in the prone position under general anesthesia. A mid-pole percutaneous puncture was performed using the gradual descent technique under C-arm guidance, after which a guidewire was inserted. Sequential dilatation of the PCN tract was achieved using an olive-tip dilator followed by serial Alken dilators under C-arm guidance.

A 16 Fr Amplatz sheath was then placed, the dilators removed, and a 12 Fr nephroscope introduced to visualize

the stones. Intracorporeal lithotripsy was performed, and all calculi were successfully removed under nephroscopic and C-arm guidance. A second percutaneous upper pole puncture was performed using the Bull's Eye technique, and the above steps were repeated. Finally, a Double J stent was inserted. The entire procedure lasted approximately three and a half hours, was uneventful intraoperatively, and the patient was rendered stone-free on the left side as confirmed by intraoperative C-arm imaging.

On the first postoperative day, the patient developed severe lower abdominal discomfort and urethral pain unresponsive to intravenous analgesics. Vital signs revealed hypotension (BP 90/60 mmHg), tachycardia (110–120 bpm), and oxygen saturation of 85% on room air. Laboratory investigations showed elevated D-dimer and Troponin I levels. Chest computed tomography (CT) angiography demonstrated a hypodense thrombus in the segmental and subsegmental branches of the right descending pulmonary artery supplying the posterior basal segment of the right lower lobe (Figure 2), confirming acute pulmonary embolism.

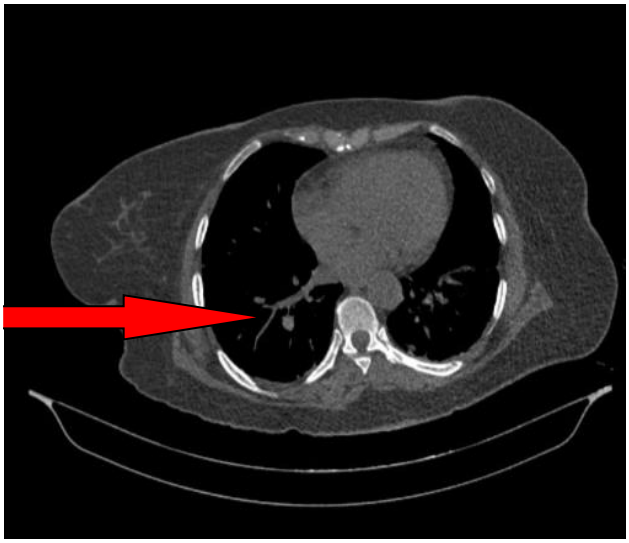


Figure 2: CT pulmonary angiography (axial view) showing an acute thrombus in the segmental and subsegmental branches of the right descending pulmonary artery, affecting the posterior basal segment of the right lower lobe.

The patient was immediately shifted to the intensive care unit (ICU) and initiated on subcutaneous enoxaparin 40 mg twice daily, dosed according to body weight. Bedside echocardiography showed normal biventricular size and function, with normal pulmonary artery pressure. Lower limb venous ultrasonography performed on the first ICU day was negative for deep vein thrombosis.

The patient was transferred to the general ward on postoperative day four. On day seven, subcutaneous enoxaparin was discontinued, and oral anticoagulation therapy was initiated. She was subsequently discharged in stable condition the following day.

At one-week follow-up, the patient experienced mild hematuria and was admitted for observation; she was discharged after two days with no further complications. At two-week follow-up, she reported complete resolution of symptoms and remained asymptomatic.

DISCUSSION

Pulmonary embolism (PE) is a rare but potentially life-threatening complication in patients undergoing PCNL. Several mechanisms may contribute, including intraoperative vascular wall injury (renal veins or adjacent pelvic veins), prolonged immobilization, hypercoagulable states secondary to infection or inflammation, and patient-specific risk factors such as diabetes, hypertension, and hypothyroidism [4,5].

Literature Review

- Paparidis et al., 2019 reported acute PE after PCNL in a previously healthy 44-year-old male [6].
- Wang et al., 2022 described PE combined with severe post-thrombolysis renal bleeding following mini-PCNL (16 Fr) [7].
- Jiang et al., 2019 identified giant hydronephrosis as a potential risk factor for pulmonary thromboembolism post-PCNL due to inferior vena cava compression and venous stasis [8].
- Escobar Monroy et al., 2025 reported that thromboembolic complications (DVT/PE) post-PCNL are rare, with incidence ranging from 0.2% in low-risk patients to 0.9–2.8% in higher-risk groups [9].

Although uncommon, these reports illustrate that PE can occur even in mini-PCNL settings and in the absence of prior major thrombotic risk factors.

Risk Factors and Preventive Strategies

In our patient, diabetes, hypertension, hypothyroidism, and previous renal surgery likely contributed to thrombosis risk. Diabetes has been associated with higher rates of major complications post-PCNL [5].

Formal guidelines for routine thromboprophylaxis in PCNL are lacking; however, the European Association of Urology (EAU) recommends mechanical prophylaxis (e.g., compression stockings, intermittent pneumatic compression) and pharmacologic prophylaxis in high-risk patients [4,10]. Early postoperative mobilization is also advised. In the PCNL setting, prolonged operative

time (3.5 hours in our case), prone positioning, multiple punctures, and potential vascular injury may further increase risk.

Diagnostic Considerations

D-dimer is highly sensitive but nonspecific in post-surgical patients. Elevation should prompt imaging when clinical suspicion exists [10]. In our patient, sudden hypoxia and hypotension suggested high-risk PE (systolic BP < 90 mmHg) consistent with European Society of Cardiology definitions [10]. Computed tomography pulmonary angiography (CTPA) remains the diagnostic gold standard [10].

Management and Outcomes

Prompt anticoagulation and thrombolysis in high-risk PE are essential. Systematic reviews show that thrombolysis reduces mortality, lowers pulmonary artery pressures, and improves right ventricular function [10]. Post-PCNL patients are at risk of bleeding at nephrostomy tracts or puncture sites. Wang et al., 2022 reported severe renal bleeding after thrombolysis requiring super-selective embolization [7]. In our case, bleeding was minimal and self-limited, reflecting careful monitoring and favorable outcome.

Reported mortality from PCNL complications, including urosepsis, hemorrhage, and PE, ranges from approximately 0.5–1.1% in large series [5].

Learning Points

- PE can occur even after mini-PCNL and may present early, within 24 hours postoperatively.
- High index of suspicion is required for unexplained hypoxia, tachycardia, hypotension, or chest discomfort post-PCNL.
- Preoperative assessment should include VTE risk factors (e.g., comorbidities, prior VTE, obesity, immobility) and surgical factors (duration, number of tracts, position).
- Mechanical prophylaxis and early mobilization may benefit high-risk patients.
- Rapid imaging (CTPA) and prompt treatment (anticoagulation ± thrombolysis) are critical; bleeding risk must be closely monitored.
- Post-thrombolysis care should include attention to nephrostomy tracts, puncture sites, hematuria, hemoglobin levels, and interventional radiology support if needed.

CONCLUSION

Although rare, PE is a potentially fatal complication following PCNL, including mini-PCNL, particularly in patients with comorbidities. Early recognition, prompt imaging, and timely intervention with anticoagulation or thrombolysis are critical for favorable outcomes. Close monitoring for bleeding post-thrombolysis is essential. Our case contributes to the limited literature, emphasizing that good outcomes are achievable with rapid recognition and management.

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