

Case Report

Acute liver injury and contralateral pleural effusion as two rare complications following percutaneous nephrolithotomy: a case report

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Abstract: Introduction: Percutaneous Nephrolithotomy (PCNL) is a widely used surgical intervention for removing large and complex renal calculi. While considered a safe and effective procedure, it can still lead to severe and rare complications, including bleeding, pulmonary complications, and liver dysfunction. Case presentation: This case report presents a case who underwent PCNL for a kidney stone and subsequently developed a series of rare and severe complications. Following the PCNL procedure, the patient experienced significant bleeding, a known but uncommon complication of PCNL, pulmonary complications, a common complication that may carry a risk of death, and acute liver failure, an exceedingly rare consequence of PCNL. Conclusion: In summary, while PCNL is a valuable technique for treating kidney stones, it is not without risk. This case underscores the importance of recognizing and managing rare complications following PCNL surgery, highlighting the need for vigilance, multidisciplinary care, and timely interventions to ensure favorable patient outcomes.

Keywords: Percutaneous nephrolithotomy (PCNL), pulmonary complications, pleural effusion, liver dysfunction, bleeding

Introduction

Renal calculi are a prevalent health problem often requiring surgery, particularly for large and complex stones. The management of kidney stones depends on several factors, including their size, shape, and location. In most cases, stones smaller than 4 millimeters can pass naturally, whereas those larger than 7 millimeters are unlikely to be expelled without surgical intervention. Other indications for kidney stone surgery include severe pain that cannot be relieved by medical treatments, obstruction accompanied by infection, bilateral obstruction, and obstruction in individuals with a single kidney [1]. PCNL is an effective method for clearing such stones, especially those in the lower calyx. This endourological technique is one of the best intervention methods to remove stones through percutaneous access, which has fewer complications than open surgical methods. However, serious complications can

still occur, albeit rarely [2, 3]. These complications include pulmonary problems, bleeding, damage to internal organs and the collecting system, urinary fistula formation, infection, and sepsis [4, 5]. Hemorrhage following PCNL can be a severe and life-threatening complication that may require angioembolism. However, in most cases, supportive measures are enough to control the bleeding [6]. Sometimes, a decrease in hematocrit and hemoglobin levels can occur without visible bleeding, indicating a possible perinephric hematoma that can be confirmed or rejected through computed tomography [7, 8]. Several factors can increase the risk of bleeding, such as prolonged operative time, stone size and type, high BMI, multiple access methods and routes, low experience of the surgeon, and damage to the renal pelvis and calyces [9].

Another complication of PCNL is pulmonary complications, which are common after surgery

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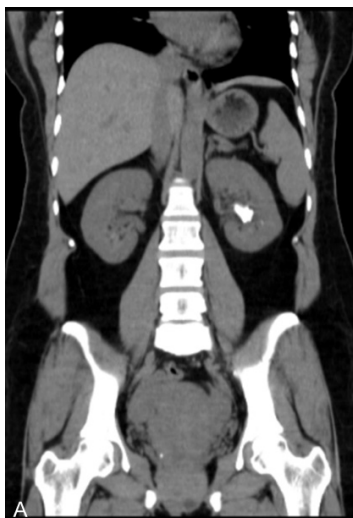
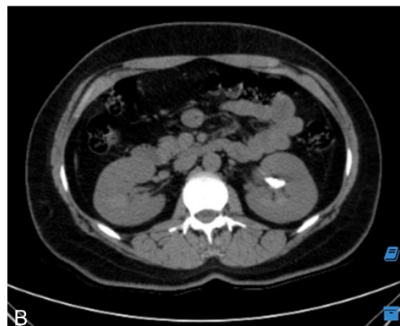


Figure 1. Abdominopelvic CT scan without contrast demonstrating lower calyx stone (2 cm) in left kidney. A. Coronal section. B. Axial section.



and may have a risk of death. Surgery near the diaphragm and close to the pleura, as well as supracostal access and anesthesia, are risk factors for causing pulmonary complications. In the PCNL technique, there is a risk of puncturing the pleura and lung, leading to pulmonary complications such as pneumothorax, hemothorax, pleural effusion, pneumonia, and atelectasis [10, 11].

Liver dysfunction, although rare, can occur as a consequence of PCNL, and often it has an unidentified cause. However, reduced liver blood flow can damage liver cells [12, 13]. This paper presents a woman of a 34-year-old who suffered from pulmonary complications, acute liver failure, and bleeding after undergoing PCNL.

Case presentation

A 34-year-old woman with no previous medical history presented to the urology clinic with left flank pain that had started approximately two weeks ago. Following a multi-detector row computed tomography (MDCT) of the abdomen and pelvis without contrast, a kidney stone in the left lower calyx was diagnosed, and the patient underwent PCNL surgery (**Figure 1**). After the surgery, the patient developed mild ileus, which improved within 48 hours post-operation. The decision to discharge the patient was made based on the improvement in her condition, absence of abdominal distention, and demonstration of successful defecation and gas passing while maintaining a stable general condition. There were no signs of fever or leukocy-

toxis. Discharge instructions were provided, and the patient was advised to seek immediate medical attention in case of persistent symptoms or changes in condition.

Twenty-four hours later, the patient presented to another emergency department with complaints of sweating, shortness of breath, and abdominal distention. She also experienced weakness, fatigue, nausea, and vomiting. Although she did not mention any lower urinary tract symptoms, she had gross hematuria. In

her surgical history, in addition to PCNL, she had undergone rhinoplasty surgery about six years ago and was only taking oral contraceptive pills (OCP) as medication. Physical examinations revealed a temperature of 39 degrees Celsius, tachycardia (PR=120), tachypnea (RR=24), pallor, decreased breath sounds, dullness on lung auscultation, and a nephrostomy tube at the site of the previous surgery.

The initial laboratory tests performed were as follows: Hematology: FBS=231, Urea=25, Creatinine=1.5, AST=21, ALT=19, ALP=155, WBC=22000 (NEU=85%, LYM=15%), Hb=11.2, PT=16.2, INR=1.33; UA: WBC=15-20, RBC>100, Nitrite +.

No bacterial growth was observed in the 24-hour urine culture, and the COVID-19 test was negative. Based on the clinical and para-clinical findings, a chest CT scan without contrast revealed right-sided pleural effusion and consolidation with an air bronchogram (**Figure 2**). For further management of the primary complaint and investigation of the underlying cause of the respiratory symptoms, a cardiac consultation was performed, based on which Pulmonary thromboembolism (PTE) was ruled out, and sinus tachycardia was reported on the electrocardiogram (ECG).

Two days after readmission, the patient developed a fever and urinary retention. Due to her reluctance to have a Foley catheter inserted, there was an increase in pressure within the kidney, which resulted in significant bleeding from the nephrostomy tube site. This extensive



Figure 2. Axial chest CT scan without contrast revealing right pleural effusion.

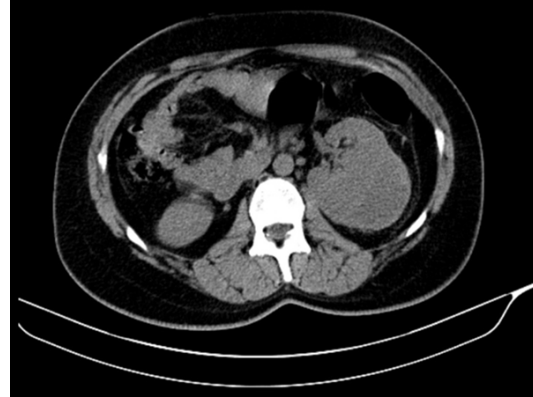


Figure 4. Axial Abdominopelvic CT scans without contrast confirm the decreased change in hematoma size after four weeks.

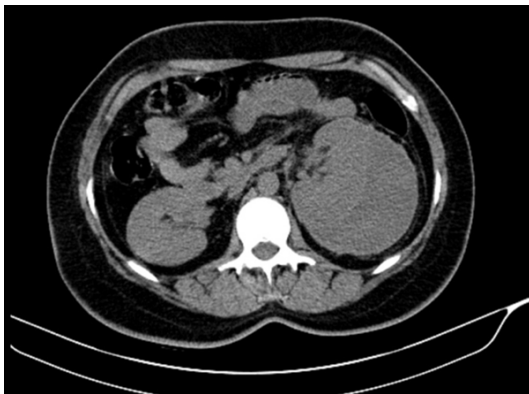


Figure 3. Axial abdominopelvic CT scans without contrast show perinephric hematoma in the left kidney.

bleeding led to a severe decrease in the patient's hemoglobin levels (Hb=7). Subsequently, the patient received four packed red blood cells and four fresh frozen plasma (FFP) units. After the insertion of a Foley catheter, urinary clean drainage was established. Also, during the hospitalization period, the patient developed elevated liver enzymes (AST=143, ALT=110, ALP=420) and coagulation abnormalities, leading to acute liver injury. An internal medicine consultation was initiated, and the possibility of rheumatologic diseases was considered due to the kidney bleeding and pleural effusion. However, after checking p-ANCA, c-ANCA, AMA, ASMA, and Lupus Ab, rheumatologic conditions were ruled out.

The day after catheter insertion, pleural fluid tapping was performed under sterile conditions and ultrasound guidance, revealing massive pleural effusion. Given the gigantic pleural effu-

sion and exudative analysis, a suitable pleural catheter was inserted under interventional radiology. The patient was subsequently transferred to the intensive care unit (ICU).

Cardiopulmonary monitoring was regularly conducted in the ICU, and significant bloody secretions were drained through the pleural catheter during the six days it was in place. After stabilizing, the patient was transferred to the general ward. A subsequent CT scan without contrast diagnosed a hematoma around the left kidney (**Figure 3**). The patient received supportive care and monitoring, and after 15 days of hospitalization and normalization of liver enzymes (AST=20, ALT=33, ALP=240), she was discharged. Follow-up examinations showed a decrease in the absorption of the hematoma around the left kidney (**Figure 4**).

Discussion

Percutaneous nephrolithotomy (PCNL) is the gold standard treatment for kidney stones more significant than 20 millimeters and measuring 10-20 millimeters in the lower calyx. Additionally, PCNL is the preferred method for managing stone types resistant to extracorporeal shock wave lithotripsy (ESWL), such as brushite, calcium oxalate monohydrate, and cystine stones. Despite being a minimally invasive surgical approach for kidney stone removal, PCNL is associated with potential complications [14].

Bleeding and respiratory complications are commonly observed after PCNL, but acute liver

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failure is an infrequent and unusual occurrence following the procedure. In this particular case, the patient experienced bleeding from the nephrostomy site on postoperative day 6, pleural effusion, pneumonia, and acute liver failure after PCNL. Post-PCNL bleeding, the most prevalent complication, can manifest immediately or with a delayed onset several days after the surgery. The primary cause of bleeding is typically attributed to renal vessel damage, resulting in the formation of pseudoaneurysms, arteriovenous fistulas, or arterial rupture. Gross hematuria is a crucial indicator of post-PCNL bleeding, accompanied by potential symptoms like flank pain, nausea, vomiting, and dizziness. The intensity of bleeding varies. Some cases experience severe bleeding and subsequent hemodynamic instability, which requires interventions like angioembolization. However, the bleeding subsides spontaneously in most instances and necessitates supportive measures [9, 15, 16]. In this patient, who experienced bleeding from the nephrostomy site, which could be attributed to excessive movement or pressure, supportive treatments, including fluid therapy and packed red blood cell transfusion, were administered.

Prompt diagnosis and management are critical due to the potential severe consequences of renal bleeding. Therefore, appropriate assessments were conducted, and necessary measures were implemented for the patient.

Patients undergoing PCNL are at risk of respiratory complications, influenced by factors such as surgical technique, patient-related characteristics, and postoperative events. Intercostal access to the collecting system, compared to the subcostal surgical method and access through the upper pole of the kidney and left-sided surgery, due to its proximity to the pleura and lung, increases the likelihood of pulmonary complications. Prolonged hospitalization post-operation and admission to the ICU are also associated with an increased risk of pulmonary complications. Additionally, intraoperative blood transfusion is a risk factor for postoperative pulmonary complications. Ample irrigation fluids during PCNL can contribute to congestion and pulmonary edema [10, 11, 17, 18]. Based on the literature, pulmonary complications after PCNL are a recognized adverse event. In most studies, including the study by

Swarnendu Mandal et al., pulmonary complications such as pleural injury and subsequent pleural effusion occur in the setting of supra-costal access. However, we have shown in this study that pleural effusion can occur even with subcostal access and without pleural injury [3]. Additionally, in studies such as the one by Gili Palnizky et al., pulmonary complications are possible on the surgical side due to proximity to the pleura when accessing the upper pole [11]. However, access was through the lower pole in our patient, and contralateral pleural effusion occurred. Therefore, it should be noted that while the surgical skill method and location of access to the kidney are essential in causing pulmonary complications, the risk of such complications should be considered even without known risk factors.

In our study, we anticipated that if a pleural effusion were to occur due to irrigation during surgery and fluid absorption from the diaphragmatic crus, it would be on the same side as the surgery. However, contrary to our expectation, the patient developed pleural effusion on the non-operated side, which was unusual. Symptoms such as dyspnea, cough, and decreased breath sounds on that side were observed. The patient has become a distinct and rare case since pleural effusion often occurs on the side where PCNL is performed. Additionally, the patient experienced pneumonia with symptoms of fever and respiratory difficulty, possibly resulting from the aspiration of oral or respiratory secretions during the procedure.

Acute liver failure is a rare complication following PCNL. Generally, anesthesia and surgery-related stresses can cause varying degrees of liver damage. The effects of anesthesia and surgery often lead to disruptions in liver blood flow, resulting in hepatic ischemia. Additionally, medications used during and after surgery can contribute to liver injury in susceptible individuals. Supportive treatments are usually provided until the liver regains standard function [13, 19-21].

Studies on hepatic complications following PCNL are minimal; among them, the study by Nguyen et al. is noteworthy. In this study, three cases of liver injury were examined, all of which underwent right PCNL and subsequently developed liver injury [22]. Hepatic complications are rare and often not given much attention during

surgery [23]. This study emphasizes considering uncommon and rare complications and being prepared for their occurrence. In our case study, the patient experienced elevated liver enzymes and coagulation disorders a few days after the surgery. Close monitoring of liver function and supportive care were implemented, and after approximately two weeks, the liver enzymes returned to their normal levels.

Conclusion

In conclusion, although percutaneous nephrolithotomy (PCNL) is an effective technique for treating renal calculi with fewer complications than other invasive methods, it is not without its specific risks, as with any surgical procedure.

This case highlights the complexity of complications arising after PCNL surgery for kidney stone removal. While bleeding is a known complication of PCNL, the occurrence of acute liver failure and pleural effusion on the contralateral side of surgery was unexpected. The management of this patient required a multidisciplinary approach involving urology, internal medicine, interventional radiology, and intensive care teams. Prompt recognition of the patient's deteriorating condition and timely interventions, such as pleural fluid tapping and inserting a pleural catheter, were crucial in stabilizing her respiratory status.

Therefore, it is essential to be aware of the potential rare complications and monitor patients closely after PCNL surgery. Vigilance and prompt intervention are crucial in managing any adverse events that may arise, ensuring optimal patient outcomes, and minimizing the impact of such complications. Further research and experience sharing in the medical community are valuable in expanding our knowledge and improving the overall safety and efficacy of PCNL as a kidney stone treatment option.

Disclosure of conflict of interest

None.

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