Synchronous Endovascular Management of Concurrent Renal Pseudoaneurysm and Arteriovenous Fistula After Percutaneous Nephrolithotomy: A Case Report

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Abstract

Pseudoaneurysm and arteriovenous fistula are vascular complications of percutaneous nephrolithotomy (PCNL) that may present with delayed haematuria. A 58-year-old man on maintenance haemodialysis presented with left flank pain and macroscopic haematuria after left PCNL. CT angiography with multiplanar and three-dimensional reconstructions demonstrated a pseudoaneurysm arising from a branch of the left renal artery with early opacification of the left renal vein. Digital subtraction angiography confirmed the vascular lesions, and selective coil embolization was performed. Post-embolization angiography showed reduced flow through the fistula. No macroscopic haematuria was observed on the second post-procedure day, and the patient's condition improved. This case illustrates the contribution of CT angiography to treatment planning and the short-term result of selective embolization of concurrent post-PCNL vascular lesions.

Keywords: AV fistula; pseudoaneurysm; therapeutic embolization

Introduction

Percutaneous nephrolithotomy (PCNL) is still considered the standard treatment for the management of staghorn/ large kidney stones, upper pole stones resistant to other treatments, difficult-to-reach lower pole stones, cystine stones, and stones in kidneys with abnormal anatomy. PCNL is a safe and time-tested procedure associated with complications ranging from transient peri-nephrostomy catheter urine leakage (15.2%) to vascular injury (1.4%) and sepsis (0.6%) [1]. Vascular complications such as Pseudoaneurysm (PA) and AV fistula (AVF) are associated with delayed bleeding and the concomitant occurrence of the same is rare.

Case Presentation

A 58-year-old male patient on maintenance hemodialysis presented with complaints of left flank pain for 1 month and blood in urine for 17 days. The patient had bilateral staghorn calculus and a few secondary smaller calculi with left calculus causing grade 2 hydronephrosis. PCNL procedure for the left renal calculus 1 month back was followed by delayed haematuria suggestive of vascular injury. Clinically, there was macroscopic haematuria, low hemoglobin level (8 gm/ dl), and metabolic acidosis with raised serum creatinine (2mg/dl).

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CT Angiography

CT-Angiography on a Siemens MS-CT Scan (128 Slice), Definition AS+ Excel Siemens showed a saccular out-pouching/puddling of contrast along the distal part of the middle segmental artery of the left renal artery in arterial phase suggestive of PA with early opacification of the left renal vein suggestive of AVF (Figure 1A-B). Multiplanar and 3-D reconstruction confirmation done for embolization planning (Figure 1C).

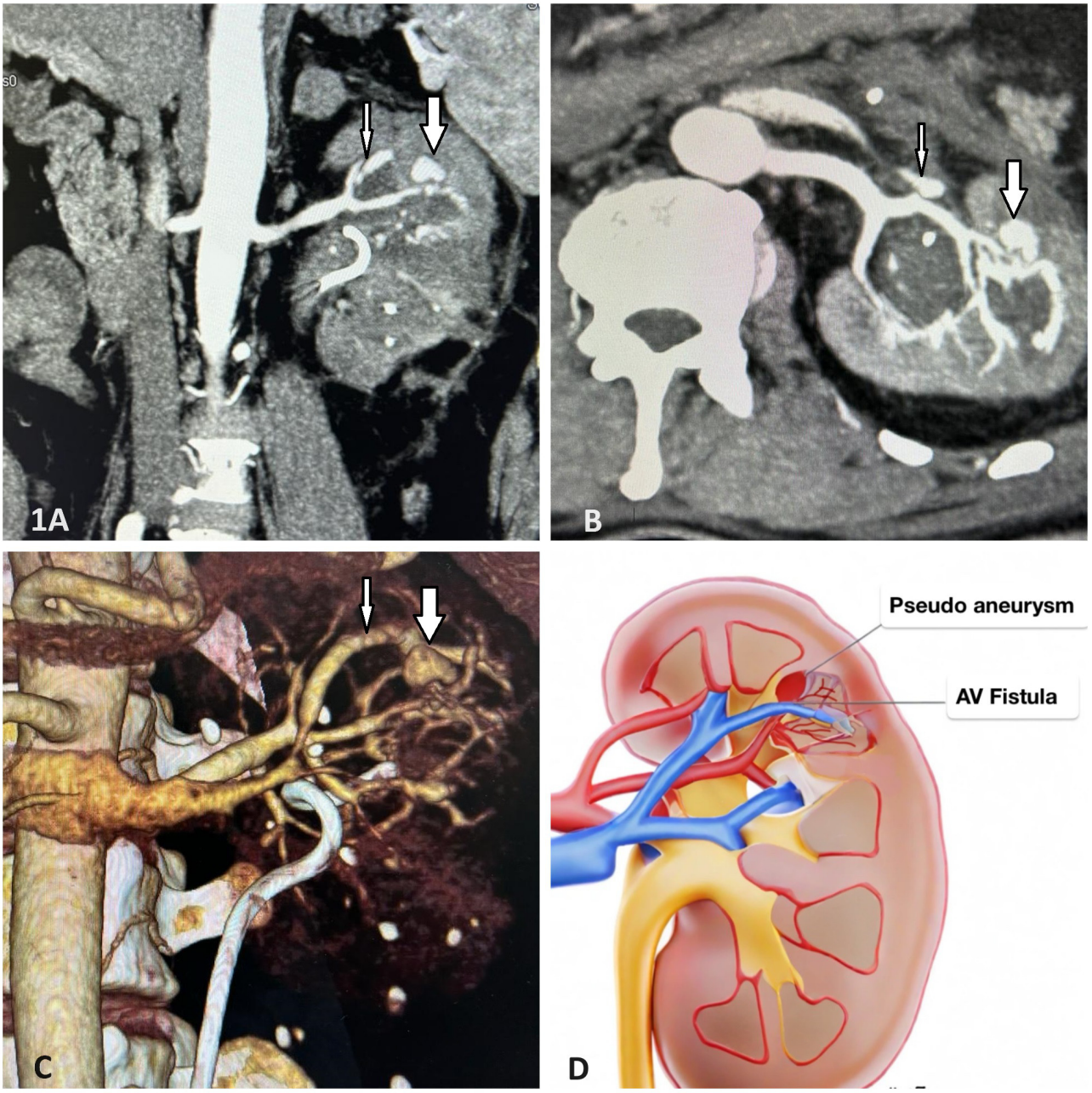


Figure 1. CECT of a post-PCNL renal pseudoaneurysm with arteriovenous fistula in the left kidney. A. CT angiography in coronal section showing the pseudoaneurysm (thick arrow) with early draining vein (thin arrow). B. CT angiography in axial section showing the pseudoaneurysm (thick arrow) with early draining vein (thin arrow). C. Volume rendering showing the pseudoaneurysm (thick arrow) with AVF showing early draining vein (thin arrow). D. Diagrammatic representation of the renal pseudoaneurysm with AVF.

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Angiography and Embolization

Using a 5F Cobra catheter Digital subtraction angiography (DSA) of left renal artery showed an abnormal tuft of vessels noted distally at the mid-pole of the left kidney with an abnormal vessel (AV Fistula) arching over from this region to drain into the left renal vein (Figure 2 A-B). Selective angiography with a 4F H1 catheter in mid-segmental artery was performed followed by coil embolization using a peripheral coil (3 mm × 3 cm) deployed at this region with its tip at the AVF and proximal end remaining in the supplying midsegmental artery (Figure 2C). Post-procedure DSA at 5 minutes shows the coil deployed in situ with a reduction in flow across AVF and the absence of tuft of vessels (Figure 2D). Post-procedure day 2 shows no macroscopic hematuria with eventual improvement in the patient's condition.

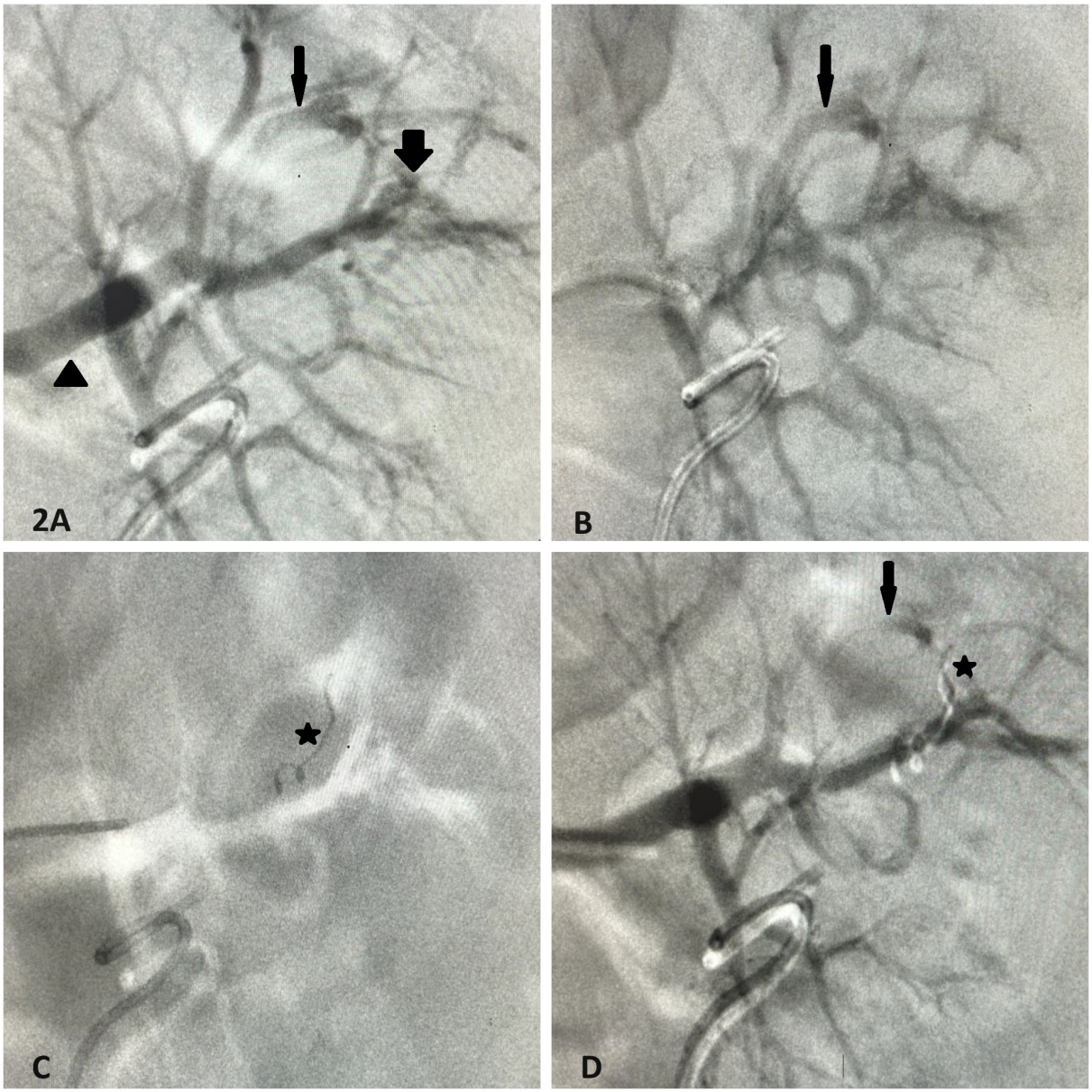


Figure 2. Digital subtraction with embolization of post-PCNL renal pseudoaneurysm with arteriovenous fistula. A. DSA of left renal artery showing normal left renal artery (triangle), with arterio-venous fistula (thin arrow), the pseudoaneurysm (thick arrow) is faintly seen. B. On selective segmental artery injection, the fistula is better seen (thin arrow). C. Endovascular peripheral coil (star) deployment in the feeding vessel done. D. Post-coil deployment (star) showing reduced flow in the AVF (thin arrow).

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Discussion

PCNL though less invasive compared to open surgery, can still be associated with a wide range of complications. Vascular injury is a rare and major complication with risk factors like UTI, diabetes mellitus, stone complexity, number of stones, puncture site, and number of punctures [2]. Delayed bleeding is defined as bleeding after 24 hours with most frequent angiographic findings being arterial pseudoaneurysms and/or AVF [3]. It results in hematuria, hypertension, decreased renal function, and congestive heart failure. Segmental arteries are more commonly involved than their peripheral branches.

El-Nahas et al. retrospectively reviewed 2,909 patients who underwent 3,878 PCNL procedures. Severe bleeding requiring angiographic renal embolization complicated 39 procedures (1%). Angiography demonstrated pseudoaneurysm in 20 patients, arteriovenous fistula in 9, both lesions in 8, and arterial laceration in 2. Superselective embolization controlled bleeding in 36 patients (92.3%) [4].

Although Angiography is the gold standard investigation, CT Angiography is the initial investigation of choice and the modality of choice for follow-up. Studies have reported a high sensitivity of 86.8 - 90.3% and a high specificity of 83.3 – 100% [5, 6] for CT analysis. Active bleeding appears as a focal area of high density on the arterial phase, increasing in size on the venous phase, whereas PA does not increase in size. AVF appears as early contrast filling off the renal vein, thereby assisting in endovascular planning.

Selective angio embolization is the treatment of choice, considering the less invasiveness and parenchymal loss. Persistent bleeding, hemoglobin drop of ≥ 3 gm/dl, and hemodynamically unstable patients are the indications for TAE. The success rate of embolization for vascular injuries post PCNL varies from 85% to 100% [7].

TAE can result in various complications, use of smaller catheters or microcatheters inserted coaxially to the desired target lesion mitigates those risks [5]. Different embolizing agents such as particulate agents, liquid agents, and micro coils can be used alone or combined to treat. Simultaneous treatment of PA and AVF in this case, proved to be technically challenging with the risk of dislodgement and embolization of embolic agents.

Conclusion

CT angiography with multiplanar and three-dimensional reconstructions helped identify concurrent pseudoaneurysm and arteriovenous fistula after PCNL and supported endovascular treatment planning. In this patient, selective coil embolization reduced fistula flow, and no macroscopic haematuria was observed on the second post-procedure day.

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Conflict of Interest

The authors declare that there were no conflicts of interest within the meaning of the recommendations of the International Committee of Medical Journal Editors when the article was written.

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