

Micro-coils Migration During Arteriovenous Fistula Embolization Post Partial Nephrectomy

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Abstract

Iatrogenic arteriovenous fistula (AVF) is one of the rare complications of partial nephrectomy that is seen in 1.96% of the laparoscopic surgery approach cases and 1% of the open surgery approach cases. Coil embolization is the treatment of choice for such a complication. Nevertheless, coil embolization is associated with the risk of migration from the placement site to an unwanted location; leading to increased thrombosis-induced morbidity and mortality. This case report presents a 67-year-old male patient with a solitary right-functioning kidney and three masses in the upper, middle, and lower poles. Initially, the patient underwent an open partial nephrectomy. Two weeks post-discharge, the patient developed haematuria and flank pain. The patient was admitted to the hospital and an angiography was performed for him. It showed a large pseudoaneurysm with a high-flow AV fistula. Embolization was executed with a micro-coil 3mm and interval migration was noted to the right atrium. During the procedure, the patient was vitally stable. The patient received conservative management post-procedure and was followed up for one year.

Keywords: micro-coil migration, arteriovenous fistula embolization, partial nephrectomy.

Introduction

Iatrogenic arteriovenous fistula (AVF) is one of the rare complications of partial nephrectomy. Such complications may lead to bleeding, deterioration in renal function, and hypertension secondary to arteriovenous shunting.¹ Studies indicate that the incidence of arteriovenous fistula (AVF) after partial nephrectomy is 1% (i.e. after an open approach surgery) and 1.96% (i.e. after a minimally invasive approach surgery), respectively.^{1,2}

Currently, the mainstay treatment for Iatrogenic AVF is artery angioembolization.²In such a procedure, the distal artery branch is embolized using a variety of clotting agents like detachable balloons, coils, particles, and Nbutyl-2-cyanoacrylate.² Several studies acknowledge the use of micro coils for distal super-selective embolization, thus preventing more parenchymal loss and deterioration in renal function.^{1,2} It is important to highlight that Iatrogenic AVF can be associated with pseudoaneurysm (SA), which may make endovascular embolization difficult and increase the risk of distal dislodgement of the embolization particles.²

Looking at the literature, studies around the management of coil migration after partial nephrectomy are limited. Hence, it is worth looking at the current case report to expand the knowledge around coil migration management after partial nephrectomy. This case report presents a patient with micro-coil migration to the right atrium post-AVF embolization for one year.

Case Report

A 67-year-old male patient with diabetes, hypertension, and stage two chronic kidney disease (CKD) presented with a solitary right-functioning kidney. The right kidney had two upper and lower pole lesions. The upper renal mass was cystic and was 2.6 cm in size [Figure 1], and the lower pole was 0.8 cm large. The patient underwent an open partial nephrectomy with resection of all lesions. Intraoperatively, an additional 1 cm solid lesion was detected next to the renal cyst (i.e. in the middle pole) and was immediately removed. During the recovery period, the patient witnessed a drop in hemoglobin with episodes of hypotension. The patient was bleeding from the subcostal vein. The patient was taken to the emergency theatre, bleeding was controlled immediately, and the renal function (i.e. GFR) was reserved.



Figure 1: Right upper renal mass, with atrophic left kidney and simple cyst.

Two weeks after discharge, the patient presented to the emergency room with a complaint of right loin pain, haematuria, and deranged renal function. Ultimately, the patient was admitted and underwent retrograde stenting to relieve clot obstruction. The renal function had improved from GFR 21 to 54 ml/min/1.73m². Unfortunately, the patient continued to have haematuria. Angiography was performed to rule out the rationale behind haematuria and it showed a large pseudoaneurysm with a high-flow AV fistula [Figure 2]. An intervention radiologist was involved to perform embolization with a 3 mm micro-coil [Figure 3].

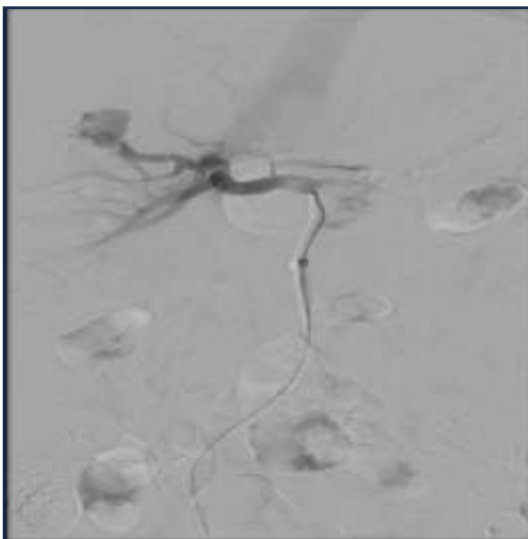


Figure 2: Arteriovenous fistula with pseudoaneurysm.

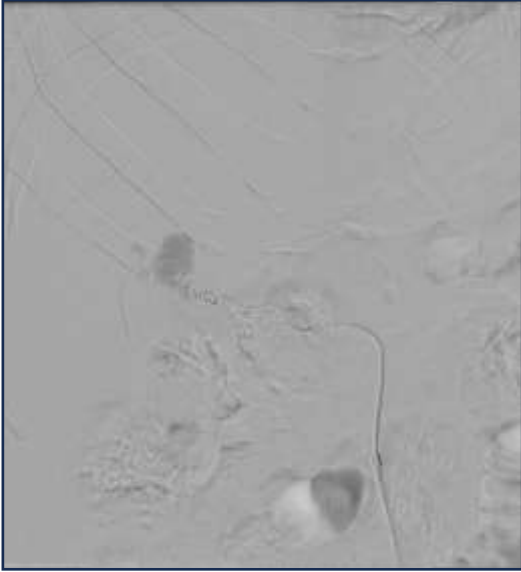


Figure 3: 3mm micro-coil embolization.

Inadvertent migration of the micro-coil was noted to the right heart. Coil aspiration was tried but failed [Figure 4]. Coils size was upsized to 6mm. A complete stasis and resolution of the aneurysm were achieved [Figure 5]. The patient remained vitally and hemodynamically stable during the procedure. Later, an echocardiogram was performed and it showed no evidence of cardiac shunt, and the coil was seen in the right atrium. The haematuria was settled, and renal function (i.e. GFR) returned to its baseline 58(ml/min/1.73m²). Importantly, the histopathology results of the resected masses showed papillary cell carcinoma. The patient was followed up after 6 months and was found to be stable, with no active complaints, and normal renal function. A Contrast-Enhanced Computed Tomography (CECT) reflected no evidence of recurrence. The micro coil was seen in the right atrium and showed no evidence of thrombus formation. Moreover, the annual follow-up with CT staging showed no recurrence and a stable coil site and size [Figure 6].

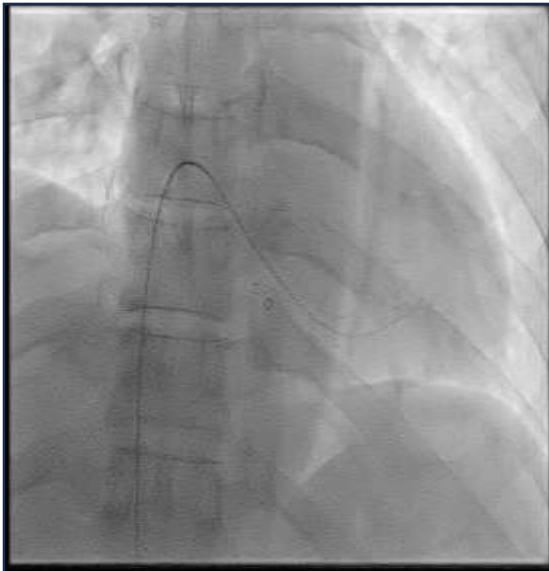


Figure 4: Trail of micro-coil retrieval from the right atrium.

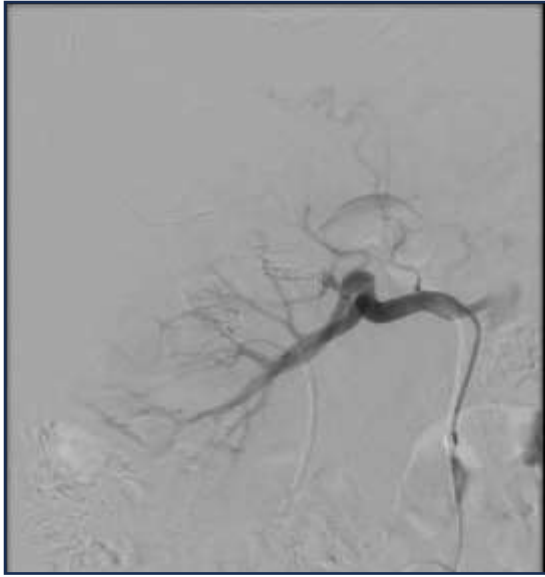


Figure 5: Resolution of AVF using 6mm micro-coil.

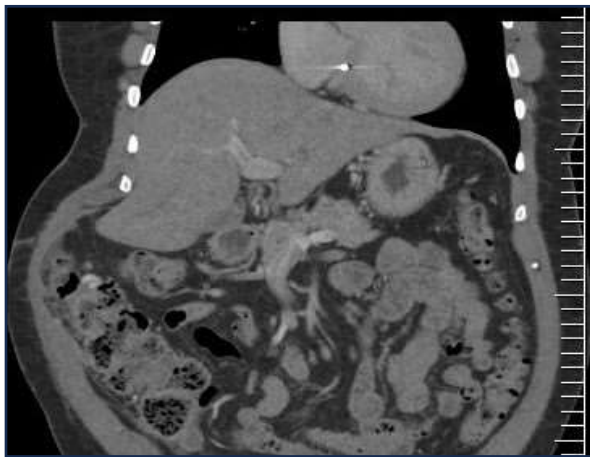


Figure 6: Follow-up CT abdomen showed right atrial micro-coil.

Discussion

Partial nephrectomy is a safe treatment option for patients with solitary kidney and who have an acceptable decline in renal function; to avoid subsequent hemodialysis.³ An arteriovenous fistula is usually asymptomatic but can present with haematuria, flank pain, hydronephrosis, and heart failure due to arteriovenous shunting.⁴

Currently, super-selective artery embolization (SAE) is the main standard treatment of renal AVF after iatrogenic vascular injury.² In this case report, a super-selective micro-coil measuring 3mm was used; to ensure that the embolization was carried out to the bleeding artery and prevent further renal function deterioration.^{2,4}

The reported patient was found to have both pseudoaneurysm with AVF, causing high-flow AVF. Generally, in patients with high-flow AVF, embolization carries a higher risk of coil migration.⁴ Studies stress that using 035 and 018 interlock coils can effectively treat high-flow AVF by preventing coil migration.⁴ Regarding the current case's AVF management, efforts were made to manage the lesion with a smaller micro-coil measuring 3mm. Despite the AVF being high flow, the lesion was initially addressed with a smaller micro-coil measuring 3mm as we want to prevent renal function deterioration and target only the affected most distal vessels. However, the occlusion of the lesion could be achieved with a 6 mm micro-coil.

Studies have shown that the incidence of coil migration post-embolization is 2.4%-2.8%.⁵ What is more, coil migration is associated with significant morbidity and mortality rates due to vascular occlusion.⁵ Fu J and Hsia D

report a case of coil migration post-varicocele embolization that had led to distant pulmonary embolism.⁶ Nonetheless, in this case report, due to coil retrieval complications, the patient was kept on conservative management. Chomyn JJ et al. report successful percutaneous retrieval of a migrated coil to the right lower lobe pulmonary artery.⁷ The percutaneous approach is the safest approach for removing intracardiac foreign bodies.⁵ However, some studies also show that the success rate of coil retrieval is about 50%.⁸ In difficult cases, an open sternotomy might be needed, and that carries high-risk complications so complications must be weighed against conservative management.⁹

A literature review by Wang X et al. suggests early removal of intracardiac foreign bodies to prevent thrombosis, infection, and distal embolization.¹⁰ However, after one year of follow-up, we didn't find any complications or signs of thrombosis. During this year the patient had a normal lifestyle and was not placed on anticoagulant as we discussed with the hematologist and advised not to keep him on an anticoagulant. Furthermore, recent reports found that intracardiac foreign bodies that are smooth, clean, and embedded within the myocardium can be left due to a lower risk of life-threatening issues.^{11,12} Especially, the small size of the coil and the absence of cardiac shunting yield a low risk of thrombosis-related morbidity and mortality. In this case report, after one year of follow-up, no thrombosis or other complications were noted and that could be attributable to the small coil size. The small coil size could hardly cause thrombosis.

Conclusion

Iatrogenic arteriovenous fistula (AVF) is one of the rare complications of partial nephrectomy. Embolization is the treatment of choice for Iatrogenic AVF. Moreover, embolization is a minimally invasive procedure that requires high operator experience and skills as there are fewer options to manage the related complications. In this case report, the AVF repair procedure was complicated by an accidental dislodgement of the micro-coil and migration to the right atrium. A trial of the micro-coil retrieval was made but failed due to the small coil size. Based on the discussion with the interventional radiologist and a rigorous literature review, the current case was managed using a conservative treatment approach. The patient was followed up for one year and that could be achieved only because the patient held a low risk of thrombosis. For one year, the micro-coil was visualized in the right atrium with no symptoms noted on the patient's hemodynamics and no evidence of thrombus formation.

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