

## Vascular Interventions Case Report

# Renal artery embolization post subtotal nephrectomy for xanthogranulomatous pyelonephritis: A case report

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## ABSTRACT

Xanthogranulomatous pyelonephritis (XGPN) is a rare, chronic disease characterized by the destruction of renal parenchyma and replacement with granulomatous tissue and is associated with long-term obstructive uropathy, chronic renal parenchymal infection, and nephrolithiasis. A 57-year-old patient with XGPN was unable to undergo total nephrectomy. Renal artery embolization (RAE) was performed post subtotal nephrectomy as adjunct therapy to prevent urine formation and decrease the risk of post-operative infection. Our case report demonstrates that RAE can be performed safely and effectively without evident complications and underscores the utility of cone-beam computed tomography in cases of altered post-surgical anatomy. To the author's knowledge, this is the second case in the literature demonstrating perioperative management of XGPN with RAE.

**Keywords:** Embolization, Interventional radiology, Radiology, Renal, Xanthogranulomatous pyelonephritis

## INTRODUCTION

Xanthogranulomatous pyelonephritis (XGPN) is a relatively infrequent entity, accounting for less than 1% of histologically documented and approximately 20% of surgically managed pyelonephritis cases.<sup>[1]</sup> Therapeutic options include conservative management, antibiotic regimens, and surgery with the choice dependent on the severity of the patient's renal dysfunction and their overall clinical status. Surgical nephrectomy remains the definitive treatment of XGPN but is recognized as a technically challenging surgery.<sup>[2]</sup> It is a high-risk procedure associated with both minor and severe complications including chronic infection, draining cutaneous fistulas, and delayed wound healing. Given the inflammation and perinephric adhesions associated with XGPN, in some cases, it is not possible to safely remove all the renal parenchyma due to the potential risk of bleeding and injury to adjacent organs.<sup>[3]</sup> In this case report, post-operative renal artery embolization (RAE) was performed after subtotal nephrectomy for infection prevention in a patient with XGPN.

## CASE REPORT

A 57-year-old male with a history of hypertension and Type II diabetes presented to our hospital after he was thrown from a horse. He presented with left-sided flank pain, chest pain, and dyspnea which prompted a trauma work-up including computed tomography (CT) of the chest, abdomen, and pelvis. In addition to several left-sided rib fractures, an incidental cystic retroperitoneal mass

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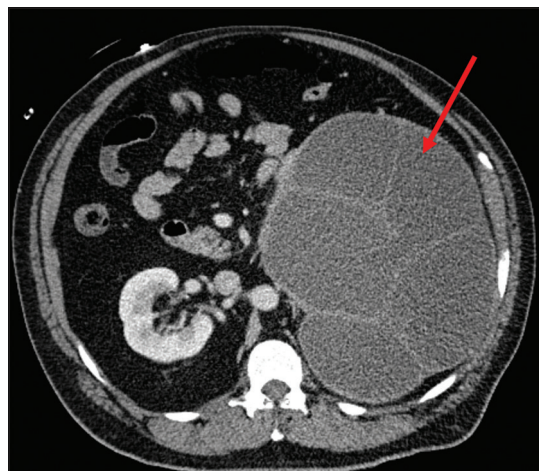
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replacing the left kidney measuring  $22 \times 17.9 \times 26$  cm was identified [Figure 1]. The differential diagnosis included multicystic dysplastic kidney, chronic severe ureteropelvic junction (UPJ) obstruction, and other cystic renal lesions (Bosniak 3). He was admitted for the management of his traumatic injuries and scheduled for subsequent outpatient follow-up of his renal mass.

On preliminary outpatient investigation, the patient denied history of abdominal pain, fevers, urinary tract infection, nausea, vomiting, urinary stone disease, and gross hematuria. A Tc-99m MAG-3 Lasix renogram demonstrated less than 1% function from the left kidney. Multiphasic magnetic resonance imaging (MRI) was performed for characterization and demonstrated an enlarged, non-enhancing left kidney with communication of the cystic areas, favoring severe hydronephrosis thought to be secondary to chronic UPJ obstruction. Given the size of the kidney and concern that if it became infected, it could be life threatening, the patient was scheduled for an open nephrectomy.

Intraoperatively, a markedly enlarged left kidney was identified containing 2–3 L of purulent fluid, fatty accumulation within the walls, and significant inflammatory adhesions to surrounding structures. These intraoperative and subsequent pathologic findings were consistent with a diagnosis of XGPN. The size of the kidney and the degree of adhesions made complete removal technically difficult, leading to a colonic serosal tear requiring intraoperative repair. A subtotal nephrectomy was performed to minimize further complications. Postoperatively, interventional radiology was consulted for embolization of the left renal remnant to prevent urine formation and decrease the risk of post-operative infection.

The patient presented for the left RAE 48 h post-nephrectomy. The procedure was performed under a moderate conscious sedation protocol. The left renal artery was accessed in the standard fashion utilizing a 5F C2 catheter (Cook Medical, Bloomington, Indiana, USA) from a right common femoral approach. The left renal arteriography demonstrated unusual branching from the left renal artery and no well-defined renal parenchyma [Figure 2a]. Given the irregular appearance, contrast-enhanced cone-beam CT (CBCT) was performed to confirm catheterization of the left renal artery before embolization. It demonstrated enhancement of distorted residual renal parenchyma in the left retroperitoneal resection bed as had been delineated on the pre-procedural CT [Figure 2b]. A 6F occlusion balloon catheter (Edwards Lifesciences, Irvine, California, USA) was inflated in the left renal artery and contrast was injected to determine the embolic volume required. A total of 10 mL of dehydrated alcohol was administered and allowed to dwell for 10 min before aspiration and balloon deflation. Post-embolization arteriography demonstrated a proximally originating



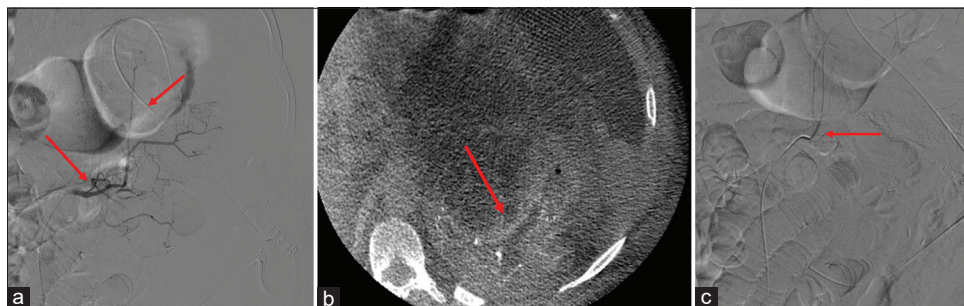
**Figure 1:** A 57-year-old male who presented after a traumatic injury was found to have a large renal mass on imaging and intraoperatively diagnosed with xanthogranulomatous pyelonephritis. Axial venous phase computed tomography abdomen pelvis shows the large multicystic mass (arrow) completely replacing the left renal parenchyma.

accessory renal artery that was incompletely treated with the initial embolization [Figure 2c]. This was effectively selected utilizing the occlusion balloon and embolized as described above with 2 mL of dehydrated alcohol. Post-embolization arteriography demonstrated cessation of blood flow into the left renal artery and proximal divisional branch [Figure 3]. The patient was discharged 6 days after the primary operation.

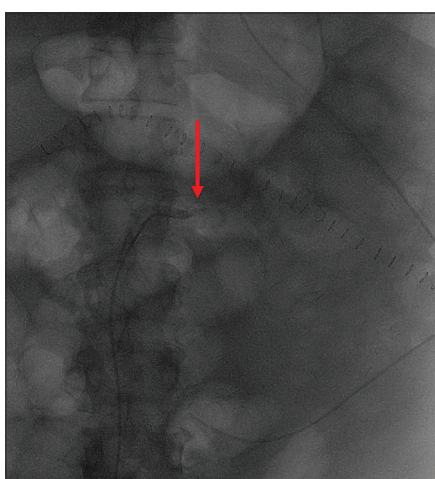
The patient's post-operative course was complicated by colonic perforation and an abdominal abscess related to the intraoperative colonic injury. An exploratory laparotomy with abdominal washout and segmental colectomy were performed. The abscess, which showed no evidence of communication with the embolization bed, was managed by a percutaneous pigtail drainage catheter. The patient developed a fistulous connection between the surgical drain and the distal descending colon which persisted at 3 months postoperatively. Nonetheless, the patient was clinically free of infection in the embolization bed or otherwise attributable to the embolization.

## DISCUSSION

XGPN is a chronic renal disease involving destruction of the parenchyma. Clinically variable, patients can be asymptomatic or present with GI and urological symptoms including flank pain, abdominal pain, lower urinary tract symptoms, palpable mass, gross hematuria, and weight loss.<sup>[4]</sup> Urine cultures are frequently positive for *Escherichia coli* and *Proteus mirabilis*, although up to 25% of patients may have negative cultures.<sup>[5]</sup> The primary modality for the diagnosis of XGPN is a CT of the abdomen and pelvis; however, it remains



**Figure 2:** (a) A 57-year-old status post-partial nephrectomy for intraoperatively diagnosed xanthogranulomatous pyelonephritis. The left renal arteriography demonstrated unusual branching (arrow) from the left renal artery and no well-defined renal parenchyma. (b) Cone-beam computed tomography demonstrates enhancement within the operative bed (arrow) in the expected location of the residual left kidney. (c) Angiogram demonstrated a proximally originating accessory branch (arrow) that was incompletely treated with the initial embolization.



**Figure 3:** A 57-year-old male status post-partial nephrectomy and alcohol embolization of the left renal artery and proximal divisional branch for xanthogranulomatous pyelonephritis. Post-embolization demonstrates cessation of blood flow in both the left renal artery and the proximal accessory renal artery branch (arrow).

a challenging entity to diagnose with 22%–50% correctly identified preoperatively.<sup>[1,2]</sup> Typical CT findings include an enlarged reniform mass with central staghorn calculus in a non-dilated pelvis, small calculi, calcifications, non-enhancing renal parenchyma, and parenchymal abscesses.<sup>[2,3]</sup> Based on these clinical, laboratory, and imaging findings, the differential diagnosis generally includes pyonephrosis, renal cell carcinoma, renal tuberculosis, and renal lymphoma. Histologically, XGPN presents with inflammatory infiltrate composed of neutrophils, lymphocytes, plasma cells, xanthomatous histiocytes, and multinucleated giant cells.<sup>[4]</sup> Treatment is conservative for asymptomatic patients and can escalate to antibiotics and nephrectomy based on severity.

Our 57-year-old male patient presented to the hospital after a traumatic injury and a bulky renal mass was incidentally found on imaging. This patient had an atypical presentation of XGPN with no identifiable renal stones, infections, or

other classic symptoms. Furthermore, the appearance of the left kidney was suggestive of chronic UPJ obstruction on pre-operative CT and MRI. The diagnosis of XGPN was suspected intraoperatively and was confirmed histologically.

RAE is a minimally invasive endovascular procedure that is used routinely for pre-operative management of renal malignancy and angiomyolipomas as well as treatment of traumatic bleeding and ablation of renovascular disease.<sup>[6,7]</sup> It is also used as an alternative therapy for end-stage renal disease and post-transplant non-functional renal allografts.<sup>[8,9]</sup> Embolization can be conducted using particulates, sclerosants, glue, coils, and alcohol.<sup>[7]</sup> We utilized alcohol which is safe and effective for permanent destruction of the renal vascular supply. After embolization, adequacy was assessed with an angiogram showing complete cessation of blood flow. Common complications of RAE include access site complications, hematoma, infection, vascular dissection, post-embolization syndrome, and necrotic pyelonephritis.<sup>[7,10]</sup> A rare, serious complication of RAE is non-target embolization, be it from coil migration or off target embolization of particulates or alcohol.<sup>[7]</sup>

To the best of our knowledge, the only other reported case of RAE used for post-operative infection prevention in an XGPN kidney was a 17-year-old male who failed conservative management and underwent subtotal nephrectomy. Concern for repeat infection due to continued urine production and persistent pain led to RAE. This patient, as opposed to our patient, had renal and perinephric abscesses before nephrectomy requiring intraoperative drain placement. This patient also had a chronic discharging wound at the drain site postoperatively. The patient did well after discharge, and he was free of infections at his 1-year follow-up.

Both our case and the prior case report on this topic suggest RAE to be an effective adjunct to subtotal nephrectomy for the management of XGPN and prevention of post-operative infection. Our case also illustrates the utility of CBCT for delineation of complex anatomy and ensuring

technical success. Moreover, knowledge that RAE can be utilized in adjunct to subtotal nephrectomies may serve to alleviate some of the technical burden associated with radical nephrectomies. As our case and the prior report demonstrate, RAE is an effective adjunctive treatment for subtotal nephrectomy in XGPN to reduce associated complications.

## CONCLUSION

Our case report enhances the current literature on use of RAE in the management of XGPN in the following ways: First, RAE is a minimally invasive treatment that appears to be a useful adjunct to the established surgical nephrectomy for the management of XGPN. Second, RAE may be offered in the perioperative period to minimize the risk of developing chronic recurrent infections as had been seen in the previous case report. Third, this additional therapy may decrease the risk of intraoperative and post-operative complications. Fourth, the use of CBCT in this case proved valuable as a tool for evaluating complex, distorted anatomy, and directly contributed to a technically successful embolization. Longitudinal follow-up will be beneficial to assess long-term results associated with RAE management for XGPN.

## Declaration of patient consent

Patient's consent not required as patients identity is not disclosed or compromised.

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Nil.

## Conflicts of interest

There are no conflicts of interest.

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