

## A Giant Pseudoaneurysm Following Robot-Assisted Laparoscopic Partial Nephrectomy

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### Abstract

Renal artery pseudoaneurysm (RAP) is a rare complication after partial nephrectomy. Here we present a 63-year-old male who had an incidental finding of a right renal cancer, with stage T1bN0M0. The patient underwent a robot-assisted laparoscopic partial nephrectomy and presented with a giant RAP since one month after the operation. He was successfully treated by an angiography with selective embolization.

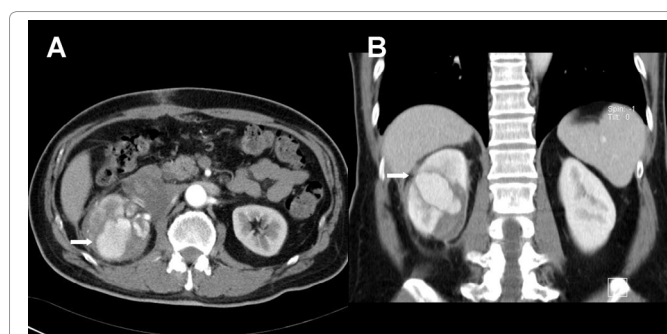
**Keywords:** PN: Partial nephrectomy; RAP: Renal artery pseudoaneurysm

### Introduction

A pseudoaneurysm is a leakage of blood from a hole in an artery. Sometimes this may occur when a blood vessel wall is injured after invasive procedures iatrogenically. Other causes of pseudoaneurysm include surgery, trauma, infection, or the rupture of an aneurysm. A renal artery pseudoaneurysm (RAP) may also be a complication of nephron-sparing surgery. Here we present our first case of a giant pseudoaneurysm, with two feeding arteries, after robot-assisted laparoscopic partial nephrectomy, which was successfully treated with dual arterial embolization.

### Case Report

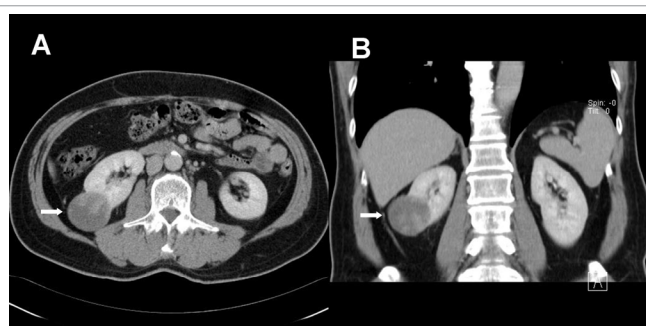
A 63-year-old male had an incidental finding of a right renal tumor, with a clinical stage of T1bN0M0 (Figure 1). He underwent a robot-assisted laparoscopic partial nephrectomy (RAPN). The operation was performed through transperitoneal approach with a 12 mm port for camera, two 8 mm ports for robotic arms, a 5 mm port for liver elevation, and a 12 mm port for assistant. After hilum dissection was completed, we injected indocyanine green (ICG) to enhance the renal pedicle and tumor demarcation. The renal artery was clamped by two bulldog clamps and the renal vein was left patent. Oozing from tumor excision bed was more than expected in this case during the operation. We performed running sutures at the tumor excision bed to sew larger vascular openings and entries into collecting system, with a 20 cm 3-0 V-Loc™ suture and a 20-cm 3-0 Monocryl absorbable suture. Each running suture was applied at the renal capsule with Hem-o-Lok clips at two ends. The end which we started the suture was made with a knot on a Hem-o-Lok clip and the other end was made with a sliding Hem-o-Lok



**Figure 2:** (A) and (B): Contrast enhanced CT scan demonstrated a huge pseudoaneurysm.

clip. The renal capsule is reapproximated using a continuous, horizontal mattress 0-Polysorb suture with a sliding Hem-o-Lok clip placed after each suture is passed through the capsule. We did not use bolsters when we repaired the kidney. After the renorrhaphy, we injected ICG again to check perfusion of the right kidney. The warm ischemia time was 60 minutes and the estimated blood loss was 1000 ml.

The patient tolerated the procedure well and was discharged uneventfully. The pathology report showed a papillary renal cell carcinoma, pT1bNxMx, Fuhrman grade II with a negative surgical margin. However, the patient presented to ER with intermittent gross hematuria aggravated since one month after the operation. A contrast enhanced computerized tomography (CT) scan demonstrated a large pseudoaneurysm of 5 × 4.4 × 3.9 cm in size over the posterior part of the right kidney at the incision site (Figure 2). Transfemoral renal angiography performed by a radiologist and demonstrated a huge pseudoaneurysm fed by the posterior branches of the right renal artery. Selective embolization was performed with coils, glue and gelfoam cubes (Figure 3). The patient tolerated the procedure well and was discharged uneventfully. After the angioembolization, the patient



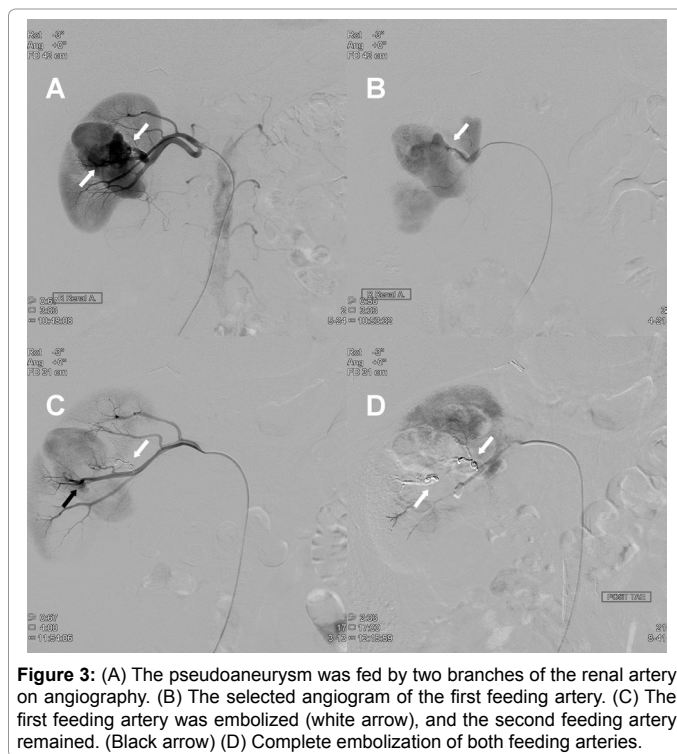
**Figure 1:** A 5 × 4.3 × 5 cm tumor of the right kidney on enhanced CT (A) Axial view (B) Coronal view.

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**Figure 3:** (A) The pseudoaneurysm was fed by two branches of the renal artery on angiography. (B) The selected angiogram of the first feeding artery. (C) The first feeding artery was embolized (white arrow), and the second feeding artery remained. (Black arrow) (D) Complete embolization of both feeding arteries.

had no more hematuria. We used simple and noninvasive ways to follow this case because the patient's condition is quite stable, as well as hemoglobin and hematocrit level. We followed this case by checking blood urea nitrogen and creatinine levels regularly to estimate the patient's renal functions. The eGFR of this patient before the robotic surgery was 91.04 mL/min/1.73 m<sup>2</sup>. The eGFR checked at the day before angioembolization was 52.04 mL/min/1.73 m<sup>2</sup> and improved to 70.34 mL/min/1.73 m<sup>2</sup> ten months later. We also performed kidney ultrasounds every 3 months. The following sonographies showed neither pseudoaneurysm nor tumor recurrence.

## Discussion

Partial nephrectomy (PN) is the standard treatment option for patients with small renal mass such as clinical T1a to T1b renal tumors. Compared with radical nephrectomy, PN is a more complicated procedure with involvement of both vascular and collecting system, and complications can occur. The incidence of RAP after PN is between 0.4% and 2%. Minimally invasive procedures such as laparoscopic or robot-assisted approaches have a higher incidence of RAP when compared with open PN [1-3].

Two mechanisms have been proposed for the development of RAP after PN. First, bleeding may occur from a partially transected artery, particularly near the apex of wedge resection. Second, bleeding may

occur from a puncture hole in a blood vessel following the removal of a needle during renorrhaphy [4]. In this case, we encountered a tough situation when we performed the renorrhaphy. Oozing more than expected lead to a more blood loss and warm ischemia time. We suggest that partial sewing of the vessels during a renorrhaphy may also contribute to developing a renal artery pseudoaneurysm after PN. Angioembolizations are often considered to cause more renal damage because of decreased renal perfusion. However in this case, we found that the worst eGFR level checked (52.04 mL/min/1.73 m<sup>2</sup>) was after RAP occurred, at the day before angiography. The eGFR level of the patient improved gradually after the angioembolization. We follow this case with regular ultrasounds. Other image studies such as computerized tomography scan or magnetic resonance imaging are also recommended depends on physicians' clinical judgments. Most RAPs previously reported have been less than 4 cm in diameter, with only single contributing artery [5,6]. However, this case presented with a RAP, which was 5.0 cm in size and was fed by two renal arteries. Patients usually present with gross hematuria and flank pain from several days to weeks following PN. Asymptomatic RAPs have also been reported [7], and life-threatening situation can be encountered.

## Conclusion

Renal artery pseudoaneurysm is a rare complication after robot-assisted laparoscopic partial nephrectomy. The cause of RAP is probably procedure related but the mechanism may be different in each case. We suggest that incomplete sewing of the vessels during renorrhaphy may also lead to RAP. Oozing more than expected, prolonged ischemia time, and more intraoperative blood loss may be risk factors. A cross-sectional image study should be performed in patients with persistent hematuria after the operation. If RAP is confirmed, angiography with selective embolization is an effective and a minimally invasive treatment.

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