Spontaneous Perirenal Hemorrhage due to Non-traumatic Renal Artery Pseudoaneurysm Rupture Successfully Treated with Angiographic Embolization

WEN-CHIH CHIU¹, SHUE-REN WANN¹, MEI-CHEN LIAO¹, YUN-TE CHANG¹,², HONG-TAI CHANG¹

Spontaneous perirenal hemorrhage is a relatively uncommon but potentially fatal condition. Among the etiologies of spontaneous perirenal hemorrhage, renal pseudoaneurysm rupture is rare, and only a few case reports have been published.

Most of these reports assert that total nephrectomy is the best treatment option for patients with unstable blood pressure due to rupture of renal artery aneurysms with massive retroperitoneal hemorrhage. We have an alternative option for consideration, as illustrated by two cases of spontaneous perirenal hemorrhage due to nontraumatic renal artery pseudoaneurysm rupture with presentations of hemoretroperitoneum and shock. We successfully treated both of these patients by selective angiographic embolization with microcoils without complications.

Key words: spontaneous perirenal hemorrhage, selective angiographic embolization

Introduction

Spontaneous perirenal hemorrhage is an unusual but life-threatening condition¹. Its rapid recognition and prompt management are critically important for emergency physicians. The most common cause of spontaneous perirenal hemorrhage is renal neoplasms, of which angiomyolipoma and renal cell carcinoma are the first and second most common¹⁻³. Among the causes of spontaneous perirenal hemorrhage, renal pseudoaneurysm rupture is rare and has been reported almost exclusively in cases of mechanical or traumatic renal injury, such as, renal blunt trauma, renal biopsy, and open or laparoscopic renal surgery⁴⁻⁵. Nontraumatic renal pseudoaneurysm rupture is very rare and only a few case reports have been published⁶. Here, we report two cases of spontaneous nontraumatic renal pseudoaneurysm rupture that were successfully treated with angiographic embolization.

Case 1

A 43-year-old man was brought to our emergency department with pain in the left side of the abdomen and left flank that had begun suddenly one hour earlier. He denied any previous...
traumatic or mechanic renal injury. He had a history of untreated hypertension. On physical examination, he was in acute distress. His vital signs included temperature of 35.6°C, heart rate of 68; blood pressure of 212/131 mmHg; and respiratory rate of 24. The left side of the abdomen was diffusely tender with muscle guarding, and the left flank showed severe tenderness to palpation. Laboratory evaluation revealed only mild leukocytosis with 12740 per cubic millimeter with a normal differential count and lactate acidosis without anemia and coagulopathy. The routine urine analysis showed microscopic hematuria without pyuria. Bedside abdominal sonography detected fluid accumulation over the left perirenal space. Abdominal computed tomography (CT) confirmed left perirenal hematoma with contrast extravasation from the lower pole of the left kidney (Fig. 1a). Hypovolemic shock was noted shortly after admission; therefore, blood transfusion with packed red cells and emergent angiography were performed. Angiography demonstrated active bleeding from a renal pseudoaneurysm of the lower pole of the left kidney (Fig. 1b). Angiographic embolization was performed successfully, and his hemodynamic status became stable. After this procedure, no more active bleeding was noted during the course of hospitalization; and he was discharged 5 days later without any complications.

**Case 2**

A 69-year-old hypertensive diabetic woman was admitted to a local hospital for septic shock. Her abdominal CT revealed a low-density lesion (13 Hounsfield units [HU], 2.5 × 2.5 × 3.0 cm³), at the lower pole of the left kidney (Fig 2a). This lesion was regarded as an abscess rather than a hematoma, and she was referred to our hospital for further evaluation and treatment. On arrival, her body temperature was 39°C, pulse rate 120/min, respiratory rate 28/min, and blood pressure 84/37 mmHg. She was pale with a rapid, weak pulse, abdominal muscle guarding, and rebound tenderness over both sides of the lower abdomen. Her hemoglobin was 3.5 mmol/L and had decreased remarkably from three days earlier (6.9 mmol/L). Hemorrhagic shock was highly suspected. Our emergency abdominal CT showed that the renal abscess had ruptured from the left intraparenchymal region into the perirenal space and extended into the retroperitoneal cavity, forming a high-

Fig. 1 (a) Left perirenal hematoma with contrast extravasation from the lower pole of the left kidney. (b) Angiography demonstrated active bleeding from a renal pseudoaneurysm of the lower pole of the left kidney
density (60-HU) lesion, about $7 \times 8 \times 14$ cm$^3$ in size. The lesion was thought to be a fresh hematoma (Fig. 2b). She was resuscitated aggressively with whole blood, packed red blood cells, and fresh frozen plasma. Renal angiography demonstrated spurring from an interlobular artery in the left kidney and also five (2.0 × 2.3 mm$^2$ to 5.0 × 6.0 mm$^2$) non-bleeding intraparenchymal pseudoaneurysms (Fig. 2c). The bleeding was subsequently occluded with intra-arterial embolization micro-coils. To rule out the possibility of coexistent autoimmune vasculopathies, right renal artery and superior mesenteric artery angiographies were done simultaneously; no vascular abnormalities were found. On the fifth day, *Escherichia coli* was found in her urine and blood specimens from the local hospital, so the antibiotic was switched to cefazolin on the basis of results from susceptibility tests. Throughout the whole course of hospitalization, no valvular vegetations were detected by echocardiographic survey. There was no clinical evidence of autoimmune vasculitis, as she had normal findings in laboratory tests for antinuclear antibodies (ANA), rheumatoid factor (RF), antineutrophil cytoplasmic autoantibodies-cytoplasmic pattern (cANCA), and peripheral pattern (pANCA). The patient was discharged on the 14th day of hospitalization without complications. Three months later, follow-up abdominal CT angiography showed a small shadow of residual perirenal effusion illustrating absorption of the hematoma, and all microaneurysms had disappeared. Her renal abscess also resolved after antibiotics treatment without drainage (Fig 2d).

![Fig 2a](image-url) ![Fig 2b](image-url) ![Fig 2c](image-url) ![Fig 2d](image-url)

**Fig. 2** (a) Low-density lesion about $2.5 \times 2.5 \times 3$ cm in size over the lower pole of the left kidney (arrow). (b) Rupture of the abscess into the perirenal space (white arrow), causing a high-density (6-HU) semilunar-shaped hematoma, about $7 \times 8 \times 14$ cm$^3$ in size. (c) An intraparenchymal renal pseudoaneurysm within the left kidney (white arrow) and continuous bleeding from one of the interlobular arteries (arrow). (d) Only a small amount of residual perirenal effusion remained 3 months after treatment, indicating resorption of the hematoma.
# Discussion

The first case of spontaneous perirenal hemorrhage was reported by Wunderlich in 1856. Later, spontaneous perirenal hemorrhage was called “Wunderlich syndrome” by Coenen in 1910\(^7\). It is a relatively rare condition and only a few larger case studies have been reported, including 78 cases by McDougal et al. in 1975, 27 cases by Cinman et al. from 1974-1985, and 163 cases in Zhang et al.’s study from 1985-1999\(^{1(3)}\). Although spontaneous perirenal hemorrhage was rare, it had a significant rate of mortality from 7.4% to 28%\(^{1(2)}\).

About 83% of patients with perirenal hemorrhage have symptoms of acute flank or abdominal pain, 19% have either gross or microscopic hematuria, and 11% have symptoms and signs of shock\(^1\). The etiologies of these 268 cases of spontaneous perirenal hemorrhage reported by McDougal, Cinman, and Zhang, were similar. The main cause of spontaneous perirenal hemorrhage is neoplasm: predominantly angiomyolipoma followed by renal cell carcinoma. Vascular disease is the next most common etiology, with polyarteritis nodosa being the most frequent. Other etiologies, including infection and idiopathic hemorrhage, are less common (Table 1). Among the etiologies of perirenal hemorrhage, spontaneous rupture of a renal pseudoaneurysm is very rare.

A renal pseudoaneurysm is a space within the renal parenchyma in which continuous arterial blood flow is present. A pseudoaneurysm might form from the surrounding tissue wall after an artery is injured. After the initial renal injury, a combination of hypotension, coagulation, and pressure from the surrounding renal parenchyma and Gerota’s fascia results in temporary cessation of the bleeding. After degradation of the blood clot, the intravascular and extravascular spaces become connected; and, subsequently, a pseudoaneurysm forms. With restoration of normal blood flow, this pseudoaneurysm can grow and become unstable, eroding into the surrounding pelvicaliceal system or the perinephric tissue\(^{5(8)}\). Renal pseudoaneurysms and aneurysms all are abnormal dilatations of the vessel lumen. Pseudoaneurysm is a perfused hematoma contained by the adventitia and perivascular tissues that is in communication with the lumen of an adjacent artery or vein. Aneurysm is a dilatation of the vessel lumen involving all three layers of the blood vessel wall\(^9\). On angiography, renal pseudoaneurysms are round or oval structures which have direct communication with the arterial lumen through the pseudoaneurysm’s neck, and renal aneurysms are direct bulging weakened area in the wall of an artery. Early opacification of a draining vein indicates an arteriovenous fistula\(^{10}\). Most renal pseudoaneurysms result from mechanical or traumatic renal injury, such as, renal blunt trauma, renal biopsy, and open or laparoscopic renal surgery, rarely congenital\(^{4,5,11}\). Non-traumatic rupture of a renal pseudoaneurysm is very rare and only a few case reports have been published. The majority of renal pseudoaneurysm rupture cases occurred in adults between 20 and 70 years old,

<table>
<thead>
<tr>
<th>References</th>
<th>Tumor, (n(%))</th>
<th>Vascular, (n(%))</th>
<th>Infection, (n(%))</th>
<th>Other, (n(%))</th>
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</thead>
<tbody>
<tr>
<td>McDougal et al. ((n=78)^{22})</td>
<td>45 (57.7)</td>
<td>14 (17.9)</td>
<td>8 (10.3)</td>
<td>11 (14.1)*</td>
</tr>
<tr>
<td>Cinman et al. ((n=27)^{3})</td>
<td>17 (63)</td>
<td>7 (26)</td>
<td>2 (7)</td>
<td>1 (4)†</td>
</tr>
<tr>
<td>Zhang et al. ((n=163)^{1(1)})</td>
<td>101 (61.5)</td>
<td>28 (17)</td>
<td>4 (2.4)</td>
<td>32 (19.4)‡</td>
</tr>
</tbody>
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*These include nephritis \((n=4)\); blood dyscrasias \((n=4)\); and miscellaneous \((n=3)\); †One case of blood dyscrasias; ‡These include miscellaneous \((n=21)\) and idiopathic \((n=11)\). Adapted from Liao et al.\(^{15}\).
Aneurysm (pseudoaneurysm) has been identified in some cases of infective endocarditis. An echocardiographic survey in our patient showed no evidence of infective endocarditis, such as, valvular vegetations, significant regurgitation, and/or destructive lesions on the cardiac valves. Thus, the possibility of infective endocarditis was excluded. Abdominal CT detected no residual microaneurysm in the left kidney, which excluded preexisting microaneurysms.

Computed tomography is 100% sensitive for detection of perirenal hemorrhage and has a higher sensitivity and specificity than ultrasound for identification of the underlying etiology. According to the meta-analysis of Zhang et al., etiology was exactly identified with an overall sensitivity and specificity of 11% and 33% for ultrasound and 57% and 82% for CT, respectively. Diagnosis of renal pseudoaneurysm is possible with the aid of CT angiography or Doppler ultrasound, but angiography remains the diagnostic standard. On angiography, renal pseudoaneurysms appear as round or oval lesions that arise from the main renal artery or one of its branches.

Treatment modalities of a renal pseudoaneurysm with perirenal hemorrhage include nephrectomy, open vascular surgery, or angiographic embolization, depending on the patient’s clinical status and the location of the pseudoaneurysm (Table 2). Some researchers assert that total nephrectomy is the best option for patients with unstable blood pressure because of the possibility of rupture of a renal artery aneurysm.

Table 2  Reported treatments and mortality published in review articles since 1975

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<tr>
<th>References</th>
<th>Nephrectomy</th>
<th>Non-nephrectomy</th>
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<td></td>
<td>n (%)</td>
<td>Mortality (%)</td>
</tr>
<tr>
<td>McDougal et al. (n=78) (12)</td>
<td>61 (78.2)</td>
<td>10 (16.3)</td>
</tr>
<tr>
<td>Cinnam et al. (n=27) (13)</td>
<td>21 (77.8)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Zhang et al. (n=165) (14)</td>
<td>113 (68.4)</td>
<td>-</td>
</tr>
</tbody>
</table>

*These included 2 patients who received embolization and survived; †These included 6 patients who underwent embolization; ‡Mortality rate not mentioned in report. Adapted from Liao et al. (15).
with massive retroperitoneal hemorrhage\textsuperscript{(2,16,17)}. Both patients in our report were treated successfully by selective angiographic embolization with microcoils. Nowadays, the number of surgical interventions for spontaneous perirenal hemorrhage is decreasing\textsuperscript{(18)}. Angiographic embolization is becoming the primary method because it is ideal for focally isolating the pseudoaneurysm and preventing a significant decrease in renal vascularization, thereby preserving surrounding nephrons\textsuperscript{(18,19,23)}. Angiographic embolization has been shown to result in stable long-term renal function with serum creatinine levels returning to baseline levels\textsuperscript{(20-22)}. Renal embolization, usually performed with coils or Gelfoam, has a high rate of success (>80\%) in controlling bleeding or preventing hemorrhage\textsuperscript{(23)}. Both of our patients had unstable blood pressure and massive retroperitoneal hemorrhage, but they were successfully treated with angiographic embolization.

Spontaneous perirenal hemorrhage, although rare, represents a serious challenge for physicians in the emergency department. Its recognition is crucial to prevent delayed diagnosis and possible complications. From these two cases we learn that renal pseudoaneurysm rupture, despite being a very rare etiology of spontaneous perirenal hemorrhage, should be borne in mind when encountering a patient with sudden onset of flank or abdominal pain. If spontaneous renal pseudoaneurysm rupture is suspected, angiography should be arranged as soon as possible to confirm the diagnosis. Spontaneous renal pseudoaneurysm rupture can be treated successfully and less invasively with angiographic embolization even in such critical cases.

References

1. Zhang JQ, Fieling JR, Zou KH. Etiology of spontaneous perirenal haemorrhage: a meta-


以血管攝影動脈栓塞術成功治療非創傷性腎臟
偽動脈瘤破裂導致自發性腎旁出血

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自發性腎旁出血是一個不常見但卻可能致死的疾病。在自發性腎旁出血的原因中，腎臟偽動脈瘤破裂很少見而且腎臟創傷是腎臟偽動脈瘤形成的主要原因，非創傷性腎臟偽動脈瘤破裂非常少見，只有少數的病例曾被報告。

部份的病例報告建議使用腎臟切除術來治療腎臟動脈瘤破裂合併大量腹腔出血且血壓不穩定的病人。我們藉著二個非創傷性腎臟偽動脈瘤破裂導致自發性腎旁出血的病例，提供另一個治療的選擇，我們以微導管來做選擇性血管攝影動脈栓塞術成功地治療了這二個病人，而且沒有併發症產生。

關鍵詞：自發性腎旁出血，選擇性血管攝影動脈栓塞術

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