Reminder of important clinical lesson

Incidental renal artery pseudoaneurysm after percutaneous native renal biopsy

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Summary

Renal artery pseudoaneurysm (RAP) is an uncommon but potentially life-threatening condition that is often difficult to diagnose. Rarely, it can occur as a complication associated with a percutaneous renal biopsy procedure. The clinical manifestations vary from asymptomatic lesions found incidentally on imaging studies to a mass causing high blood pressure, pain, haematuria and rupture. Although the risk of rupture is considered low, RAP is associated with a high death rate if ruptured. Currently, with the aid of high-quality interventional radiology, this challenging pathology can be effectively treated. In this report, we describe a case of RAP that was incidentally discovered 4 years after percutaneous renal biopsy which was successfully treated with selective angiographic embolisation.

BACKGROUND

A percutaneous renal biopsy of native or allograft kidneys is a useful procedure in the diagnosis of various renal diseases. As evidenced by several reports on large series of patients undergoing percutaneous renal biopsy, the procedure is generally safe with low morbidity and mortality.¹ Although the risks are minimal, postrenal biopsy complications include perirenal haematoma, laceration of the collecting system, arteriovenous fistula, formation of a perirenal abscess, anuria and haematuria.^{1 2}

In contrast, renal artery pseudoaneurysm (RAP), a rare complication of percutaneous renal procedures, is of great clinical significance because of its propensity to rupture.²⁻⁴ RAPs mainly develop after laparoscopic partial nephrectomy, percutaneous nephrolithotomy, traumatic penetrating and blunt renal injuries.⁵⁻⁷ Symptomatic RAPs after renal biopsy are accompanied by massive gross haematuria, urinary clot retention and bladder tamponade, and in the case of ruptured pseudoaneurysms, by gastrointestinal bleeding.^{6 7} In this report, we present a successfully treated case of a 50-year-old woman with an asymptomatic RAP incidentally found on screening abdominal sonography 4 years after percutaneous biopsy of the native kidney.

CASE PRESENTATION

A 50-year-old woman visited our clinic with an incidental finding of an approximately 1 cm sized haematoma of the left kidney during a health screening abdominal sonography. The patient had no complaints or symptoms referable to the intrarenal lesion before discovery by abdominal imaging. She was diagnosed with membranous glomerulonephritis stage III confirmed by renal biopsy 4 years prior. She was discharged on that occasion without any acute complications, with the abdominal sonography showing only a small amount of perirenal haematoma after the biopsy (figure 1).

INVESTIGATIONS

On assessment at our clinic, the physical examination was unremarkable and blood pressure was normal. Laboratory data showed a haemoglobin level of 13.8 g/dl and a white cell count of $6.14 \times 10^3/\mu\text{l}$ with a normal differential cell count. Urinalysis showed positive occult blood test without proteinuria. Serum chemistry levels including renal function markers were within normal limits. Contrast-enhanced CT of the kidney showed a 2 cm renal mass with a strongly enhancing anterior half and a cyst-like posterior half in the lower pole of the left kidney. Radiological appearances corresponded with a partially thrombosed pseudoaneurysm (figure 2).

TREATMENT

Embolisation using a 6 mm×7 cm microcoil was done and postembolisation angiography showed a well-occluded feeding artery (figure 3). There were no signs of

Figure 1 Abdominal sonography of the left kidney after biopsy shows a small perirenal haematoma.

Figure 2 (A) Contrast-enhanced CT in the arterial phase shows a 2 cm sized renal mass with a strong enhancing anterior half and a cyst-like posterior half in the lower pole of the left kidney, suggesting a partially thrombosed pseudoaneurysm. (B) Coronal image demonstrates a vascular connection to the contrast medium collection, confirming the diagnosis of pseudoaneurysm.

postembolisation syndrome or contrast-medium-induced nephrotoxicity. The patient was discharged 1 day after the embolisation.

OUTCOME AND FOLLOW-UP

A follow-up CT scan 3 months after the embolisation showed total occlusion of the RAP with chronic renal infarction in the lower pole of the left kidney (figure 4).

DISCUSSION

RAP is a rare clinical entity that has been reported after renal biopsy, percutaneous renal surgery, kidney transplantation, penetrating trauma and blunt renal trauma. Blood passage from a lacerated artery to the renal parenchyma leads to RAP. The walls of a true aneurysm contain one or more of the original arterial coats while the walls of a false aneurysm (pseudoaneurysm) derive from tissues surrounding the arteries.⁸ After the initial renal injury, a combination of hypotension, coagulation and pressure from the surrounding tissues such as the vascular adventitia, renal parenchyma and Gerota's fascia result in temporary cessation of the bleeding. Degradation of the clot and surrounding necrotic tissue results in recanalisation between the intravascular and extravascular space, and subsequently, the formation of a

pseudoaneurysm. With restoration of normal blood flow, this pseudoaneurysm can grow and eventually become unstable, with erosion into the surrounding perinephric tissue.⁷

Symptoms may include abdominal tenderness, abdominal mass, haematuria, hypertension and shock. Signs and symptoms of the RAP may develop immediately after the insult or they may be delayed.³ Mima *et al*⁵ reported a case in which massive haematuria, urinary clot retention and bladder tamponade 7 h after the percutaneous renal biopsy were the presenting signs of RAP. Haematuria is the most common symptom associated with RAPs and results from erosion of the RAP into the adjacent renal collecting system⁹; this may occur within 2–4 weeks after the injury. One series study showed that average presentation time was 17 days after the original injury including blunt and penetrating injuries.⁷ However, patients can present with non-specific symptoms so that RAP is incidentally found. In one case presented with haematuria only, arteriovenous fistula and pseudoaneurysm were diagnosed 10 years after kidney allograft biopsy.² Therefore, it is difficult to diagnose an RAP without a high index of suspicion. These findings suggest that after renal biopsy it is necessary to periodically evaluate the kidney using imaging studies.²

Figure 3 (A) Left renal angiography shows a 2 cm sized saccular pseudoaneurysm at the lower pole of the left kidney with an early draining vein. (B) Angiography after embolisation using a microcoil shows a well-occluded feeding artery. The absence of filling of the pseudoaneurysm with contrast material indicates successful embolisation.

Figure 4 (A,B) Follow-up CT scan 3 months after the embolisation shows total occlusion of the renal artery pseudoaneurysm with chronic renal infarction in the lower pole of the left kidney.

In fact, the diagnosis of RAP is challenging. Angiography has been the standard tool for diagnosis. However, if the patient is stable, non-invasive tests such as contrast medium-enhanced CT, colour Doppler sonography or magnetic resonance angiography should be performed.⁶ The advantage of CT is that it enables imaging of the entire urinary tract, and is the technique of choice for follow-up.¹⁰ RAP is best seen on the arterial phase, appearing as a focal high attenuation lesion with a density similar to that of the adjacent arterial vessels. The RAP may also be visible in the nephrographic phase, but may sometimes be missed when the adjacent renal parenchyma is densely enhanced, masking the high density of the pseudoaneurysm. The RAP will not be seen in the pyelographic phase due to washout of contrast material from the pseudoaneurysm.⁵ Pseudoaneurysm may resemble a cystic mass on sonography. The ultrasound findings alone, therefore, may not be sufficient to distinguish a haematoma from a pseudoaneurysm. However, colour Doppler sonography shows characteristic to-and-fro flow within the mass. If imaging findings are not conclusive and there is clinical suspicion of RAP or the patient is haemodynamically unstable, angiography should be undertaken. In addition to high sensitivity in identifying the RAP, the advantages of angiography include the potential to achieve simultaneous endovascular management of RAP.¹¹ Embolisation of RAP has been reported to have high success rates exceeding 90%.^{11 12}

The risk of rupture is estimated to be low, but it is associated with a death rate as high as 80%.¹³ Currently, no consensus exists for the size at which an RAP should be repaired in an asymptomatic patient. In general, aneurysms greater than 2 cm in diameter are considered to have a high risk of rupture. The incidental, asymptomatic and 2 cm sized RAP in our patient creates a dilemma of management: opinions among the physicians in our clinic were varied with respect to the influence of the RAP size of the likelihood of severe clinical presentation such as rupture or deterioration in renal function. In fact, it has been reported that most pseudoaneurysms are small and asymptomatic and sometimes resolve spontaneously.¹⁴ Some clinicians followed a successful conservative treatment of a RAP detected incidentally,⁹ although there is a

growing tendency to prefer active interventions.¹⁵ However, growth of the pseudoaneurysm may occur rapidly. A previous report showed diameter evolving from 17 to 30 mm within 2 months.¹⁶ Another report demonstrated that a pseudoaneurysm was diagnosed at 30 mm while a CT scan performed 2 months before was normal.¹⁷ Given that ruptures have also been reported in smaller aneurysms if left untreated, it was decided that an intervention on the RAP would decrease the risk of ultimate rupture.¹⁸

Management methods of RAP are also a challenging issue, and a variety of treatment modalities have been exploited so far.⁹ Treatment of renal artery pseudoaneurysm can be by nephrectomy, open vascular surgery or angiographic embolisation, depending on the patient's clinical condition. Surgical indications for repair include overt ruptures, an aneurysm greater than 2 cm, renovascular hypertension, expansion of the aneurysm and evidence of renal damage.⁹ In general, angiographic embolisation is the procedure of choice due to its minimally invasive and selective nature and the maximal preservation of renal parenchyma.⁵ However, embolisation for the management of RAP appears to have some shortcomings, such as possible reflux of embolic material into the normal proximal vessel if the distal branch has not been selectively cannulated and the risk of more generalised ischaemia resulting from thrombosis of a main feeding branch.^{9 11} In order to overcome these limitations, treatment with covered stent-grafts on RAP located in branches of visceral arteries has been suggested.¹¹ In selected cases, the use of ultrasound-guided thrombin injection into an extracapsular pseudoaneurysm following renal allograft biopsy can also be considered a treatment option.¹⁹

In conclusion, we herein showed a case of a 50-year-old woman with asymptomatic RAP diagnosed 4 years after percutaneous native renal biopsy. The RAP was treated with percutaneous selective angioembolisation and follow-up imaging showed successful resolution without evidence of complications. Clinicians need to bear in mind that patients with a history of minimally invasive intervention of the kidneys may have RAP. It is also necessary to follow up patients with imaging studies to prevent a sudden disastrous rupture of the RAP.

Learning points

- ▶ Renal artery pseudoaneurysm (RAP) is a rare but fatal complication of percutaneous renal biopsy.
- ▶ Management of renal RAP consists of elective or urgent selective embolisation depending on the size of the pseudoaneurysm and the severity of presentation.
- ▶ Recognition of pseudoaneurysm is critical, as the follow-up with imaging studies after percutaneous kidney biopsy leads to appropriate intervention.

Competing interests None.

Patient consent Obtained.

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