

Case Report

Transcatheter Arterial Embolization Therapy for Huge Renal Cysts: Two Case Reports

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Keywords

Simple renal cyst · Transcatheter arterial embolization · Cyst drainage

Abstract

We encountered 2 patients with symptomatic huge simple renal cysts. In case 1, 4,000 mL of cyst fluid was drained via a catheter, but intracystic bleeding occurred immediately afterwards. Transcatheter arterial embolization (TAE) was performed, after which the bleeding stopped, and cyst drainage was repeated successfully. After 2 years, the total cyst volume was reduced from 11,775 mL to 75.4 mL. In case 2, TAE was performed prophylactically before drainage. Subsequently, 9,400 mL of fluid was removed from multiple cysts. After 1 year,

the total cyst volume was reduced from 9,215 mL to 633 mL without bleeding. Based on these 2 cases, prophylactic TAE before drainage may be useful in patients with huge renal cysts.

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Introduction

Based on imaging findings, renal cysts are classified as simple (Bosniak categories I and II) or complex (Bosniak categories III and IV), with an intermediate category (Bosniak II-F) [1]. Simple renal cysts are benign and usually asymptomatic so that generally no treatment is required. If a simple cyst is symptomatic, percutaneous drainage is combined with sclerotherapy or surgical treatment is selected. In contrast, complex renal cysts are treated surgically because there is a high incidence of malignancy [2, 3].

We encountered 2 patients with huge simple renal cysts that were symptomatic. Severe intracystic bleeding occurred after cyst drainage in the first patient and was successfully treated by transcatheter arterial embolization (TAE). In the second patient, TAE was performed prophylactically, and there was no bleeding associated with subsequent cyst drainage. We discuss the therapeutic options for huge renal cysts based on these 2 cases.

Case Reports

Case 1

In August 2007, a 24-year-old Japanese woman was admitted to an outside hospital for investigation of abdominal pain and distension. Contrast-enhanced computed tomography (CT) revealed a huge homogeneous cyst (50 × 25 × 18 cm; 11,775 mL) in the right kidney. The cyst walls were thin, and the lesion was sharply delineated from the renal parenchyma, so it was categorized as a category I cyst according to the Bosniak classification [1] (Fig. 1a). Percutaneous catheter drainage was performed under ultrasonographic guidance. Immediately after 4,000 mL of cyst fluid was removed, the patient developed severe abdominal pain and her hemoglobin decreased from 11.0 g/dL to 7.3 g/dL. Therefore, further cyst drainage and sclerotherapy were not done. CT revealed intracystic bleeding (Fig. 1b). She received transfusion of packed red blood cells (800 mL). Nephrectomy was recommended, but the patient hoped to preserve her kidney and was referred to our hospital to explore further options.

On admission, she was 157 cm tall and weighed 47.5 kg, with a blood pressure of 98/56 mm Hg, heart rate of 105/min, and body temperature of 37.5°C. Laboratory findings were as follows (Table 1): white blood cell count, 12,900/μL; red blood cell count, 3.10 × 10⁶/μL; hemoglobin, 8.6 g/dL; platelet count, 339 × 10³/μL; total protein, 6.3 g/dL; albumin, 1.8 g/dL; blood urea nitrogen, 3 mg/dL; serum creatinine (Cre), 0.4 mg/dL; and C-reactive protein (CRP), 15.6 mg/dL.

Clinical Course

The patient gave informed consent to renal TAE rather than other therapeutic options. Angiography showed elongated and narrow branches of the right renal artery encircling the huge cyst (Fig. 1c). TAE was performed using 28 platinum microcoils according to the previously reported method [4, 5], achieving occlusion of the feeding arteries while preserving the residual right kidney parenchyma (Fig. 1d). After TAE, intracystic bleeding stopped and percutaneous catheter drainage was again performed under ultrasonographic guidance, removing 4,000 mL of bloody fluid. Further hemorrhage did not occur. Two years later, her cyst was reduced to dimensions of 6 × 4 × 4 cm with a volume of 75.4 mL (Fig. 1e).

Case 2

In July 2016, a 16-year-old Japanese female was admitted to our hospital with abdominal distention. CT revealed 4 huge cysts in the left kidney, while the right kidney was normal. The total volume of the 4 cysts was 9,215 mL, and all cysts were Bosniak category I (Fig. 2a, b). Although nephrectomy had been recommended at the previous hospital where she was first assessed, both the patient and her parents preferred to avoid surgery and wanted to explore further therapeutic options.

On admission, she was 155.1 cm tall and weighed 56.5 kg, with a blood pressure of 124/87 mm Hg and body temperature of 36.5°C. Abdominal distention was noted. Laboratory findings were as follows (Table 1): white blood cell count, 4,200/μL; red blood cell count, 3.94 × 10⁶/μL; hemoglobin, 12.2 g/dL; platelet count, 284 × 10³/μL; total protein, 7.1 g/dL; albumin, 4.5 g/dL; blood urea nitrogen, 5.3 mg/dL; Cre, 0.63 mg/dL; and CRP, 0 mg/dL. Genetic testing was performed (including PKD1 and PKD2) according to the previous method [6], but no abnormalities were detected.

Clinical Course

Because intracystic bleeding had occurred in case 1 after catheter drainage, prophylactic TAE was performed in this patient to avoid bleeding. A total of 8 platinum microcoils were used to block the branches of the left renal artery encircling the cyst walls (Fig. 2c, d). Subsequently, a total volume of 9,400 mL of cyst fluid was removed. Then, sclerotherapy was performed by daily infusion of minocycline hydrochloride for 7 days and the catheters were removed. Cytology for the cystic fluid was negative for malignancy. Serum Cre increased to 0.93 mg/dL immediately after TAE, but then improved to 0.63 mg/dL within 1 week. After 1 year, the total cyst volume was decreased to 633 mL (Fig. 2e).

Discussion

The cases reported here illustrate 2 main clinical issues: (1) percutaneous catheter drainage of huge cysts is associated with a risk of severe intracystic hemorrhage, and (2) prophylactic TAE can be employed to prevent such hemorrhage.

Symptomatic renal cysts (simple or complicated) can be treated by percutaneous catheter drainage plus sclerotherapy or by surgery, depending on the risk of malignancy. Bosniak classified renal cysts into 5 categories (I, II, II-F, III, and IV) according to their complexity and the likelihood of malignancy [1]. The risk of malignancy is negligible for renal cysts in cate-

gories I or II, so percutaneous drainage is performed if a cyst is symptomatic. Renal cysts in category II-F are suspicious for malignancy, so regular follow-up is recommended with percutaneous drainage if the cyst is symptomatic. On the other hand, there is a higher risk of malignancy for cysts in categories III or IV, so these lesions are managed by surgical resection [3].

Methods that have been reported for reducing the size of large renal cysts include drainage (needle aspiration) and sclerotherapy, as well as surgical and laparoscopic fenestration. Atug et al. [7] performed laparoscopic decortication of symptomatic simple renal cysts in 45 patients whose mean cyst size was 9.7 cm in diameter and among whom 24 patients (53.3%) had undergone previous cyst aspiration with injection of a sclerosant. Only 1 patient (2.2%) required conversion to open surgery because of excessive bleeding, and laparoscopic decortication was considered to be an effective and durable option for symptomatic simple renal cysts. They also suggested that cyst aspiration was associated with a high recurrence rate, although percutaneous drainage is safe and minimally invasive. Kilinc et al. [8] treated 76 symptomatic cysts, whose mean cyst size was 6.9 cm, by aspiration with or without sclerotherapy and concluded that aspiration with sclerotherapy was more effective without any major complications. In addition, Akinci et al. [9] treated 98 simple renal cysts by percutaneous sclerotherapy, achieving an average cyst volume reduction of 93% at 1 year. Although 1 patient developed spontaneous cyst hemorrhage 1 year after the procedure, treatment was not required. Moreover, Fontana et al. [10] performed percutaneous drainage followed by 3 consecutive injections of alcohol for 72 renal cysts measuring 9–14 cm in diameter (mean, 10.8 cm), achieving complete obliteration of the cyst cavity in 68 patients, although 1 patient developed cyst hemorrhage and required surgical treatment without the need for blood transfusion.

The safety of draining huge renal cysts has not yet been established, because there have only been a few reports about drainage of cysts measuring more than 15 cm in diameter. Riyach et al. [11] reported the removal of 8 L of fluid from a giant cyst (35 × 32 × 22 cm) with no major complications.

In our 2 cases, we found that performing TAE for the feeding arteries of the cysts could prevent or treat intracystic bleeding related to drainage and also reduced the cyst size. There have been no previous reports about treatment of simple renal cysts by TAE, although renal TAE is employed for autosomal dominant polycystic kidney disease. In patients with this disease, the renal cysts are usually supplied by well-developed arteries with an extensive capillary network so that hemorrhage is frequent [5], and TAE has been reported to be effective for intracystic bleeding [4]. Furthermore, Fujisaki et al. [12] treated patients with horse-shoe kidney and persistent abdominal fullness after commencement of hemodialysis by embolizing only the right renal artery to maintain residual kidney function and reported involution of the right part of the kidney with preservation of urine output after 2 years. Finally, Ubara [13] reported that TAE could reduce the kidney size in patients with a symptomatic nonfunctioning hydronephrotic kidney.

Drainage of huge cysts without potentially prophylactic TAE may lead to massive bleeding of the simple cysts. It has been suggested that drainage of huge cysts may cause sudden shrinkage of the cysts, which may denature the blood vessels of the cysts, and the blood flow of arteries which supply the cysts is stopped so that intracystic bleeding occurs. On the other hand, adverse events, including contrast-induced nephropathy and cholesterol embolization,

should be considered. The risk factors of contrast-induced nephropathy are preexisting chronic kidney disease, diabetes mellitus, older age, and dehydration, while those of cholesterol embolization are older age, hypertension, diabetes mellitus, and atherosclerotic vascular disease [14, 15]. Adverse events should be considered if the patients have these risk factors.

In conclusion, we managed 2 patients with huge simple renal cysts. Severe intracystic bleeding occurred after cyst drainage in case 1. Angiography showed well-developed feeding vessels arising from the renal artery to supply the cyst, and TAE targeting these vessels prevented further bleeding. TAE was performed prophylactically in case 2 to prevent intracystic bleeding, after which cyst drainage was accomplished successfully without hemorrhage. Our experience suggests that it may be worth considering prophylactic TAE as an option before drainage of huge renal cysts.

Statement of Ethics

The present study adhered to the Declaration of Helsinki, and both patients gave consent for the details of their cases to be published.

Disclosure Statement

The authors declare no competing financial interests. The authors also declare that they have no conflicts of interest.

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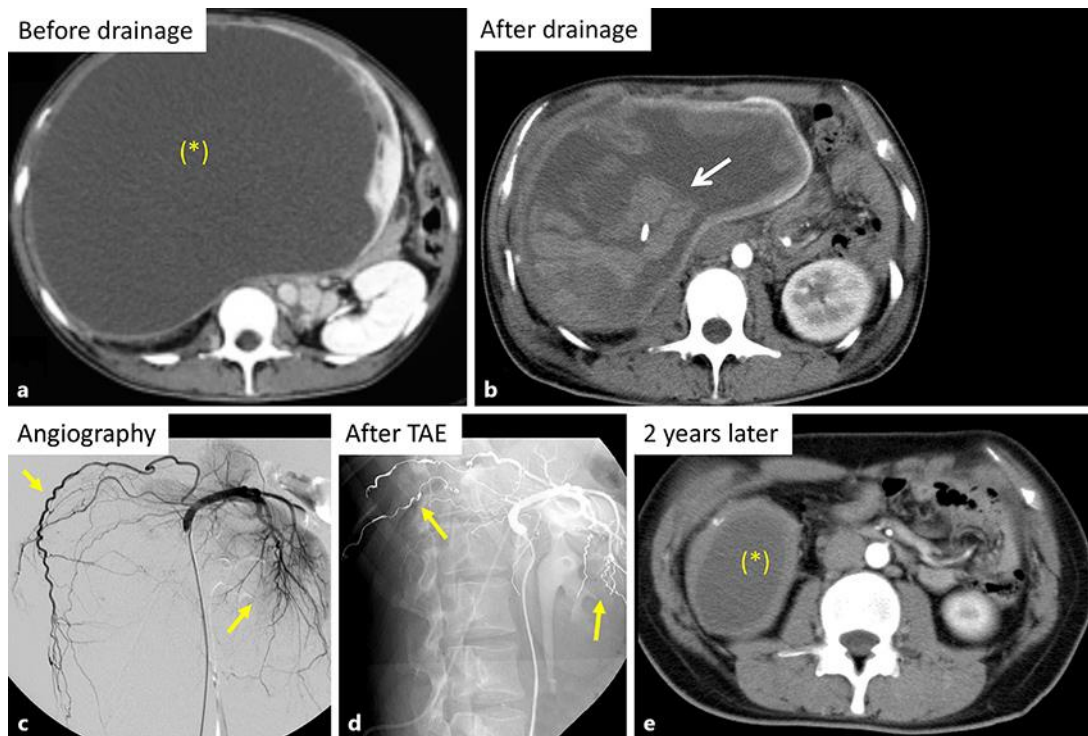


Fig. 1. Case 1. **a** Contrast-enhanced CT reveals a huge renal cyst (*) before drainage. **b** Contrast-enhanced CT shows intracystic bleeding (arrow) after initial drainage of the cyst. **c** Renal artery angiography displays well-developed feeding arteries supplying the renal cyst (arrows). **d** Radiograph shows microcoils (arrows) after TAE. **e** CT reveals involution of the cyst (*) after treatment. CT, computed tomography; TAE, transcatheter arterial embolization.

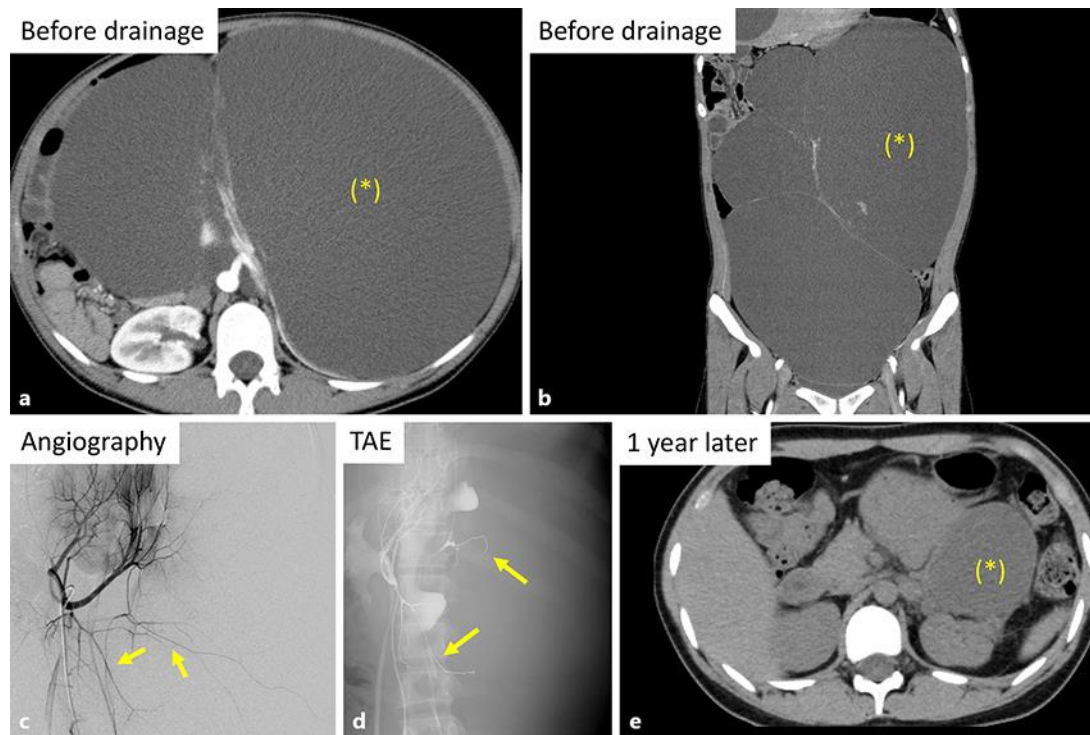


Fig. 2. Case 2. **a** Axial contrast-enhanced CT shows 4 huge renal cysts in the left kidney. (*) indicates the largest cyst. **b** On coronal CT, huge cysts occupy the abdominal cavity. (*) indicates the largest cyst. **c** Renal artery angiography reveals well-developed feeding arteries supplying the renal cysts (arrows). **d** Radiograph shows microcoils (arrows) after TAE. **e** CT displays involution of the largest cyst (*) after treatment. CT, computed tomography; TAE, transcatheter arterial embolization.

Table 1. Laboratory findings

| | Unit of measurement | Case 1 | Case 2 | Normal range |
|-------------------|----------------------------|--------|--------|--------------|
| White blood cells | / μ L | 12,900 | 4,200 | 3,200–7,900 |
| Hemoglobin | g/dL | 8.6 | 12.2 | 11.3–15.0 |
| Platelets | $\times 10^3/\mu$ L | 339 | 284 | 155–350 |
| Total protein | g/dL | 6.3 | 7.1 | 6.9–8.4 |
| Albumin | g/dL | 1.8 | 4.5 | 3.9–5.2 |
| AST | IU/L | 20 | 24 | 13–33 |
| ALT | IU/L | 13 | 23 | 117–350 |
| LDH | IU/L | 101 | 220 | 119–229 |
| ALP | IU/L | 237 | 310 | 117–350 |
| γ -GTP | IU/L | 13 | 21 | 9–109 |
| Urea nitrogen | mg/dL | 3 | 5.3 | 8–21 |
| Creatinine | mg/dL | 0.4 | 0.63 | 0.46–0.78 |
| eGFR | mL/min/1.73 m ² | 156.9 | 107.2 | >90 |
| Uric acid | mg/dL | 1.4 | 5.3 | 2.5–7.0 |
| Na | mmol/L | 139 | 141 | 139–146 |
| K | mmol/L | 3.9 | 3.8 | 3.7–4.8 |
| Cl | mmol/L | 103 | 104 | 101–109 |
| Ca | mg/dL | 7.6 | 9.6 | 8.7–10.1 |
| P | mg/dL | 3.1 | 4.9 | 2.8–4.6 |
| Bil | mg/dL | 0.4 | 0.7 | 0.3–1.1 |
| CRP | mg/dL | 15.6 | 0 | 0.0–0.3 |
| PT | % | 70.1 | 95.6 | >75 |
| APTT | s | 29.2 | 28.4 | 27.0–40.0 |

AST, aspartate transaminase; ALT, alanine transaminase; LDH, lactate dehydrogenase; ALP, alkaline phosphatase; γ -GTP, gamma glutamyl transferase; eGFR, estimated glomerular filtration rate; Bil, bilirubin; CRP, C-reactive protein; PT, prothrombin time; APTT, activated partial thromboplastin time.