CASE REPORT

Acute renal failure and arterial hypertension due to subcapsular haematoma: is percutaneous drainage a feasible treatment?

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SUMMARY

Percutaneous drainage proved to be successful in managing a renal subcapsular haematoma that was causing acute renal failure and hypertension in a 74-year-old woman. The patient presented with oliguria, nausea and malaise 2 days after a ureteronephroscopic procedure with biopsies of a suspected urothelial neoplasm in the right renal pelvis. The left kidney had recently been removed due to renal cell carcinoma. At admission, the patient's blood pressure and plasma creatinine levels were massively elevated.

Ultrasonography revealed a moderate right-sided renal subcapsular haematoma. When the patient did not respond to antihypertensive treatment, Page kidney was suspected. A pigtail catheter was placed in the haematoma and, shortly after drainage, the diuresis resumed and plasma creatinine together with blood pressure decreased. This condition had previously been managed by open surgery, but recent case reports have described successful management by laparoscopy-assisted and radiology-assisted drainage, as described in this case report.

presumably because of contralateral compensation. In the cases of Page kidney phenomenon in native kidneys, the most common aetiologies were motor vehicle accidents, retroperitoneal masses and post-operative causes.⁵

Patients present with acute hypertension and, in cases of a solitary kidney or bilateral Page kidneys, they also present with oligo-anuria.⁶ The blood pressure averages 177/95 mm Hg. In eight cases, plasma renin levels or renal vein renin ratios were recorded and in all of these, levels were elevated or ratios showed increased secretion from affected kidneys.⁴ In some cases, plasma creatinine levels are increased as an indication of impaired kidney function.⁵⁻⁷

Previously, definitive management of Page kidney phenomenon often involved radical nephrectomy or open surgery for haematoma evacuation or capsulotomy,⁴ but recent case reports have described successful laparoscopy-assisted and radiology-assisted drainage.⁸⁻¹²

CASE PRESENTATION

A 74-year-old woman was seen in the emergency room with oliguria, nausea, vomiting and malaise 2 days after a ureteronephroscopic procedure, including biopsies of a suspected urothelial neoplasm in the right renal pelvis. A double pigtail ureteral stent had been placed during a previous diagnostic procedure due to a relative stenosis at the ureteropelvic junction. After stent removal, the stenosis made it difficult to place the ureteral access sheath for the endoscopic procedure, after which discreet bleedings and small blood clots were observed in the proximal ureter and pelvis. The endoscopic procedure was accomplished without difficulties and a new ureteral stent was placed. The left kidney had recently been removed due to clear cell renal cell carcinoma. Moreover, the patient had a 5-year history of arterial hypertension, treated with amlodipine 5 mg and metoprolol 50 mg. At admission, her blood pressure had increased from 150/67 mm Hg on the day of surgery to 185/103 mm Hg. Plasma creatinine had increased from 81 µmol/L on the day of surgery to 612 µmol/L and plasma potassium from 3.8 to 4.8 mmol/L. Renin levels were not obtained. Allegedly, her diuresis had only been a few drops of bloody urine in the last 24 h. A subsequent ultrasound of the right kidney revealed a moderate subcapsular haematoma, no hydronephrosis and a well-placed ureteral stent. Initially, the condition was treated

BACKGROUND

Page kidney phenomenon is rare. It consists of arterial hypertension secondary to sustained external compression of the renal parenchyma by a haematoma, often a subcapsular haematoma or a large retroperitoneal mass. The mechanism is presumably hypoperfusion, microvascular ischaemia and activation of the renin-angiotensin-aldosterone system, leading to hypertension—although a recent animal study suggests that angiotensin is not involved and the hypertension is due to tubulointerstitial inflammation.¹ The phenomenon was first described in 1939 by Page,² when he wrapped animal kidneys in cellophane and observed the response in blood pressure. In 1955, Engel and Page³ described the first clinical case of a young male American football player, who became hypertensive due to a subcapsular renal haematoma. His blood pressure normalised after nephrectomy.³

Until 2008, a total of 108 Page kidney phenomenon cases had been reported in the literature.⁴ A majority of the cases reported before 1991 were related to blunt trauma. Most cases reported between 1991 and 2008 were related to allograft kidney biopsies due to the high frequency of this procedure at that time. In these cases, hypertension was accompanied by an acute decrease in renal function—this was not seen in native kidneys,

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conservatively with 80 mg furosemide with some effect on the diuresis. The following day plasma creatinine had increased to 701 $\mu\text{mol/L}$ and the patient had acute haemodialysis. Renewed ultrasound showed unchanged subcapsular haematoma. During the following days, there was no clinical improvement and Page kidney phenomenon was suggested as an explanation for the patient's sustained renal failure and hypertension. A percutaneous ultrasound-guided intervention of the renal subcapsular haematoma was arranged.

TREATMENT

An ultrasound-guided percutaneous drainage was arranged (figure 1). First, the subcapsular renal haematoma was punctured with a 0.9 mm puncture cannula, but only a few drops of viscous, urine-like fluid were aspirated. Using the Seldinger technique, a 10 Fr pigtail catheter was placed in the haematoma. Over the next few days, approximately 150 mL bloody fluid was drained. A few hours after drainage, urine production started again. After 3 days the catheter was removed, and the patient was discharged with decreasing plasma creatinine at 169 $\mu\text{mol/L}$ and blood pressure at 186/84 mm Hg, so metoprolol was increased to 100 mg and bendroflumethiazide 2.5 mg was added to the medical antihypertensive therapy.

OUTCOME AND FOLLOW-UP

At clinical follow-up 1 month after drainage, the patient was normouric and plasma creatinine had decreased to 108 $\mu\text{mol/L}$, which was the patient's habitual level before the ureteronephroscopic procedure. Blood pressure was reduced to 151/85 mm Hg and, according to the medical record, home monitoring of blood pressure was within normal range. The histological biopsies and irrigation fluid obtained during the ureteronephroscopy showed no malignancy. A follow-up CT scan 5 months after the procedure showed neither remains of the subcapsular haematoma nor signs of urothelial malignancy. Ten months after drainage, plasma creatinine remained at the habitual level.

DISCUSSION

Page kidney phenomenon due to subcapsular haematoma is a known complication of extracorporeal shock wave lithotripsy and renal allograft biopsies.^{6 13} The condition as a complication to a ureteronephroscopic procedure with successful management by percutaneous drainage has been presented only in one prior case report.¹⁰ In the present case, the difficulties in passing the access sheath through the stenosis in the

ureteropelvic junction might have caused unrecognised bleeding leading to the subcapsular haematoma. According to a recent review, the use of ureteral access sheaths for retrograde nephroscopic procedures reduces the risk of ureteral lesions, especially after prestenosing. The review did not address larger, unrecognised bleedings.¹⁴ One case of spontaneous subcapsular haematoma has previously been reported.¹⁵

The first reported attempt of percutaneous aspiration as treatment for Page kidney phenomenon was in 1976. In this case, capsulotomy was subsequently necessary, since the presumed trauma had occurred 1 month prior to treatment and a fibrous pseudocapsule had formed around the kidney in the meantime.¹⁶ Percutaneous drainage as treatment for Page kidney phenomenon in solitary native kidneys was described in 1998 and 2006,^{11 17} and for Page kidney phenomenon related to extracorporeal shock wave lithotripsy, in 2006.¹⁸ Page kidney phenomenon complicating kidney transplant artery stenting was managed by ultrasound-guided percutaneous drainage in 2013.¹⁹

Some cases of Page kidney phenomenon are responsive to medical antihypertensive therapy alone, while others require intervention.⁴ No standardised treatment exists for Page kidney phenomenon due to subcapsular haematoma. Reported strategies range from medical therapy alone over radiology-assisted drainage to surgical haematoma evacuation, capsulotomy or, ultimately, nephrectomy. Babel *et al*²⁰ suggest that the major factor affecting treatment is the age of the subcapsular renal haematoma, suggesting that haematomas ≤ 3 weeks in duration usually resolve spontaneously and should be observed while treating the hypertension medically. However, if hypertension remains uncontrolled despite medical therapy, the haematoma should be drained. Furthermore, it is suggested that haematomas existing for ≥ 3 weeks transform into pseudocapsules and are therefore usually not responsive to percutaneous drainage and may require capsulotomy or nephrectomy.²⁰ Shen *et al*⁷ suggested that a combination of percutaneous drainage and injection of urokinase into the haematoma cavity may solve the problem. They have used this treatment safely on 20 patients with large subcapsular renal haematomas.⁷

Infection is a well-known complication of percutaneous drainage of haematomas in general. However, in the literature, there are no case reports of infection after percutaneous drainage of subcapsular renal haematomas.

Figure 1 Ultrasonography of the right kidney on the day of puncture. Note the hypoechoic (dark) subcapsular haematoma and the compressed renal parenchyma below the haematoma. The dotted line represents the needle puncture guide.

Learning points

- ▶ Page kidney phenomenon is a type of hypertension that develops following sustained compression of renal parenchyma caused by a subcapsular renal collection (eg, haematoma, seroma or urinoma) or an extracapsular mass.
- ▶ Page kidney phenomenon should be considered in patients presenting with oliguria and hypertension following instrumentation of the kidney, such as a ureteronephroscopic procedure.
- ▶ Percutaneous drainage can be a potentially nephron sparing and minimally invasive treatment of Page kidney phenomenon.

Competing interests None declared.

Patient consent Obtained.

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REFERENCES

- 1 Vanegas V, Ferrebuz A, Quiroz Y, *et al.* Hypertension in Page (cellophane-wrapped) kidney is due to interstitial nephritis. *Kidney Int* 2005;68: 1161–70.
- 2 Page IH. The production of persistent arterial hypertension by cellophane perinephritis. *J Am Med Assoc* 1939;113:2046–8.
- 3 Engel WJ, Page IH. Hypertension due to renal compression resulting from subcapsular hematoma. *J Urol* 1955;73:735–9.
- 4 Dopson SJ, Jayakumar S, Velez JCQ. Page kidney as a rare cause of hypertension: case report and review of the literature. *Am J Kidney Dis* 2009;54: 334–9.
- 5 McCune TR, Stone WJ, Breyer JA. Page kidney: case report and review of the literature. *Am J Kidney Dis* 1991;18:593–9.
- 6 Chung J, Caumartin Y, Warren J, *et al.* Acute Page kidney following renal allograft biopsy: a complication requiring early recognition and treatment. *Am J Transplant* 2008;8:1323–8.
- 7 Shen Z, He W, Liu D, *et al.* Novel technique for the treatment of large subcapsular renal hematoma: combined use of percutaneous drainage and urokinase injection. *Int Urol Nephrol* 2014;46:1751–5.
- 8 Duchene DA, Williams RD, Winfield HN. Laparoscopic management of bilateral Page kidneys. *Urology* 2007;69:1208.e1–3.
- 9 Castle EP, Herrell SD. Laparoscopic management of Page kidney. *J Urol* 2002;168:673–4.
- 10 Bansal U, Sawant A, Dhabalia J. Subcapsular renal hematoma after ureterorenoscopy: an unknown complication of a known procedure. *Urol Ann* 2010;2:119–21.
- 11 Boggi U, Berchiolli R, Ferrari M, *et al.* Renal hypertension due to giant perirenal haematoma: Permanent resolution by percutaneous ultrasound-guided drainage. *Scand J Urol Nephrol* 1998;32:64–6.
- 12 Vo NJ, Hanevold CD, Edwards R, *et al.* Recurrent Page kidney in a child with a congenital solitary kidney requiring capsular artery embolization. *Pediatr Radiol* 2010;40:1837–40.
- 13 Dhar N, Thornton J, Karafa MT, *et al.* A multivariate analysis of risk factors associated with subcapsular hematoma formation following electromagnetic shock wave lithotripsy. *J Urol* 2004;172:2271–4.
- 14 Breda A, Territo A, López-Martínez JM. Benefits and risks of ureteral access sheaths for retrograde renal access. *Curr Opin Urol* 2016;26:70–5.
- 15 Yung BCK, Wong KW, Fan WC, *et al.* Negative captopril renography on patients with renin mediated hypertension due to page kidney and reninoma. *Eur J Radiol* 1999;31:63–8.
- 16 Freed TA, Tavel FR. Diagnosis and surgical treatment of Page kidney: selected aspects. *Urology* 1976;7:330–3.
- 17 Suckling R, Uddin F, Pilcher J, *et al.* Page kidney: successful radiological management of acute renal failure. *Nephrol Dial Transplant* 2006;21:1740.
- 18 Jang YB, Kang KP, Lee S, *et al.* Treatment of subcapsular haematoma, a complication of extracorporeal shock wave lithotripsy (ESWL), by percutaneous drainage. *Nephrol Dial Transplant* 2006;21:1117–18.
- 19 Hamidian Jahromi A, Fronck J, Kessaris N, *et al.* Acute Page kidney complicating kidney transplant artery stenting: presentation of a case and novel management. *Iran J Kidney Dis* 2013;7:352–5.
- 20 Babel N, Sakpal SV, Chamberlain RS. The Page kidney phenomenon secondary to a traumatic fall. *Eur J Emerg Med* 2010;17:24–6.

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