

Capsulectomy: A Cure for the Page Kidney

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● Hypertension is a known complication after renal trauma. The cause of posttraumatic hypertension can be renal scarring, infarction, hydronephrosis, infection, vascular injury, and parenchymal compression. The authors report on the case of a 16-year-old boy who experienced hypertension after blunt renal trauma. He had a dense fibrous pseudocapsule causing renal parenchymal compression, which led to hypertension, a Page kidney. Evaluation with computed tomographic (CT) scan, radioisotope renal scan, renal Doppler, and angiogram confirmed the diagnosis. Removal of the renal capsule and the constricting fibrous pseudocapsule was curative.

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HYPERTENSION is a known complication after renal trauma occurring in 4% to 10% of patients.¹⁻⁴ The cause of the hypertension can be renal infarction, scarring, hydronephrosis, chronic infections, vascular injury, and parenchymal compression (Page kidney).^{1,5} The follow-up of renal injuries has not been standardized. Abdalati et al³ found that grade 1 and 2 renal injuries required no follow-up because of complete healing. However, grade 3 and 4 injuries often resulted in delayed complications and required close follow-up with computed tomographic (CT) scan, scintigraphy or ultrasound scan every 3 to 4 months until complete healing.³ We recently treated a 16-year-old boy with posttraumatic, surgically correctable hypertension caused by a Page kidney.⁵

CASE REPORT

A 16-year-old boy sustained a left renal subcapsular hematoma, a splenic laceration and a left femur fracture in a motor vehicle collision. He had intramedullary rodding of the left femur and was treated nonoperatively for the intraabdominal injuries. Four months postinjury he had new onset headaches and hypertension, with a blood pressure of 140/98 mm Hg. Two years before, his blood pressure was 122/76 mm Hg. He had normal renal function, with a blood urea nitrogen level of 10 mg/dL and a creatinine level of 0.8 mg/dL. CT scan showed a left subcapsular fluid collection with mass effect on the kidney (Fig 1). Radioisotope renal scan showed diminished perfusion to the left kidney at 22% compared with the right kidney at 78% with good bilateral renal function (Fig 2). Renal Doppler flow and renal angiogram findings showed no evidence of renal artery stenosis.

Twelve months postinjury the left kidney was explored through the flank with hilar control. During the operation it was noted that Gerota's fascia was densely adherent to the renal capsule, and at the posterolateral aspect of the lower pole of the kidney was a 7 cm × 6 cm serous fluid collection. After removal of the capsule and drainage of the fluid a 2- to 3-mm thick pseudocapsule was found attached to the kidney, compressing the renal parenchyma. The fibrotic pseudocapsule as well

as the renal capsule were dissected off the renal parenchyma without difficulty by blunt and electrocautery dissection.

To further confirm the diagnosis, intraoperative postcaptopril peripheral and left renal vein renin levels were obtained. The renal to systemic renin index (RSRI) was elevated at 1.7.^{6,7} The patient had an uneventful recovery and remains normotensive at 38 months follow-up. Repeat radioisotope renal scan findings showed 44% flow to the left kidney and 56% flow to the right kidney. A 66-hour ambulatory blood pressure monitoring confirmed normal blood pressure with the average reading of 118/72 mm Hg.

DISCUSSION

Goldblatt, in 1934, demonstrated renal artery constriction was sufficient to produce sustained hypertension.⁸ In 1939, Page demonstrated that experimental persistent arterial hypertension could be produced by wrapping the kidney in cellophane, which resulted in perinephritis and the formation of a fibrocollagenous scar, which compressed the renal parenchyma.⁵

The pathophysiology of the Page kidney consists of renal parenchymal compression leading to ischemia. There are two types of Page kidney. An acute process caused by the accumulation of blood or fluid in the subcapsular or perinephric space, which is often transient^{4,9-13} and a chronic process often of delayed onset caused by a fibrocollagenous scar compressing the parenchyma.¹⁴⁻¹⁸ In both there is preservation of renal function. The juxtaglomerular cells respond to ischemia with increased secretion of renin, and the renin-angiotensin response is initiated leading to arterial hypertension.⁷

To diagnose a Page kidney, history and physical examination are important. The typical patient is a young boy with a history of trauma or participation in contact sports.^{12,17} Diagnostic evaluation with noninvasive CT will demonstrate compression of the renal parenchyma by perinephric fluid or thickened pseudocapsule adjacent to the kidney.^{12,18} Renal duplex sonography is a valuable screening test for renal artery stenosis.¹⁹ Radioisotope imaging technique can assess renal flow and excretory function.²⁰ In the case described, the diagnosis could have been made without the aid of an angiogram. In other reports, as in the case described, RSRI's were used to

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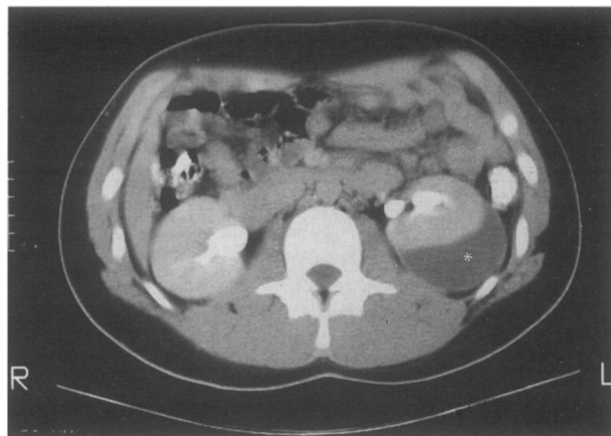


Fig 1. CT scan showing the chronic subcapsular fluid collection (*) compressing the kidney.

confirm the diagnosis, however, invasive preoperative renin levels are not imperative.^{9,17,18}

Definitive therapy is controversial. In Page's original work, as with many reports, nephrectomy was performed with over 90% cure rate.^{5,11,14,16,17} Percutaneous drainage

and capsulotomy with drainage of a chronic perinephric fluid collection has not been shown to be curative because the compressive fibrotic pseudocapsule remains on the kidney.^{9,16,17} Acute hypertension should resolve in 30 to 60 days as the hematoma resolves.^{4,11,12} If hypertension persists with a perinephric collection, percutaneous drainage should be performed before the formation of a fibrotic pseudocapsule.^{9,12,13} As in the case described, if a dense fibrotic capsule is identified, removal has been reported as curative and preserves functioning renal tissue.^{18,21}

Based on our experience and reports in the literature of hypertension being discovered up to 16 years postinjury, we recommend that all patients with blunt renal trauma have long-term follow-up in case of the development of hypertension.¹⁶ Noninvasive evaluation with CT scan, renal duplex sonography, and radioisotope renal scan is sufficient to diagnose a Page kidney. The goal of therapy should be to correct the hypertension and to preserve functioning renal tissue. Removal of the capsule and pseudocapsule should be performed before nephrectomy.

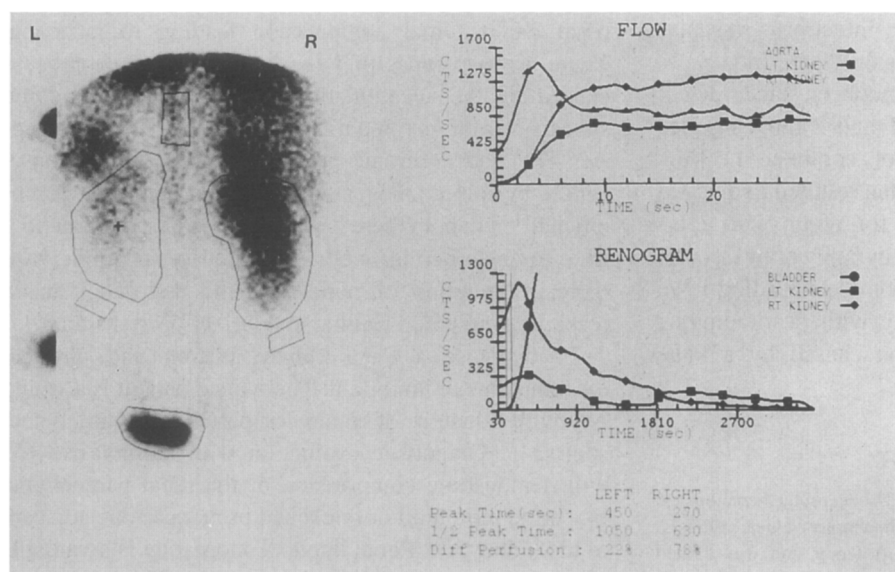


Fig 2. A radioisotope renal scan showing normal bilateral renal function and 22% flow to left kidney and 78% flow to the right kidney.

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