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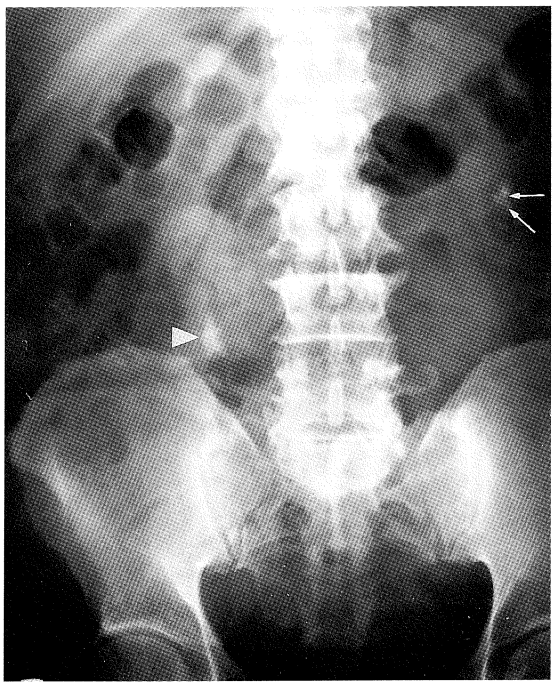

Fig 1a – Initial abdominal radiograph shows two small left renal (small arrows) and one relatively-large right ureteric (arrowhead) calculi.

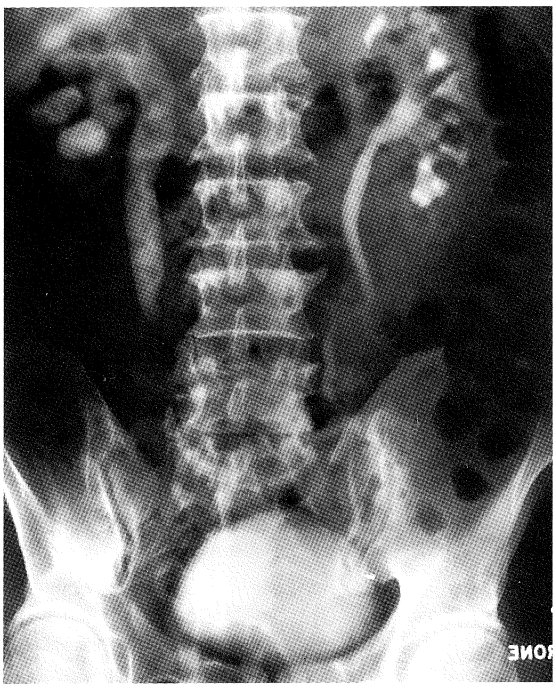

Fig 1b – Initial IVU shows a right hydrometer and dilated pelvicalyceal system due to the obstructing right ureteric calculus.

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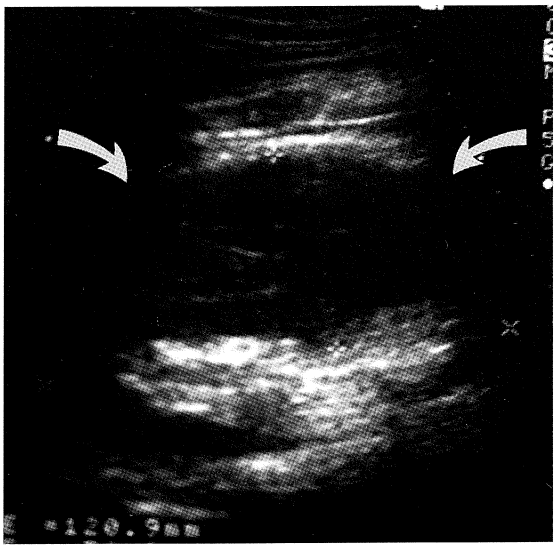

Fig 2 – Post-ESWL ultrasound of the left kidney.

CASE PRESENTATION

A 57-year-old Malay man was admitted with fever, chills and rigors for one week. He also had dysuria and frequency during micturation but no abdominal or loin pain. He had no other medical problems other than previous left ureterolithotomy. His abdomen was soft and non-tender. An elevated white cell count was noted. Urine microscopy showed pyuria and blood culture grew *Klebsiella*. His urinary tract infection was treated accordingly. Subsequent intravenous urogram (IVU) showed two small calculi in the left lower renal pole and a right ureteric calculus, which caused obstruction to the proximal collecting system obstruction (Figs 1a & b). He received six sessions of extracorporeal shockwave lithotripsy (ESWL) for his right ureteric calculus. Treatment was uneventful and stone clearance was confirmed radiographically.

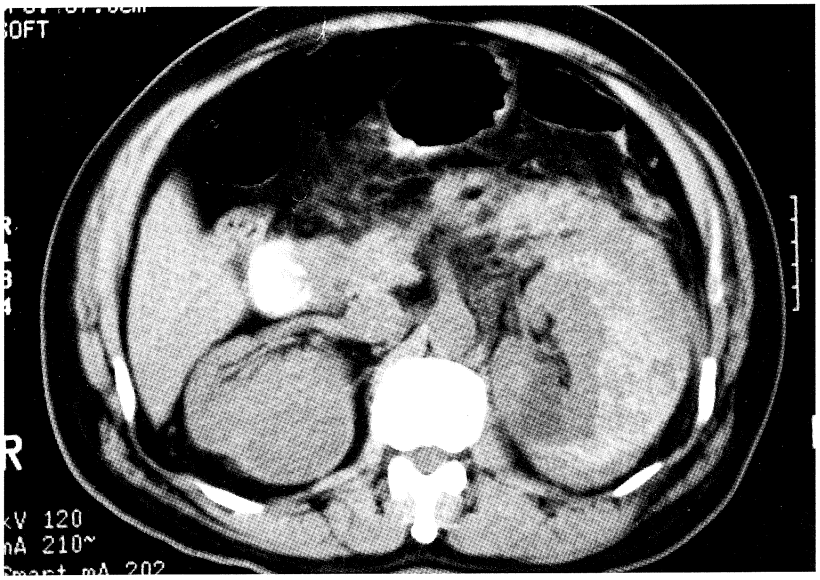

Fig 3a

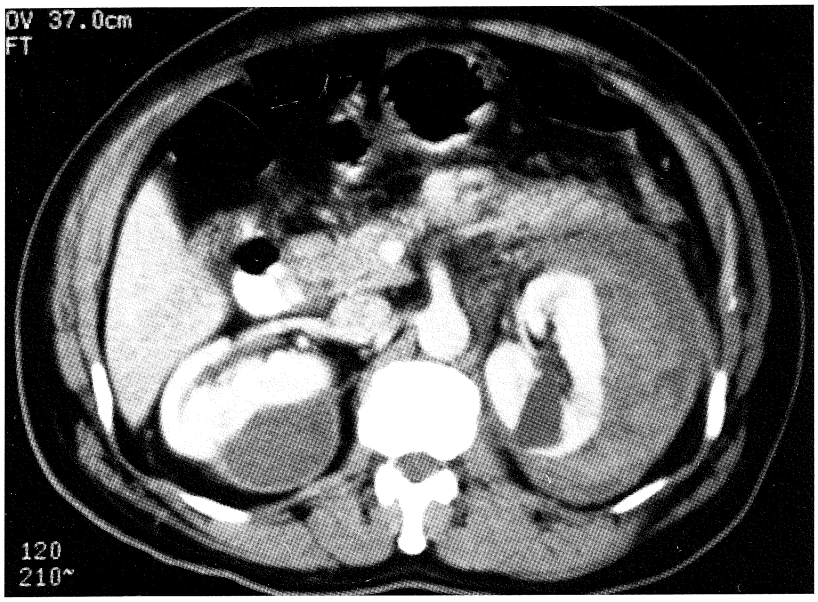

Fig 3b

Fig 3a & b – (a) Unenhanced and (b) enhanced CT scans of the abdomen at the level of the mid-pole of the left kidney.

The patient subsequently received ESWL for his left renal calculi, following which he developed left loin pain on the same day. He was admitted for management of this pain. No haematuria or stone passage was noted. His abdomen was soft but mild left loin tenderness was present. Otherwise, he was afebrile and haemodynamically stable. He was treated conservatively and analgesics were given for pain control. He was discharged after one day of admission. Less than one week later, he was re-admitted with fever, chills and rigors for four days which was associated with left loin pain. What did the urgent ultrasound scans of kidneys show (Fig 2)? Computed tomography (CT) of the abdomen was subsequently performed (Figs 3a & b). What was the diagnosis?

IMAGE INTERPRETATION

The urgent ultrasound scans showed a hypoechoic perinephric fluid collection (curved arrows) surrounding the left kidney. It contained echogenic material and measured 11 cm x 6 cm. The left pelvicalyceal system was also mildly dilated. CT scans (Fig 3a & b) confirmed the presence of a large perinephric collection surrounding the left kidney. This collection was heterogeneously hyperdense compared to the renal parenchyma, with no gas pockets or wall enhancement being evident.

DIAGNOSIS

Post-ESWL perinephric haematoma.

CLINICAL COURSE

The patient was admitted two more times over the next two months, with complaints of fever, chills, rigors and left loin pain. Intravenous antibiotics were given. Despite this, he developed recurrent bouts of fever as well as persistent hiccups. Repeat CT showed decrease in size of the left perinephric haematoma. However, there was peripheral contrast enhancement, suggestive of abscess formation (Fig 4). He underwent a percutaneous drainage of the left perinephric collection. The turbid brownish fluid which was aspirated grew *Klebsiella*. Contrast injection confirmed a perinephric collection. No communication with the renal collecting system was demonstrated (Fig 5). An 8.5F Cope loop was inserted for continuous external drainage. The infection and hiccups settled, and the drain was subsequently removed. The patient currently remains well.

DISCUSSION

We previously reported our experience of ESWL for urinary stones using the Storz Modulith SL20 lithotriptor[1]. In general, ESWL has a complication rate of 2% to 5%[1,2]. Of these, the major complications are obstruction from stone fragments and steinstrasse formation (Fig 6); and perirenal or subcapsular haematoma. Knapp et al[3] followed up 3620 ESWL treatments in 3208 patients and detected 24 perirenal haematomas in 21 patients, giving an incidence of 0.66% per treatment. All the patients had significant post-ESWL pain requiring parenteral narcotics. Newman and Saltzman[4] studied 1012 treatments and reported an incidence of 0.49% of significant haematomas.

The risk factors for the development of post-ESWL haematoma are hypertension, diabetes mellitus, coronary artery disease, obesity, pre-treatment urinary tract infection, bilateral treatment and the use of antiplatelet agents such as Aspirin, even when stopped up to 2 weeks prior to treatment[3,4]. The aetiology of perinephric haematoma formation is unclear. High-energy shockwaves do cause tissue damage. Many of the aforementioned risk factors such as hypertension, diabetes mellitus, coronary artery disease and obesity have atherosclerosis as a common pathology. In this connection, Newman and Saltzman postulated the pathogenesis as being related to a loss of vascular tensile strength as a result of atherosclerosis[4].

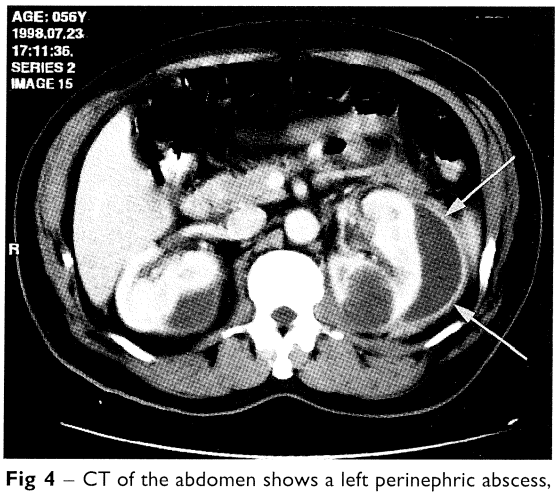

Fig 4 – CT of the abdomen shows a left perinephric abscess, with prominent peripheral enhancement (arrows).

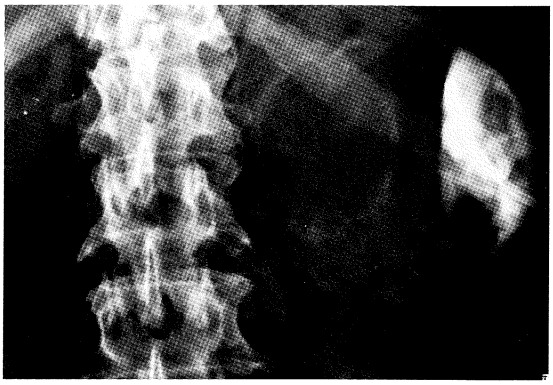

Fig 5 – Percutaneous drainage of the left perinephric abscess. Injected contrast following aspiration shows a perinephric collection with no communication with the renal collecting system.

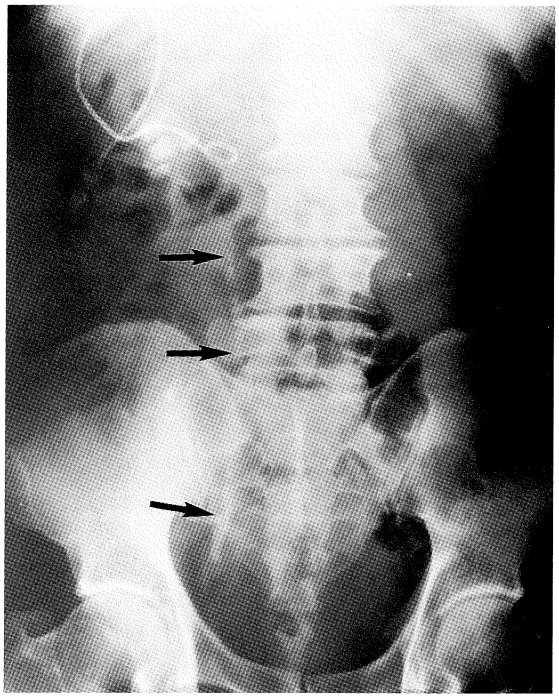

Fig 6 – Radiograph following external drain placement shows steinstrasse formation after ESWL. A line of stone fragments is seen (arrows).

Post-ESWL haematoma, while not uncommon, often remains asymptomatic. Occasionally, infection and renal impairment may develop, although this is found to be so only in patients with pre-existing azotaemia. Tuteja et al[5] reported a case of anuria as a result of extensive haemorrhage complicating bilateral ESWL using the Dornier HM3 lithotriptor. The DTPA scan of this patient showed markedly decreased uptake with no excretion. They postulated that the haematoma could have caused compression and ischaemia leading to compromised renal function in the absence of demonstrable ureteric obstruction.

Krishnamurthi and Streem[6] studied the long term radiological and functional outcomes of ESWL-induced perirenal haematoma by following up a series of patients using routine ultrasound scans (one month post-ESWL). They detected 21 haematomas in 19 patients. The patients were monitored by serial ultrasound scans and complete resolution was noted in 18 cases (85.7%). Two were significantly smaller (9.5%) and one (4.8%) remained unchanged. The authors suggested that the most likely outcome would be radiological resolution within two years. In the same series, they did not detect any significant adverse effect upon the blood pressure. Only one patient had significant rise in serum creatinine, and he had pre-existing azotaemia at the onset of treatment. Nevertheless, the authors recommended monitoring of blood pressure and renal function in those patients with pre-existing azotaemia or solitary kidneys.

Papanicolaou et al[7] evaluated all their ESWL patients with abdominal radiographs and renal ultrasound scans before and after the procedure. They found fluid collections in 3% of patients. Those with small collections and stable haematocrit did not undergo further imaging unless a second session of ESWL was planned. An accurate diagnosis of bleeding was made with renal ultrasound scans in all cases. For major fluid collections, further evaluation was made employing CT. Acute haematomas were denser than renal parenchyma on pre-contrast CT scans, as seen in our patient. In older haematomas, they were equally or less dense than the renal parenchyma[7]. Ultrasound thus appears to be the modality of choice in the detection and follow-up of post-ESWL haematoma. It has been shown to be more specific and more sensitive in the evaluation of the presence of intrarenal or perirenal abnormalities compared to other imaging modalities such as IVU[8].

In summary, subcapsular and perinephric haematomas are among the many complications associated with ESWL. Although the majority resolve, there may be complicated sequelae. Risk factors for their development should be identified and avoided. Detection hinges on a high index of clinical suspicion and judicious use of renal ultrasonography and complementary CT for a detailed study of the anatomy and extent of the haematomas. Imaging is particularly useful in the planning of percutaneous or endourological intervention.

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ABSTRACT

A 57-year-old man presented with urosepsis related to urinary calculi. He underwent multiple sessions of ESWL and developed a perinephric haematoma that was treated conservatively and monitored by serial imaging. However, the haematoma became infected, necessitating percutaneous drainage 2 months after the initial ESWL. The risk factors and sequelae of post-ESWL perinephric haematoma, as well as its diagnosis and imaging, are discussed.

Keywords: extracorporeal shockwave lithotripsy (ESWL), complications, perinephric haematoma, infection, imaging, ultrasound, computed tomography