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Trauma and reconstruction

Extracorporeal shock wave lithotripsy-induced renal blunt trauma in young adult patient: A case report

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ABSTRACT

Extracorporeal Shock Wave Lithotripsy (ESWL) is an option in the management of urolithiasis. Despite its significant benefits, it has an undesirable outcome such as renal trauma. We report a case of a 38-year-old male with iatrogenic left kidney blunt trauma (AAST Grade IV-V) due to left ESWL, presented initially with unstable hemodynamic and successfully managed conservatively.

1. Introduction

ESWL has been a safe and effective non-invasive treatment option for urolithiasis since early 1980. ESWL works by an externally generated shockwave of energy being focussed and delivered directly to the imaged stone. The European Association of Urology (EAU) recommends the use of ESWL in renal stones up to 20 mm in size, in the absence of unfavourable factors for lower pole stones.[1,2]

Contraindication to ESWL includes coagulopathy or use of platelet aggregation inhibitors, pregnancy, sepsis, and abdominal aortic aneurysm. Hematuria, colic, infection, and steinstrasse are known to be the complications of ESWL. Asymptomatic renal hematoma was found in approximately 15% patients, while 1% patients will develop symptoms. Numerous risk factors have been determined of predisposing to renal hematoma including pre-existing hypertension and increasing age. There are only 7 cases published from 1994 until 2014 reporting severe renal trauma induced by ESWL varying in age, gender, stone size, location, and treatment conducted to the patients.[2,3]

We report a case of significant renal hematoma induced by ESWL. This patient underwent his first ESWL and began presenting symptoms of abdominal pain in the left flank and restlessness 6 hours after the procedure.

2. Case presentation

A 38-year-old male was admitted to the Emergency Room (ER) of Wangaya General Hospital, due to dull abdominal pain in the left flank region followed by restlessness and vomiting occasionally. He reported that the complaints had been felt intermittently for 10 hours prior to admission. A day before, he underwent an ESWL procedure at another hospital due to left nephrolithiasis.

He underwent left ureterorenoscopy (URS) and ureter stent insertion on early May 2023 at another hospital due to left renal colic caused by hydronephrosis (based on pre-operative ultrasound result). Intraoperatively, a proximal ureteric stone measuring approximately 12mm retropulsed to the left pelvicalyceal was found. After the procedure completed, the patient was observed for 3 days and showed no complications. Two weeks later, he was planned to undergo a left ESWL under intravenous (IV) analgesia. The procedure is carried out for 1 hour with 4000 shocks and the shock energy level gradually escalating from 3 to 5 kV (kV).

Six hours after ESWL, he presented with progressively worsens left flank pain. He was then admitted to our hospital with a blood pressure of 70/40 mmHg, heart rate of 120 beats per minute, a haemoglobin of 10.8 g/dL, haematocrit of 34.7%, and serum creatinine of 2.5 mg/dL. Initial abdominal ultrasound revealed a hypoechoic lesion of approximately 9.44 cm × 7.09 cm in the left lower pole of the kidney, a suspected hematoma, free fluid in the abdominal cavity and pelvic cavity (Fig. 1). Even though the patient is suspected of hematoma, there was no risk factor for bleeding based on the anamnesis (such as no history of uncontrolled or untreated hypertension or use of platelet aggregation inhibitor).

Subsequent non contrast abdominal computed tomography (CT) scan revealed a hyperechoic lesion in the left renal and perirenal area

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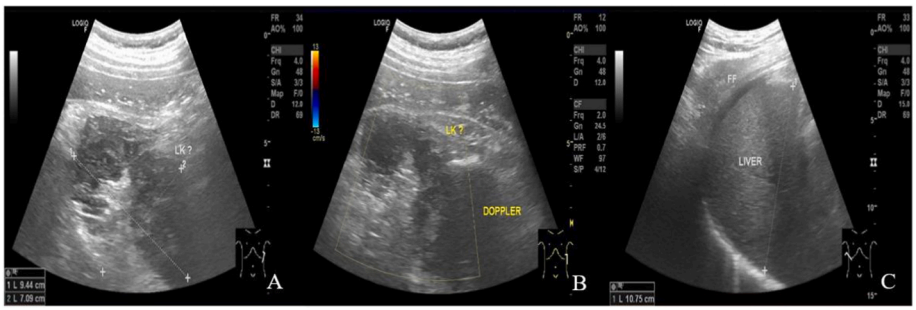

Fig. 1. Abdominal Ultrasound. (A) Hypoechoic lesion measuring approximately 9.44 cm × 7.09 cm in the left lower pole of the kidney suspected hematoma; (B) Color doppler ultrasound showed no vascularization on the left kidney; and (C) Free fluid in the abdominal cavity. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

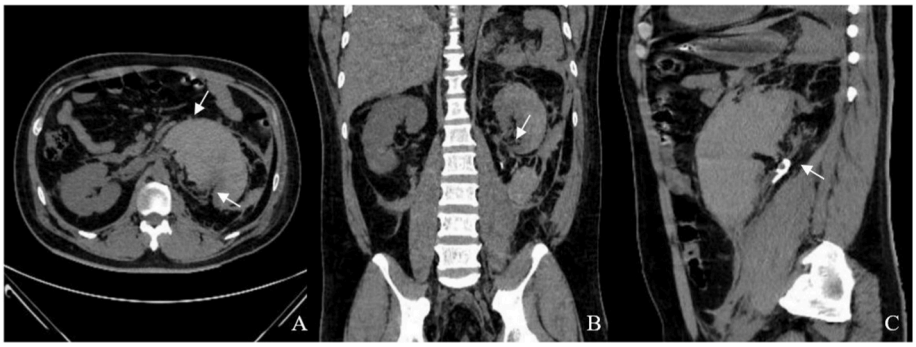

Fig. 2. Abdominal CT-scan without contrast. (A) Axial view showed left renal pelvis laceration with extensive perirenal hematoma; (B) Coronal view showed segmental left renal vein or artery injury; and (C) Sagittal view showed proximal tip of the stent slipped down and placed ectopically in the left proximal ureter with renal pelvis laceration.

with a border that is difficult to distinguish from the left kidney, suspected extensive left perirenal hematoma (Fig. 2). The patient was then diagnosed with iatrogenic left kidney blunt trauma (AAST Grade IV-V). We decided to approach the case conservatively. He was given supportive treatment: vasopressor, antibiotics, fluid therapy, and blood transfusions. Within 24 hours after admission, he achieved stable hemodynamic with minimal symptoms. He underwent conservative management with a total of 6 packed red cell (PRC) transfusions and was discharged on day 7 with stable hemodynamic and haemoglobin of 12.2 g/dL and HCT of 35.1%.

3. Discussion

ESWL is an option for the treatment of urolithiasis. However, it has an undesirable outcome such as renal trauma. In general, renal trauma accounts for about 3% of all trauma admissions and up to 10% of patients who experience major abdominal trauma. CT imaging has become the gold standard for determining organ injury following trauma.[3,4]

We present a case of a 38-year-old male who underwent an ESWL at another hospital due to left nephrolithiasis. The next day the patient then came to our hospital with dull abdominal pain in the left flank region followed by restlessness and vomiting occasionally. Non contrast abdominal CT-scan showed a hyperechoic lesion in the left renal dan perirenal area with suspicion of an extensive left perirenal hematoma. The patient was then diagnosed with iatrogenic left kidney blunt trauma (AAST Grade IV-V). The reported incidence of asymptomatic renal hematoma following ESWL detected through ultrasonography was 0.2–0.7% and 23–26% through CT or MRI. Age is the main contributor to the occurrence of hematoma, which doubles every 10 years when combined with untreated or uncorrected hypertension, diabetes, and generalized vascular calcification.[3,5]

Bubble cavitation and shear stress have been proven to be significant in the mechanical trauma caused by the shock wave. Studies conducted by Smolic et al. and Dzięgała et al. reported that renal trauma can be distinguished into two major types: traumatic vascular injury and ischemic injury. Traumatic injury is provoked by the sheer shock waves of physical force. The ischemic (hypoxic) injury appears in both kidneys, not just the treated one, and is caused by renal vasoconstriction together with intraparenchymal bleeding. Furthermore, kidney damage during ESWL may be exacerbated by oxidative stress mediated by ischemia-reperfusion.[4,5] The amount of energy and the quantity of delivered shockwaves are correlated with the degree of damage. Evidence suggested that power ramping corresponds with less kidney damage and induced statistically fewer ultrasound-detected renal hematoma (5.6%), compared with fixed power (13%).[1,5] Despite the fact that our patient had no risk factors or contraindications, yet we still cannot rule out the amount of energy or the quantity of shockwave delivered that caused the trauma.

In this case, the patient was given a conservative treatment after initial resuscitation. He underwent continuous monitoring (including serial complete blood count (CBC)), bedrest, and was given IV antibiotics, PRC transfusions, cold pack compress on the left loin. He was discharged with stable hemodynamic and no complaints on day seven. Several studies stated that most renal hematomas resolve without any medical implication within weeks or months, without any long-term effects on the renal function. Non-operative management (NOM) is the standard in the majority of patients with renal trauma; even in high grade patients, the NOM success rate can exceed 80% when hemodynamic is stable.[3,5]

4. Conclusion

ESWL is a safe and effective non-invasive treatment option for urolithiasis since the early 1980s. Despite its significant benefits, it has an

undesirable outcome such as renal trauma. The amount of energy and the quantity of delivered shockwaves are correlated with the degree of damage. Therefore, a guideline for safer ESWL treatment must be obtained for achieving fewer shock wave lithotripsy-induced renal trauma.

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Consent

Written informed consent was obtained from the patient.

Declaration of competing interests

The authors declare no conflict of interest.

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