

Severe renal trauma after twice Extracorporeal Shockwave Lithotripsy (ESWL)

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Abstract

Background: The complications of extracorporeal shockwave lithotripsy (ESWL) occur in a few patients. In addition, serious renal trauma is extremely rare. we report a severe complication of kidney trauma after receiving twice ESWL.

Case Presentation: A 56-year-old Man was transferred to our Emergency Department (ED) with severe left flank pain. He had undergone ESWL twice for the left renal stone at intervals of less than four days. Left flank pain developed immediately after second ESWL and was not spontaneously relieved. Computed tomography (CT) performed in our hospital showed an extensive left perinephric hematoma. His vital signs were unstable and were not stabilized even with fluid resuscitation and transfusion. Left nephrectomy was selected for the progressive decline of hemoglobin Hb levels. He was discharged on the 11th hospital day safely.

Conclusion: Although it is rare, patients may present with kidney trauma especially when receiving twice ESWL in a short time.

Keywords: ESWL; hematoma; urolithiasis; renal trauma; nephrectomy; case report.

Abbreviations

ESWL: Extracorporeal shockwave lithotripsy; CT: Computerized tomography; ED: Emergency Department; NOM: non-operative management; RFs: Residual fragments; Hb: Hemoglobin; Hct: Hematocrit.

Introduction

It is well generally accepted that extracorporeal shockwave lithotripsy (ESWL) has becoming a safe and useful treatment modality for urolithiasis, since it was first applied in the early 1980s [1,2]. Researchers have always believed that the destructive forces, created via the extracorporeal shockwave, would cause damages to adjacent tissues and vessels in the kidney [3]. Only less than 7% patients who receiving ESWL would generate mild Complications, and severe kidney trauma is extremely rare [4]. In this report, we describe the case of a grade IV renal trauma patient after ESWL treatment. The relevant literature was also reviewed in order to help improve the treatment of urolithiasis.

Case presentation

A 56-year-old man was transferred to our Emergency Department (ED) with severe left flank pain in Immediately after he had undergone ESWL twice at less than four days. He has no known significant past medical history and special family history. Initial vital signs at the emergency

department was follows: blood pressure, 145/65 mmHg, heart rate, 70 beats/min; respiratory rate, 20/min; body temperature, 36.4C; and blood oxygen saturation, 99%. Routine blood test revealed an initial hemoglobin (Hb) level of 80g/L, a hematocrit (Hct) of 25.0%. In the following time these two indicators still showed a progressive decline, although physicians had tried a conservative therapy with many transfusions. These results are shown in (Table 1).

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Table 1: The decline of the Hb and Hct.

Time	Hb (g/L)	Hct (%)
4:00am	80g/L	25.0
5:00am	75g/L	22.6
6:00am	70g/L	20.9
7:00am	63g/L	19.9
8:00am	58g/L	17.5

Hb, hemoglobin, reference range 110-150 g/L for woman;
Hct, hematocrit, reference range 37-43% for woman.

Computed tomography (CT) demonstrated a huge left perinephric haematoma (Figure 1A and B). the patient was diagnosed with grade IV renal trauma at least. Thus, it was finally decided to treat the patient with left nephrectomy. In the surgical report it is documented that the left kidney showed a rupture of the capsule, renal laceration >1.5 cm depth, subcapsular haemorrhage and massive haemorrhage around the left kidney. On the 5th hospital day, CT images showed that there was no additional hematoma (Figure 2). He was discharged from the hospital on the 11th hospital day without extra complications.

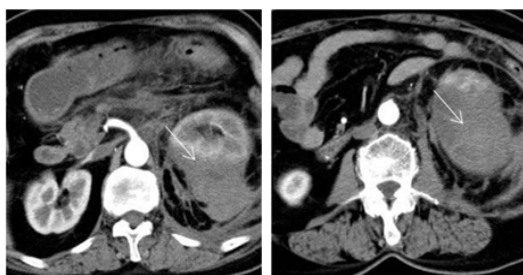


Figure 1: CT scans show an extensive left perinephric hematoma (white arrow, size: 8.6*7.3*15 cm).

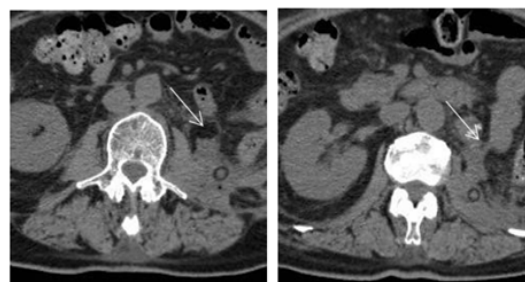


Figure 2: CT scans show there are no external hematoma after nephrectomy.

Discussion

Renal Injury

The kidneys are paired retroperitoneal structures lying against the psoas muscles, cushioned by perinephric fat, and surrounded by Gerota’s fascia. Renal trauma accounts for approximately 3% of all trauma admissions and as many as 10% of patients who sustain significant abdominal trauma [5]. CT imaging has become the essential inspection for the diagnosis of organ injury after trauma [6]. Please refer to (Table 2) for the grading of kidney injury severity. Several studies have confirmed the safety of non-operative management (NOM) in renal injury [8], and NOM has become the standard in most patients with renal trauma, even in high grade patients, the NOM success rate can reach to 80% when haemodynamics is stable [9]. Although the angioembolization for the treatment of active bleeding complications may have established an intermediate step between NOM and traditional surgery [10]. Immediate surgical management is widely accepted in some special circumstances [11] (Table 3). outlines the indications of operative intervention in blunt renal injury. Finally, we choose the left nephrectomy to save the life of patient.

Table 2: Kidney Injury Scale of 2018 AAST [7].

Grade	Type of Injury	Imaging Criteria (CT Findings)
I	Contusion	-Microscopic or gross hematuria -parenchymal contusion without laceration
	Hematoma	-Subcapsular hematoma
II	Hematoma	-Perirenal hematoma confined to Gerota fascia
	Laceration	-Renal parenchymal lacerations ≤1 cm depth without urinary extravasation
III	Laceration	-Renal laceration >1 cm depth without collecting system rupture or urinary extravasation
	Vascular	-kidney vascular injury or active bleeding contained within Gerota fascia
IV	Laceration	-Renal laceration extending into urinary collecting system with urinary extravasation
		-Renal pelvis laceration and/or complete ureteropelvic disruption

	Vascular	-Segmental renal vein or artery injury -Active bleeding beyond Gerota fascia into the retroperitoneum or peritoneum -Segmental or complete kidney infarction(s) due to vessel thrombosis without active bleeding
V	Laceration	-Main renal artery or vein laceration or avulsion of hilum
	Vascular	-Devascularized kidney with active bleeding
		-Shattered kidney with loss of identifiable parenchymal renal anatomy

More than one grade of kidney injury may be present and should be classified by the higher grade of injury; Advance one grade for bilateral injuries up to Grade III; ASST: the American Association for the Surgery of Trauma.

Table 3: Indications for Operative Intervention of 2020 AUA Guideline [12].

Description	Evidence Strength
-hemodynamically unstable patients with no or transient response to resuscitation	Grade B
-hemodynamically unstable patients with radiographic of large perirenal hematoma (>4 cm)	Grade C
-vascular contrast extravasation in the setting of deep or complex renal laceration (AAST Grade3-5)	Grade C
Grade B: Moderate Certainty, Benefits > Risks/Burdens (or vice versa) Net benefit (or net harm) is substantial Applies to most patients in most circumstances but better evidence could change confidence; Grade C: Low Certainty, Benefits > Risks/Burdens (or vice versa) Net benefit (or net harm) appears moderate Applies to most patients in most circumstances but better evidence is likely to change confidence; AUA: American Urological Association.	

Our Experience of ESWL

Extracorporeal shockwave lithotripsy (ESWL) has been widely used for treatment of ureteral and symptomatic renal stones, which is showed in (Table 4). While increasing evidence suggested that ESWL could lead to various complications (Table 5). Previous studies have proved that we could lower the pulse rate to 60-80 shock waves/min and ramp up the energy voltage gradually (rather than beginning at maximum energy) to improve the safety and efficacy of ESWL [15]. However, there is a report that the incidence of renal hematoma after ESWL to occur in 0.2– 0.7% of cases when examined by ultrasonography, but when examined by CT or magnetic resonance imaging, the figures would fly to 23–26% [16]. The results indicated that the ESWL may cause potential damages to kidney more

than we expected. Reviewing the previous literature, only seven cases we found were reported for severe kidney trauma in adults after ESEL. The characters of each case are shown in (Table 6).

Residual fragments (RFs) following ESWL method seems inevitable [22]. At present, no acknowledged or standardized protocol exists regarding their definition, diagnosis, and treatment with the different procedures available [23]. In our patient, when He first received the ESWL for curing the ureteral calculus, the left kidney may have small renal hematoma. Unfortunately, the following ultrasonography only showed the left kidney stones, so our patient received a second ESWL treatment at intervals of less than four days. That may be the main reasons for the severe renal trauma.

Table 4: The relative indication of ESWL.

Location	Stone size(mm)	Sources of information
Kidney	≤20	EAU
	≤10	AUA/ES
Ureter	≥10	AUA
	≥6	EAU
AUA/ES, American Urological Association/Endourological Society; EAU, European Association of Urology; ESWL, extracorporeal shockwave lithotripsy.		

Table 5: Common complications after ESWL.

Complications	EAU guidelines	References (13)	References (14)
Intra procedure Dysrhythmia	11-59%	-	-
Early complications	<	-	
Hematoma(symptomatic)	1%	-	0.48%
Hematoma (asymptomatic)Renal colic	4-19%	-	- 1.02%
Steinstrasse	2-4%	1.3-3.7%	1.96%
Sepsis	4-7%	-	2.05%
1-2.7%	4.0-7.4%		
Long-term complications			
Regrowth of residual fragments	21-59%	-	-

Table 6: Reported cases of severe renal trauma.

Author, year	Ages (years)	Gender	Stone size (cm)	Location	Treatment	Refs
Mzaiak <i>et al</i> ,1994	59	Male	-	right kidney	conservative treatment	(4)
May <i>et al</i> ,2004	66	Male	0.8	left kidney	nephrectomy	(17)
Jeon <i>et al</i> ,2008	65	Male	1.3*1.0	right kidney	conservative treatment	(16)
Marchini <i>et al</i> ,2011	57	Female	1.5	left kidney	Conservative treatment	(18)
Inoue <i>et al</i> ,2011	76	Male	-	right kidney	nephrectomy	(19)
Kim <i>et al</i> ,2013	39	Female	-	left kidney	nephrectomy	(20)
Torbati <i>et al</i> ,2014	41	Female	-	left kidney	conservative treatment	(21)

Conclusion

BA is a devastating disease affecting newborns, there is a progress in BA diagnosis however there is a dire need for specific therapy development to achieve better outcome.

Consent

Written informed consent was obtained from the patient for the publication of this report and any accompanying images.

Competing interests: The authors declare that they have no competing interests.

Author's contributions

ZxZ and YpH drafted the report. XxW cared for patient and approved the final version of the manuscript. All authors read and approved the final manuscript.

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