

# RUPTURE OF RENAL PELVIS IN AN ADULT WITH CONGENITAL URETEROPELVIC JUNCTION OBSTRUCTION AFTER BLUNT ABDOMINAL TRAUMA

Wei-Ming Li,<sup>1</sup> Chia-Chu Liu,<sup>1</sup> Wen-Jeng Wu,<sup>1,2</sup> Yii-Her Chou,<sup>1,2</sup>  
Chun-Hsiung Huang,<sup>1,2</sup> and Ching-Chia Li<sup>1</sup>

<sup>1</sup>Department of Urology, Kaohsiung Medical University Hospital, and <sup>2</sup>Department of Urology, Faculty of Medicine, College of Medicine, Kaohsiung Medical University, Kaohsiung, Taiwan.

Isolated injury to the renal pelvis following blunt abdominal trauma is very rare. However, a pre-existing renal abnormality will increase the risk of rupture. We present a 24-year-old man with rupture of the left renal pelvis following blunt abdominal trauma. He had pre-existing left ureteropelvic junction (UPJ) obstruction. Delayed computed tomography scan with excretory phase revealed contrast medium extravasation from the left UPJ, and left renal pelvis rupture was diagnosed. He was managed successfully with ureteral double-J stenting for 2 months.

**Key Words:** hematuria, hydronephrosis, kidney, wounds and injuries  
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Noniatrogenic injuries of the upper ureter and renal pelvis are rare, with the majority resulting from penetrating mechanisms [1]. Blunt injuries involving the ureteropelvic junction (UPJ) are relatively rare occurrences. Traditionally, this injury has been reported mostly in children [2]. However, a pre-existing renal abnormality is a risk factor for renal pelvic rupture [3,4]. Accurate diagnosis of UPJ disruption following blunt abdominal trauma has been difficult. In almost half of the reported cases, the diagnosis was delayed [5,6]. Most delays were attributed to failure in imaging the genitourinary tract, either because the severity of the injury was underestimated or because the patient was rushed to the operation room due to hemodynamic instability with imaging being omitted. We report a case of traumatic rupture of the left renal

pelvis obstructed at the UPJ and discuss the diagnosis and management.

## CASE PRESENTATION

A 24-year-old man with left UPJ obstruction had received surgical intervention in childhood, but the actual type of operation was not traceable. Left flank soreness was noted intermittently. After being involved in a motor vehicle accident, he was admitted to our emergency department. He complained of severe left flank pain but he was alert and well orientated. Gross hematuria and multiple skin abrasions were found. His blood pressure was 108/64 mmHg and his pulse was 104 bpm. Urinalysis revealed hematuria, with more than 100 red blood cells per high-power field. His hemoglobin and hematocrit were 16.7 g/dL and 48.9%, respectively.

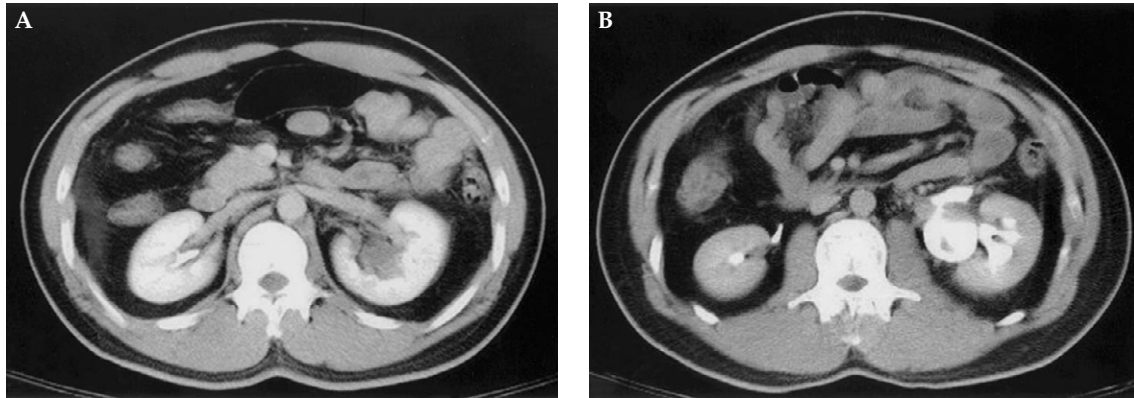
Chest, skull and pelvic X-ray films were unremarkable. Abdominal sonography revealed left hydronephrosis and perinephric fluid collection. Computed

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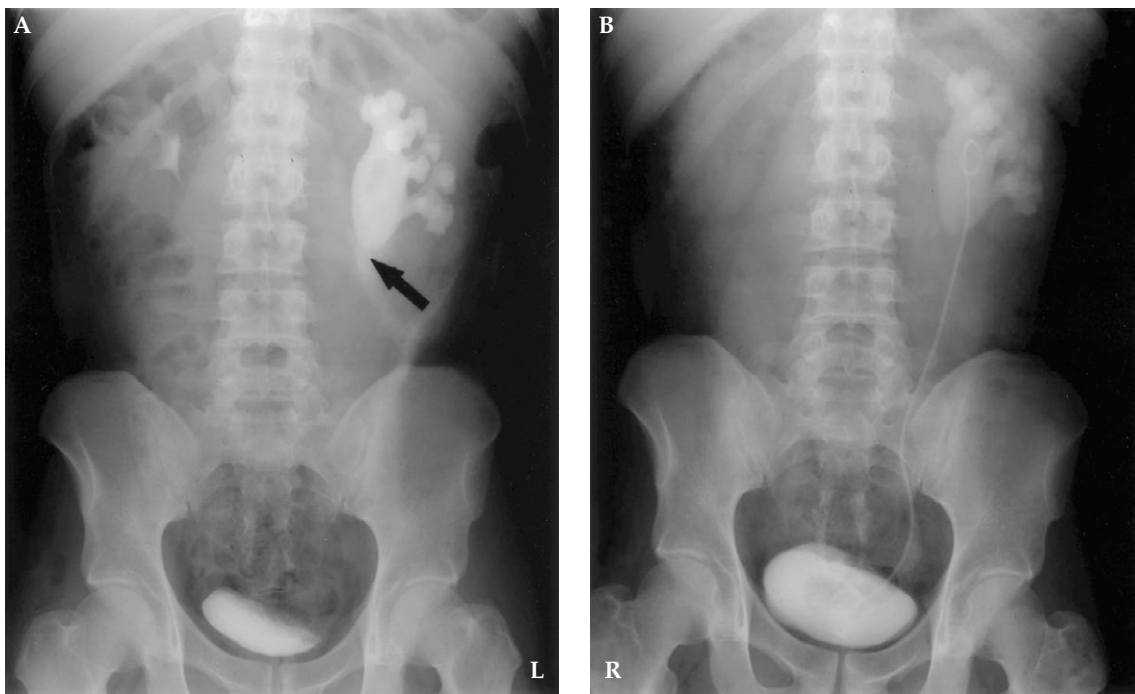
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Address correspondence and reprint requests to: Dr Ching-Chia Li, Department of Urology, Kaohsiung Medical University Hospital, 100 Tzyou 1<sup>st</sup> Road, Kaohsiung 807, Taiwan.

E-mail: ccli1010@hotmail.com



**Figure 1.** (A) Initial contrast-enhanced abdominal computed tomography (CT) on nephrogram shows left hydronephrosis but no contrast extravasation, and no parenchyma injury is evident. (B) One hour after the initial contrast-enhanced abdominal CT, repeat CT shows contrast extravasation from the left ureteropelvic junction.



**Figure 2.** (A) Plain abdominal X-ray (standing view) 2 hours after the initial computed tomography scan shows obvious contrast extravasation (arrow). (B) Follow-up intravenous urography 2 months after the trauma confirmed that there was no contrast extravasation.

tomography (CT) with contrast enhancement was performed and showed left hydronephrosis without parenchymal injury (Figure 1A). Delayed images obtained after 1 hour revealed extravasation of contrast medium from the left UPJ, and rupture of the left renal pelvis was diagnosed (Figure 1B). Plain abdominal X-ray taken 2 hours later also showed contrast medium leakage (Figure 2A).

The patient was kept on strict complete bed rest. Double-J stent was implanted successfully on the

next day and was removed 2 months later. Diuretic diethylenetriaminepentaacetic acid (DTPA) renal scan showed that the glomerular filtration rate of the left kidney increased from 32.8 mL/minute to 45.3 mL/minute within 3 months. Follow-up CT and intravenous urography (IVU, Figure 2B) were performed 2 months later and confirmed that there was neither perinephric fluid collection nor contrast extravasation. An Anderson-Hynes pyeloplasty was planned for a later date.

## DISCUSSION

Renal injuries occur in approximately 10% of patients who sustain blunt abdominal trauma, and 60% of the major renal injuries are associated with lesions to other abdominal systems [7]. Genitourinary anomalies are thought to increase the risk for blunt renal trauma related genitourinary injury. The most common pre-existing anomalies are cyst and tumor, horseshoe or ectopic kidney, and hydronephrosis [3]. However, injury of the renal pelvis attributed to a blunt mechanism is exceedingly rare [2,8]. Such injuries of the UPJ and renal pelvis are more common and severe among children than adults [3,4]. Rupture of congenital UPJ obstruction is thought to be more likely because of hyperextension associated with rapid deceleration or falls from higher than 20 feet [5]. Moreover, UPJ hydronephrosis is a high-pressure system and blunt abdominal trauma would increase the pressure within the hydronephrotic renal pelvis and cause rupture. This situation may amplify the force of the impact, thereby increasing the concentration of stress at the outer surface of the kidney, resulting in a higher probability of tissue rupture [9].

Accurate diagnosis of renal pelvic rupture or UPJ disruption following abdominal blunt trauma has been difficult and a delay in diagnosis of 36 hours or longer has been reported in more than 50% of patients [5,8]. McGinty and Mendez reported that delayed recognition of ureteral injuries resulted in a 32% nephrectomy rate compared with a 4.5% nephrectomy rate when these injuries were detected earlier [6]. Boone et al found that the majority of patients with UPJ disruptions had histories of rapid deceleration injuries and the presence of at least one of the following four associated findings: microscopic hematuria with shock; gross hematuria; direct flank tenderness/ecchymosis; multisystem trauma [5].

Ultrasonography may provide important information on a renal injury. Ultrasound findings in cases of isolated ureteric avulsion usually reveal clear fluid collection next to the renal pelvis, with intact parenchyma. However, ultrasonography done very shortly after trauma or in patients with shock and poor renal perfusion may show no or very little fluid collection, and thus, the accurate diagnosis can be missed [10].

CT scan of the abdomen is the most sensitive radiologic staging technique that accurately assesses

injuries of the kidney, the excretory system, and other abdominal organs [7]. The constellation of good renal contrast excretion with extravasation of contrast into the medial perirenal space with an intact calyceal system and nonvisualization of the unilateral ureter is virtually diagnostic of complete or partial UPJ disruption [11]. However, CT may miss up to two thirds of UPJ or renal pelvic injuries on initial trauma survey, especially if the scans are timed inappropriately [11]. Titton et al reported that delayed phase CT scans (obtained 5–20 minutes after contrast material injection) are optimal for demonstrating ureteral urine leaks [12]. In addition, fluid collection around the renal hilum or in the perirenal space with normal perfusion on the nephrographic phase of scanning should suggest the presence of a UPJ disruption, and delayed scanning should be used to either exclude or confirm the diagnosis. In our case, renal pelvic rupture was diagnosed in the delayed film with an excretion phase image obtained 60 minutes after contrast injection. Therefore, standard CT protocol should include nephrographic, arterial and excretion phase images to obtain the entire spectrum of images of the collecting system.

The aim of management is to prevent mortality, conserve the kidney, and reduce immediate and long-term morbidity. Primary pyeloplasty at initial presentation has been performed for traumatic renal pelvic disruption [8]. However, another study reported that immediate surgery for hematuria after blunt renal trauma resulted in a high nephrectomy rate [13]. Also, the resultant injury can be classified as partial or complete. Partial injuries can often be managed successfully with stenting for 6–8 weeks [11]. Our patient was managed effectively by ureteral stenting and improved renal function was noted after 2 months of follow-up. Furthermore, a dismembered pyeloplasty is needed for definitive surgical management of the UPJ obstruction.

In conclusion, isolated renal pelvic rupture in a congenitally obstructed kidney is rare. This injury should be suspected in patients who have been involved in high velocity blunt trauma and who present with microscopic hematuria with shock, gross hematuria, direct flank tenderness/ecchymosis, or multisystem trauma. The presence of perinephrotic fluid collection, normal parenchyma and hydronephrosis on ultrasound examination is highly suspicious for UPJ avulsion. Contrast material-enhanced CT with delayed imaging should be performed to accurately diagnose renal pelvic rupture since contrast extravasation may

not be present in the initial (nephrographic phase) CT scan. Delayed films added to the initial CT are advised to reduce the possibility of missing a UPJ disruption. Once the diagnosis is established, the injury can be managed successfully with retrograde ureteral stenting, and subsequent surgical reversal of the obstruction is warranted.

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# 腹部鈍傷造成腎盂破裂發生於先天性輸尿管腎盂接合處狹窄之病人

李威明<sup>1</sup> 劉家駒<sup>1</sup> 吳文正<sup>1,2</sup> 周以和<sup>1,2</sup>

黃俊雄<sup>1,2</sup> 李經家<sup>1</sup>

<sup>1</sup>高雄醫學大學附設醫院 泌尿科

<sup>2</sup>高雄醫學大學 醫學院醫學系 泌尿科學

腹部鈍器性外傷後造成單獨腎盂破損是罕見的狀況。然而，若存在腎臟的先天性異常則會增加此種破裂的風險。我們報告一位 24 歲男性病患，於腹部鈍傷後造成左側腎盂破裂的病例。病人本身患有左側腎盂輸尿管接合處阻塞的病史，受傷後於急診進行治療，在一系列的檢查後並無發現骨骼或內臟的受損。但在延遲性的電腦斷層檢查後發現，顯影劑由左側腎盂輸尿管接合處滲出，所以診斷為左側腎盂破裂。病人接受輸尿管導管置入並留置兩個月，以此方法成功地治療此次腎盂破裂。

**關鍵詞：**血尿，腎水腫，腎臟，傷口和受傷

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通訊作者：李經家醫師

高雄醫學大學附設醫院泌尿科

高雄市807三民區自由一路100號