CASE REPORT

Renorrhaphy of Unilateral Grade V Blunt Renal Injury: Case Report

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ABSTRACT

The kidney continues to be the most commonly injured organ in the genitourinary system, with the vast majority of cases being caused by blunt trauma. The majority of individuals with renal trauma are managed conservatively. However, hemodynamic instability, such as shock induced by renal hemorrhage or developing retroperitoneal hematoma (showing grade v renal trauma), renal pelvis or ureteral injury, as well as other renovascular pathologies, may signal the necessity for surgical intervention, which may include renorrhapy. Renorrhaphy in the setting of grade V renal trauma is very uncommon and has only been documented in a few cases in the preceding literature. We discuss a unique and complex case that was successfully managed, and we examine the relevant literature to give useful information for the management of blunt renal trauma patients.

Introduction

Every year, almost 245,000 people experience renal trauma.[1] It accounts for up to 5% of all trauma cases and 24% of abdominal solid organ injuries, ranking third behind the spleen and liver.[2,3] The majority of cases (80–95%) are due to blunt trauma, which is most often caused by traffic accidents.[4,5]

Renal trauma therapy has changed over the previous few decades, with a clear shift toward a nonsurgical strategy.[6] This shift is most likely due to an increased understanding of the safety and effectiveness of this method. Conservative therapy, minimally invasive intervention, and open surgery are all treatment possibilities of renal trauma.[7] Conservative treatment usually entails bed rest, analgesics, hemodynamic monitoring, serial laboratory assessment, and reimaging if the condition worsens.

Although most renal trauma patients are treated conservatively, in a life-threatening situation such as an embolization, ureteral stent implantation, open nephrectomy, or renorrhaphy, the patient may need surgery for final treatment.[8] Here we reported a 52-year-old woman admitted after motorcycle accident that caused grade V renal trauma underwent successful renorrhaphy.

Case Report

A 52-year-old female with no medical history was admitted to the emergency department after a road traffic accident. She was the driver of a motorcycle involved in an intersection collision with another motorcycle. Physical examination showed the patient was alert with Glasgow coma score (GCS) score 15, pulse 100 beats per minute, respiratory rate 22 times per minute, axillary temperature 36.5°C, weighed approximately 65 kgs. With a visual analogue scale (VAS) of 6, she experienced significant discomfort across her left flank. The initial management was in line with the Advanced Trauma Life Support (ATLS) protocol.

Gross hematuria was detected when the urethral catheter was placed. Furthermore, no further injuries were discovered during the tertiary survey. Microscopic

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hematuria was discovered with moderately increased leucocyte and amylase levels, normal hemoglobin (14.5 g/dl), and creatinine (1.05 mg/dl) (Table 1). The abdominal and pelvis contrast CT scan demonstrated on the left side a shattered kidney, which was then classified as Grade V Renal Trauma according to the American Association for the Surgery of Trauma (AAST) Organ Injury Scale grading system (Figure 1) (Table 2). A diagnosis of unilateral grade V renal trauma was commenced. The patient was managed conservatively with close monitoring.

On day 7th, due to the patient's hemodynamic instability, an intermittent balloon occlusion to the left renal artery for hemostasis followed by an emergency exploratory laparotomy was performed. On the left kidney, renorrhaphy was performed (Figure 2). Lacerations in the kidney were closed with suture and ureteral stent implantation was performed. Throughout the procedure, two packs of packed red blood cells were transfused throughout. Postoperatively, there were no complications. Following surgery, metamizole iv three times daily (analgesic) and cefuroxime iv twice daily (antibiotic) were administered for three days. One month following the first operation, wound care, renal function test monitoring, and IVP were performed as part of the follow-up procedure. Ureteral stent was maintained for three months. After seven days in the hospital, the patient reported no symptoms and was discharged. The patient was instructed to attend the hospital's outpatient clinic for the purpose of symptom monitoring.

Results

25 identified articles from PubMed were assessed in full-text. 18 articles were excluded based on exclusion criteria, and 7 studies were selected. All selected studies used high-fat diet as experimental intervention and examined Bcl-2 expression independently. (Table 1)

According to Sakr et al. (2019), high-fat diet promoted inflammatory process. However, there was a significant decrease in Bcl-2 expression in high-fat diet group compared to control group ($p<0.05$), which means there was an increase in apoptosis as well as the expression of Bax.[11] This result is similar with a research which was conducted by Liu et al. (2019), a significant decrease in Bcl-2 was also found. In contrast, this is supported by an increase in Bax and Caspase-3 expression.[12] Sahraoui et al. (2016) reported that in animal model of myocardial anomalies, high-fat diet result in a decrease of Bcl-2 expression. This result is in line with an increase of Bax/Bcl-2 ratio, implying an occurrence of apoptosis process.[13] As reported by Hill et al. (2015), Bcl-2 gene expression was found slightly lower in high-fat diet group ($p<0.01$). While in contrary, Bcl-2 protein level was elevated in high-fat group ($p<0.001$).[14]

However, this result is the opposite of Zhang et al. (2015), which showed that there was no significant change in Bcl-2 gene expression, but it was found a decrease in Bcl-2 protein levels ($p<0.05$).[15] Based on findings from Gong et al. (2012), it was found significant decrease of Bcl-2 gene expression, examined through immunohistochemistry and confirmed by examination of Bcl-2 protein level through western blotting ($p<0.01$).[16] Research conducted by Aguiar e Silva et al. (2012) revealed that a decrease in Bcl-2 protein level in high-fat diet group ($<0.05<p<0.001$), which was examined by western blotting.[17]

Figure 1. Axial and coronal contrast CT abdomen and pelvis. Grade V renal trauma was shown by the white arrow, which indicated by shattered kidney and avulsion of the renal hilum.

Table 1. Laboratory findings

Variable	Value	Reference	Unit
Blood			
WBC	12.54	3.37 - 10	103/uL
HGB	14.5	M: 13.3 – 16.6 F: 11.0-14.7	g/dl
PLT	272	150 - 450	103/uL
Glucose	120	<100	mg/dl
Creatinnin serum	1.05	0.5 - 1.2	mg/dl
BUN	13	10.0 - 20.0	mg/dl
SGOT	28	M: 0 – 50 F: P: 0 - 35	U/L
SGPT	32	M: 0 – 50 F: 0 - 35	U/L
Albumin	3.4	3.4 - 5	g/dl
Sodium	135	136 - 144	mmol/l
Potassium	4	3.8 - 5.0	mmol/l
Chloride	97	97 - 103	mmol/l
Amylase	118	25 – 115	U/L
Lipase	202	73 – 393	U/L
Immunology Analysis			
HBsAg	Non Reactive	Non Reactive	
Blood coagulation			
PPT	10	9 – 12	seconds
APTT	25	23 – 33	seconds
Urine Analysis			
pH	7	5-7	
Erythrocytes	4+	0 - 2	/lpf
Leukocytes	-	0 - 2	/lpf

Table 2. The classification for renal trauma by The American Association for Trauma Surgery[15]

Grade	Type of Injury	Injury description
I	Contusion	Microscopic or gross hematuria, normal urologic studies
	Hematoma	Non-expanding subcapsular hematoma confined to retroperitoneum
II	Hematoma	Non-expanding perirenal hematoma confined to retroperitoneum
	Laceration	<1.0 superficial contical laceration without collecting system
III	Laceration	>1.0 cm lacerations without collecting system injury
IV	Laceration	Parenchymal laceration extending throught renal cortex, medulla and collecying system
IV	Vascular Injury	Main renal artery or vein injury with contained hemorrhage
V	Laceration	Completely shattered kidney or avulsion or uteropelvic junction
	Vascular Injury	Avulsion or thrombosis of renal hilum that devasculariez the kidney
Advance one grade for bilateral injuries up to grade III		

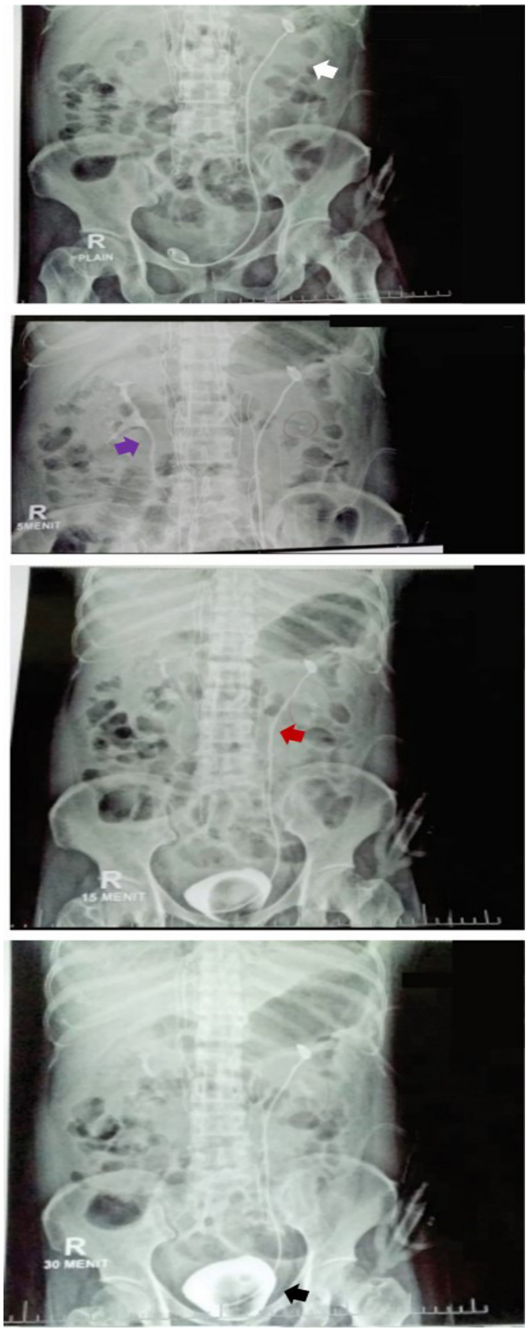

Figure 2. Postoperative IVP revealed stent placement on the left kidney and intact right kidney function. The white arrow indicated an intact kidney, the purple arrow indicated an intact ureter, the red arrow indicated a left ureteral stent, and the black arrow indicated an intact bladder.

Discussion

The patient was diagnosed with an isolated blunt renal injury induced by a traffic incident in this case. Although the etiology of blunt renal trauma is unknown, it seems that deceleration and acceleration forces are the primary elements that cause damage.[6] In MVAs, high-speed motor vehicle collisions may result in serious renal damage as a result of the rapid deceleration and acceleration. Due to its anatomical location, deceleration forces may cause rupture or thrombosis, and acceleration forces may cause a collision with nearby tissues such as the ribs or spine, potentially harming the parenchyma and vascular system. Unless proven otherwise, tenderness throughout the flank area as a result of trauma should be viewed as a renal injury. Our patient reported a VAS score of 6/10 across the left flank area, which was confirmed by a contrast CT scan as renal injury.[7]

Hematuria and hypotension are two critical clinical signs that indicate an increased risk of severe renal impairment. Urinalysis provides rapid information in patients suspected of having sustained renal parenchymal lacerations. It must, however, be tailored to their clinical conditions. However, no consistent relationship exists between the degree of hematuria and the severity of renal injury. The examination identified 31 (62%) patients with severe hematuria, 12 (24%) patients with microscopic hematuria, and 7 (14%) patients without hematuria.[7] In our case, only gross hematuria was seen, along with pain in the left flank area. The gold standard of imaging for hemodynamically stable patients with blunt renal injury is now intravenous contrast-medium enhanced CT to assess the injury, rule out substantial extravasation, and rule out potentially treatable related injuries.[7] We do a CT scan immediately to confirm the diagnosis of renal trauma.

The vast majorities of individuals with renal trauma may be managed non-operatively. The AAST grading (Table 2) approach is most often used to determine the amount of renal trauma. The renal trauma of grades IV and V often demands surgery. Individuals suspected of having renal impairment should have a first evaluation, which should include an assessment of their airway, breathing, and circulation. Immediate exploration may be preferred in cases of hemodynamic instability and significant bleeding.[9] The majorities of available evidence support successful selected trials of conservative treatment, even in stable individuals with high-grade renal impairment. Our patient was conservatively handled for at least seven days before we determined that open surgery was necessary due to unstable vital signs.

Hemodynamic instability, such as shock caused by renal hemorrhage, increasing retroperitoneal hematoma (indicating grade V renal damage), renal pelvis or ureteral injury, and other renovascular diseases, indicates the needs for surgical intervention. A study reported around 16.6% of the 19,572 patients with renal damage were treated surgically.[10] Risk factors for nephrectomy include hemodynamic instability, 4-5 AAST grade injury, and concurrent intra-abdominal injuries.[6] Prior to laparotomy, balloon insertion into the renal arteries helps reduce renal artery pressure and intraoperative blood loss during balloon inflation, since high arterial pressure exacerbates target organ damage.[11] The major targets of surgical treatment have been and continue to be renal salvage and the avoidance of long-term effects. When kidney damage is assessed, all patients have a 64% chance of nephrectomy.[7] Renal salvage by renorrhaphy entails maximal exposure of the kidney, debridement of nonviable tissue, suture control of bleeding, watertight closure of the collecting system, and repair of parenchymal damage.[6] In addition to obtaining hemostasis and sealing the collecting system, Renorrhaphy purpose is to maximize the preservation of vascularized parenchyma which may translate into a benefit of ultimate renal function.[12] Renorrhaphy is a vital technique for generating adequate hemostasis and kidney healing within an appropriate warm ischemia time.

In addition to complete nephrectomy, renal reconstruction and salvage may be achieved if proximal vascular control is gained early and bleeding is halted.[7] In cases with extensive polar injuries or mid-renal lacerations, renorrhaphy or partial nephrectomy may be the most suitable surgical approach. In these conditions, the surgery is via midline laparotomy, permitting a proper evaluation of more viscera. The ideas of exposure, hemorrhage control, debridement, and hemostasis underlie rebuilding. To our best knowledge, renorrhaphy done on grade V blunt renal injury is unusual in the literature. In this example, the patient had renorrhaphy, followed by the implantation of a ureteral stent on the left kidney.

Even when individuals are treated nonoperatively, the repercussions of a high-grade blunt renal injury remain serious.[13] The most prevalent findings of complication after surgery were persistent hematuria and urinoma. An intervention was needed in 19.2% of patients with persistent hematuria (angiographic embolization) and 71.4% of patients with urinoma (ureteral stenting, percutaneous nephrostomy, and percutaneous drainage of collection).13 We reported no difficulties following renorrhaphy and stent insertion days after surgery.

A recent analysis indicated that all grade IV and V injuries observed on initial CT should undergo regular follow-up imaging.[14] Although there is no uniform consensus on follow-up imaging, radiographic testing should be done when clinical (fever, flank pain/mass, bleeding, etc.) or laboratory data shows a high risk of morbidity. We administered IVP postoperatively to assess the renal function postoperatively.

Conclusion

We have presented an unusual and challenging case that was successfully managed and that may be of assistance in the recovery of individuals suffering from severe kidney injury. Renorrhaphy was effectively conducted with no renal unit loss or adverse effects. The renal consequences were severe, with the majority of patients experiencing hematuria or urinoma, but stent implantation effectively reduced them. Renorrhaphy may be beneficial for patients who have had significant renal impairment.

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Conflict of Interest

The authors have stated that they have no conflicts of interest in relation to the research, writing, and/or publishing of this work.

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