



Trauma and Reconstruction

Isolated Grade 5 Renal Trauma in a Hemodynamically Stable Patient

Nandu Dantanarayana^{a,*}, Francis Ting^a, James Symons^a, David Evans^b, Antony Graham^b^a Department of Urology, St Vincent's Hospital, Sydney, Australia^b Department of Vascular Surgery, St Vincent's Hospital, Sydney, Australia

ARTICLE INFO

Article history:

Received 22 October 2015

Received in revised form

4 November 2015

Accepted 9 November 2015

Keywords:

Renal injury

Trauma

Angio-embolization

Nephrectomy

ABSTRACT

Isolated grade 5 renal trauma in a hemodynamically stable patient is rare. It is therefore unsurprising there are conflicting recommendations on management of these injuries from authorities including the AUA, EAU and SIU. We present a 26-year-old male with flank pain following a 3-m fall whilst bicycle riding off a ramp, who was found to have an isolated grade 5 renal injury (shattered kidney). He was managed with early angio-embolization and subsequent nephrectomy due to ongoing bleeding. Further reports of clinician experience with this type of renal injury are needed to clarify best practice in management.

© 2016 The Authors. Published by Elsevier Inc. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Introduction

Renal trauma is uncommon, accounting for approximately 1–5% of trauma admissions with the majority of these injuries being of low severity grading and resulting from blunt trauma.¹ Isolated grade 5 renal trauma in a hemodynamically stable patient is particularly rare. This may be due to relatively well-protected position of the kidneys in the retroperitoneum surrounded by abdominal viscera anteriorly and dense musculature/spine posteriorly. However, they are vulnerable to acceleration/deceleration injuries as they are only held in space by the renal pelvis and vascular pedicle. Management of renal trauma depends on several factors including hemodynamic stability, grade of renal injury based on the American Association for the Surgery of Trauma (AAST) scale and presence of concomitant injuries.¹ There is currently significant variability in the recommendations for grade 5 renal trauma between the American Urological Association (AUA), European Association of Urology (EAU) and Société Internationale d'Urologie (SIU). We present a case of hemodynamically stable isolated grade 5 renal injury following blunt abdominal trauma that was initially managed with angio-embolization and subsequently

underwent nephrectomy. Our approach is compared to current guidelines to explore the relative advantages and disadvantages.

Case presentation

A 26-year-old male was brought to the Emergency Department following a 3-m fall onto his back whilst riding a bicycle off a ramp. He complained of left flank pain, thoracic and lumbar back pain but was otherwise well. He was hemodynamically normal and had no macroscopic hematuria. His hemoglobin was 121 g/L, he had a normal serum creatinine and urea, whilst his FAST ultrasound was positive in the perisplenic space. He subsequently had a trauma CT chest/abdomen/pelvis which revealed a grade 5 left kidney injury (shattered kidney) with active arterial extravasation and associated large (10 cm × 8 cm × 17 cm) retroperitoneal hematoma as seen in Fig. 1. There were no other thoracic or abdominal injuries.

Whilst the patient remained hemodynamically stable, the significant hemoglobin drop and active arterial contrast leak on the CT resulted in the decision to undergo urgent angio-embolization 3 hours since the time of injury. This revealed devascularization of the superior pole of the left kidney (Fig. 2). Coil embolization of the left renal artery was performed with good angiographic result.

Post-embolization the patient was managed in an Intensive Care Unit. He remained hemodynamically normal, though was noted to have a declining hemoglobin (79 g/L) and increasing abdominal distension at 15 hours post injury. A repeat CT angiogram performed at 18 hours post injury revealed ongoing venous phase bleeding within the upper pole of the left kidney and as such the

Abbreviations: AAST, American Association for the Surgery of Trauma; CT, Computer Tomography; FAST, Focused Assessment with Sonography of Trauma; AUA, American Urological Association; EAU, European Association of Urology; SIU, Société Internationale d'Urologie.

* Corresponding author.

E-mail address: Nandu.dantan@gmail.com (N. Dantanarayana).



Figure 1. CT abdomen axial section showing shattered left kidney.



Figure 3. Operative specimen of the shattered left kidney post nephrectomy.

decision was made to proceed to open left nephrectomy. The operation was performed with a midline incision and a transperitoneal approach to achieve vascular control prior to opening the Gerota's fascia. Evacuation of a large left perinephric hematoma was performed. The kidney was shattered into 3 pieces separated from the renal pelvis (Fig. 3). Post-operatively the patient developed an ileus but otherwise had an uneventful recovery and discharged at day 21 post injury.

Discussion

Our case highlights some of the challenges that arise in managing isolated grade 5 renal trauma. At present, there is strong evidence for the conservative management of hemodynamically stable grade 1–4 renal injuries following blunt trauma.² In contrast, there is significant variability in the recommendations for grade 5 renal trauma though there has been an increasing trend toward

conservative management. All guidelines recommend intervention for hemodynamically unstable renal trauma patients.²

The latest AUA recommendations advocate non-invasive management of hemodynamically stable patients with renal trauma regardless of AAST injury grading.³ The rationale is that high interobserver variability in classifying grade 4 and 5 injuries results in unnecessary intervention for many patients with its associated morbidity and mortality. The EAU guidelines similarly list hemodynamic instability as an indication for invasive treatment of renal trauma though additionally recommend intervention if renal vascular pedicle injury exists.⁴ In contrast, the SIU recommends exploratory laparotomy for all grade 5 injuries.⁵

Options for intervention in grade 5 isolated renal injury include angio-embolization and/or nephrectomy either immediately or as a delayed procedure. Angio-embolization has been shown to be effective in grade 5 renal injury with acceptable short and intermediate term outcomes.¹ Whilst the AUA and EAU guidelines allow for angio-embolization even in hemodynamically unstable patients, early nephrectomy may be more appropriate if there is no timely access to the interventional radiology suite or if patient is exsanguinating at a rate of blood loss >1 unit/minute.^{3,4} The SIU does not recommend angio-embolization in any hemodynamically unstable renal trauma patient.⁵

Whilst our patient was hemodynamically stable throughout admission – a gradually declining hemoglobin and active contrast extravasation on CT favored early intervention. Based strictly on the AUA and EAU guidelines, our patient should have been initially conservatively managed with serial hemoglobins, bed rest and hemodynamic monitoring. We deemed it dangerous to prolong intervention and sought to act prior to inevitable hemodynamic instability developing in a high-risk injury, particularly in a young patient with good physiological compensation mechanisms. Angio-embolization was preferred to early nephrectomy due to its less invasive nature, though this opposes the SIU recommendations. Continuing hemoglobin drop and repeat CT imaging the next



Figure 2. Angiogram showing devascularization of the left kidney superior pole.

day revealing possible ongoing contrast extravasation post-embolization meant that nephrectomy was needed.

Conclusion

The optimal management of hemodynamically stable grade 5 renal injury remains unclear, with conflicting recommendations between published guidelines from the AUA, EAU and SIU. This is largely due to the variation in clinical presentation and rare nature of these injuries. Further reports of clinician experiences with this sub-set of renal injury would be useful in clarifying best practice.

Conflicts of interests

Nil conflicts of interest to declare from any of the authors.

Acknowledgment

Nil.

References

1. Shoobridge JJ, Corcoran NM, Martin KA, et al. Contemporary management of renal trauma. *Rev Urol.* 2011;13:65–72.
2. Bryk DJ, Zhao LC. Guideline of guidelines: a review of urological trauma guidelines. *BJU Int.* 2015.
3. Morey AF, Brandes S, Dugi 3rd DD, et al. Urotrauma: AUA guideline. *J Urol.* 2014;192:327–335.
4. Serafetinides E, Kitrey ND, Djakovic N, et al. Review of the current management of upper urinary tract injuries by the EAU Trauma Guidelines Panel. *Eur Urol.* 2015;67:930–936.
5. Santucci RA, Wessells H, Bartsch G, et al. Evaluation and management of renal injuries: consensus statement of the renal trauma subcommittee. *BJU Int.* 2004;93:937–954.