CASE REPORT

Renal pelvicalyceal rupture secondary to extraperitoneal pelvic packing (EPP) in the unstable trauma patient

Margaret Mary Mansbridge,¹ Edward Ramez Latif,¹ Lobsang Tenzin Lamdark,² Martin Wullschleger²

¹Urology, Gold Coast University Hospital, Southport, Queensland, Australia

²Trauma, Gold Coast University Hospital, Southport, Queensland, Australia

Correspondence to

Dr Margaret Mary Mansbridge, margaret.mansbridge@health.qld.gov.au

Accepted 25 May 2018

SUMMARY

Presented here is the case of an 86-year-old man who was found to have right-sided pelvicalyceal rupture and anuric renal failure, secondary to obstructive uropathy caused by life-saving extraperitoneal pelvic packing (EPP) in the settling of severe trauma. In efforts to control haemorrhage in this haemodynamically unstable patient, EPP placement deviated from the recognised method of three extraperitoneal packs bilaterally with seven surgical packs placed. Progress postoperative imaging revealed right-sided hydroureteronephrosis with obstruction evident at the level of the extraperitoneal pelvic packs, identified by delayed contrast excretion from the preceding CT angiography imaging. Urology performed bilateral retrograde pyelograms at his relook laparotomy, timed after removal of his extraperitoneal packs and haemostasis, which showed impression of the surgical pack on the distal ureter but no persisting obstruction or short-term complications. Anuric renal failure improved, and renal function returned to near pre-morbid levels on day 4 postoperatively.

BACKGROUND

In the absence of interventional radiology or in the case of pelvic haemorrhage not amenable to angioembolisation, damage control extraperitoneal pelvic packing (EPP) is the widely accepted choice of management in a haemodynamically unstable trauma patient.^{1,2} There are clear guidelines for the specific pelvic placement of three surgical packs bilaterally.^{1–3} There are no reports in the literature of hydronephrosis, obstructive uropathy or pelvicalyceal rupture secondary to EPP in the absence of abdominal compartment syndrome, although there is wide knowledge of the potential for this relative complication due to the close proximity and vulnerability of the pelvic ureter.

Deteriorating renal function and anuric renal failure in the haemodynamically unstable trauma patient may commonly be contributed to shock.⁴ Routine imaging studies post EPP are not done, and therefore, obstructive uropathy may not be diagnosed as a contributing cause to the acute kidney injury. This case highlights that postrenal causes of acute kidney injury can also be a contributing factor in the trauma patient who has undergone EPP, even in the absence of abdominal compartment

syndrome. The sequence of management steps and timing of radiological investigations required in this case was able to demonstrate the collecting system pathology as a sequelae of this patient's EPP.

CASE PRESENTATION

This 86-year-old man on aspirin was the front-seat passenger in a high-speed motor vehicle accident, travelling at 60 km/hour and struck in a 't-bone' fashion on the passenger's side by a large truck travelling at high speed. On ambulance arrival his airway was patent, he was tachypnoeic with no air entry on auscultation of his left chest and had clinical left-sided rib fractures. He was haemodynamically unstable, but fluid responsive, and his Glasgow Coma Scale was 12 (E4V2M6). He required brief extrication with paramedics, and after initial resuscitation, a pelvic binder, and spinal immobilisation, was en route to a regional hospital within 30 min. During transport he became increasingly tachypnoeic with decreasing oxygen saturations, and a needle decompression test confirmed a left tension pneumothorax.

On arrival to the emergency department, he became hypotensive and peripherally shutdown. Respiratory distress continued, and bilateral intercostal catheters were placed and the decision was made for intubation. His focused assessment with sonography for trauma scan was equivocal, and due to ongoing haemodynamic instability unresponsive to massive trauma protocol-guided resuscitation and inotrope boluses a decision was made to proceed to damage control surgery with a trauma series head, neck, chest, abdomen and pelvis CT en route to theatres. CT revealed active pelvic haemorrhage with a haematoma measuring 8.6 × 5.1 cm but no bleeding vessel was identified; therefore, interventional radiology was unable to offer angioembolisation. CT also identified the patient's Paget's disease of the bone and Young-Burgess Classification LC Type II⁵ multipart complex fracture of the left pubic body, comminuted and displaced left superior and inferior pubic rami fractures, left ilium fracture and left sacral ala fracture.

Other injuries identified on CT were bilateral pneumothoraces, left-sided second to tenth rib fractures, right-sided rib fractures of the first, second and fifth to tenth ribs with no flail segment, and an L1 superior endplate vertebral body compression

To cite: Mansbridge MM, Latif ER, Lamdark LT, et al. *BMJ Case Rep* Published Online First: [please include Day Month Year]. doi:10.1136/bcr-2018-224910

Figure 1 Extrapertoneal pelvic packing schematic as detailed by Cullinane *et al*, *Journal of Trauma* guidelines. Pelvic packing highlighted in green. Drawn by Lobsang Tenzin Lamdark (author).

fracture. CT also demonstrated known bilateral renal cysts but no hydronephrosis.

With the pelvic binder firmly in situ, a preperitoneal lower midline incision was performed and haematoma evacuated. No arterial bleed was identified but ongoing brisk venous ooze persisted. Haemorrhage was controlled with placement of seven pre-peritoneal surgical packs, a deviation from the traditional three surgical packs bilaterally (figure 1). Temporary surgical closure was performed and the patient was transferred by helicopter to a major trauma centre for ongoing management. Total blood products required prior to transfer were 11 units of packed red blood cells, 4 units of cryoprecipitate, 4 units of fresh frozen plasma and 1 unit of platelets. He was also given tranexamic acid.

On arrival, the patient remained hypotensive and continued to receive inotrope boluses. A further 4 g of fibrinogen was

Figure 2 Right contrast extravasation secondary to pelvicalyceal rupture. Right inferior pole simple cyst.

Figure 3 Right mid ureter delayed contrast drainage marked by blue arrow. Green arrow marks right pelvic laparotomy pack, with contrast drainage obstructed proximal to this.

administered, and he was taken for a CT angiogram of his chest, abdomen and pelvis. There was no active contrast blush in the pelvis; however, CT revealed contrast extravasation around the right kidney and right psoas major muscle indicating right renal pelvicalyceal rupture (figure 2). Contrast being renally excreted from the preceding CT allowed for assessment of collecting system drainage and the right ureter could be followed to the false pelvis where it became obstructed by the pelvic packing (figure 3), as did the left ureter. Creatinine (Cr) was $128 \mu\text{mol/L}$ with an estimated glomerular filtration rate (eGFR) of 43 mL/min , from an initial Cr $84 \mu\text{mol/L}$ and eGFR 75 mL/min (table 1).

Renal function continued to deteriorate with a Cr $307 \mu\text{mol/L}$ and eGFR 15 mL/min the following day, and the patient became anuric in the intensive care unit. The abdomen remained soft and continued to be monitored for signs of abdominal compartment syndrome. A central venous catheter was inserted and dialysis commenced.

Consensus orthopaedic opinion was for conservative management of the patient's pelvic fractures due to his widespread Paget's disease, and he was taken back to theatre for

Table 1 Deterioration and resolution of baseline renal function during admission

Renal function	Initial	After transfer	Day 2	Day 1 post relook	Day 4 post relook
Creatinine ($\mu\text{mol/L}$)	84	128	307	362	98
Estimated glomerular filtration rate (mL/min)	75	43	15	12	60

Figure 4 Distal ureter on retrograde pyelogram shows slight narrowing corresponding to location of right pelvic pack.

Figure 5 Image intensifier (II) retrograde pyelogram at relook laparotomy, post removal of pelvic packing. Retrograde pyelogram was normal, without any contrast extravasation.

a relook laparotomy and removal of his pelvic packs within 48 hours with urology present. The lower midline incision was re-entered and seven abdominal packs were removed from the dissected pelvic space. This release of tamponade prompted recurrence of pelvic bleeding which was controlled with haemostatic clips, with a total blood loss of 500 mL. After haemostasis was achieved, the extraperitoneal space was closed and a 15 Blakes drain left in situ. Planned exploratory laparotomy was then carried out which revealed only a perisigmoid haematoma, small volume retroperitoneal haematoma tracking from the pelvis and no other visceral organ injury.

Urology performed a cystoscopy and bilateral retrograde pyelograms. There was no obvious bladder injury, and the left retrograde pyelogram was normal. The right retrograde pyelogram showed a slight narrowing of the pelvic ureter (figure 4) which corresponded to the position of the right pelvic packing. Proximal collecting system image intensifier (II) images showed no contrast extravasation or hydroureteronephrosis (figure 5). The abdomen was closed and the patient returned to the intensive care unit.

The patient began producing urine overnight postoperatively at 20–60 mL/hour with renal function plateauing at a Cr 362 μ mol/L and eGFR 12 mL/min. This was followed by a postobstructive diuresis on day 2 postoperatively and Cr clearance began to improve; however, rising urea and concerns that uraemia may be contributing to slow progress to extubation prompted a short course of dialysis that night. Renal function improved and stabilised at Cr 98 μ mol/L, eGFR 60 mL/min and he was extubated 2 days later.

OUTCOME AND FOLLOW-UP

He remained under the trauma service for the following 10 days where he continued to improve, renal function remained stable, intercostal catheters were removed and he

was subsequently transferred to inpatient rehabilitation for ongoing care.

DISCUSSION

This case highlights the vulnerability of the urinary tract to distal obstruction from damage control surgery and EPP. Haemorrhage control in this haemodynamically unstable trauma patient required additional surgical packs to be placed which may have highlighted the pathology. The timeline of imaging and investigations in this case illustrates that the pelvicalyceal rupture secondary to EPP was reversible with no further invasive or corrective urological surgery required. Anuric renal failure quickly resolved post removal of pelvic packs and renal function was restored. The timeline of events also highlights obstructive uropathy as a contributor to the patient's anuric renal failure, even in the absence of abdominal compartment syndrome.

Learning points

- ▶ Pelvicalyceal rupture secondary to obstructive uropathy can occur as a complication from extraperitoneal pelvic packing (EPP).
- ▶ It should be noted that there was deviation from the guidelines in this case with an additional surgical pack placed for haemorrhage control.
- ▶ In this case, only diagnostic cystoscopy and bilateral retrograde pyelography was performed, which confirmed the resolution of pelvicalyceal extravasation and ruled out need for further urological corrective surgery.
- ▶ Obstructive uropathy secondary to EPP, even in the absence of abdominal compartment syndrome, should be considered as a contributing factor to acute kidney injury in the trauma patient.

Contributors MMM: involved in care and wrote manuscript. ERL: involved in care and writing manuscript. LTL: involved in care, writing manuscript and contributed illustration. MW: involved in care, writing manuscript and oversaw the article writing process.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

© BMJ Publishing Group Ltd (unless otherwise stated in the text of the article) 2018. All rights reserved. No commercial use is permitted unless otherwise expressly granted.

REFERENCES

- 1 Jang JY, Shim H, Jung PY, *et al.* Preperitoneal pelvic packing in patients with hemodynamic instability due to severe pelvic fracture: early experience in a Korean trauma center. *Scand J Trauma Resusc Emerg Med* 2016;24:1–7.
- 2 Lustenberger T, Wutzler S, Störmann P, *et al.* The Role of Pelvic Packing for Hemodynamically Unstable Pelvic Ring Injuries. *Clinical Medicine Insights: Trauma and Intensive Medicine* 2015;6:CMTIM.S12257–8.
- 3 Cullinane DC, Schiller HJ, Zielinski MD, *et al.* Eastern Association for the Surgery of Trauma practice management guidelines for hemorrhage in pelvic fracture--update and systematic review. *J Trauma* 2011;71:1850–68.
- 4 Medha, Subramanian A, Pandey RM, *et al.* Incidence, clinical predictors and outcome of acute renal failure among North Indian trauma patients. *J Emerg Trauma Shock* 2013;6:21–8.
- 5 Alton TB, Gee AO. Classifications in brief: young and burgess classification of pelvic ring injuries. *Clin Orthop Relat Res* 2014;472:2338–42.

Copyright 2018 BMJ Publishing Group. All rights reserved. For permission to reuse any of this content visit <http://group.bmj.com/group/rights-licensing/permissions>.
BMJ Case Report Fellows may re-use this article for personal use and teaching without any further permission.

Become a Fellow of BMJ Case Reports today and you can:

- Submit as many cases as you like
- Enjoy fast sympathetic peer review and rapid publication of accepted articles
- Access all the published articles
- Re-use any of the published material for personal use and teaching without further permission

For information on Institutional Fellowships contact consortiasales@bmjgroup.com

Visit casereports.bmj.com for more articles like this and to become a Fellow