The importance of active investigation and follow-up in bladder injury

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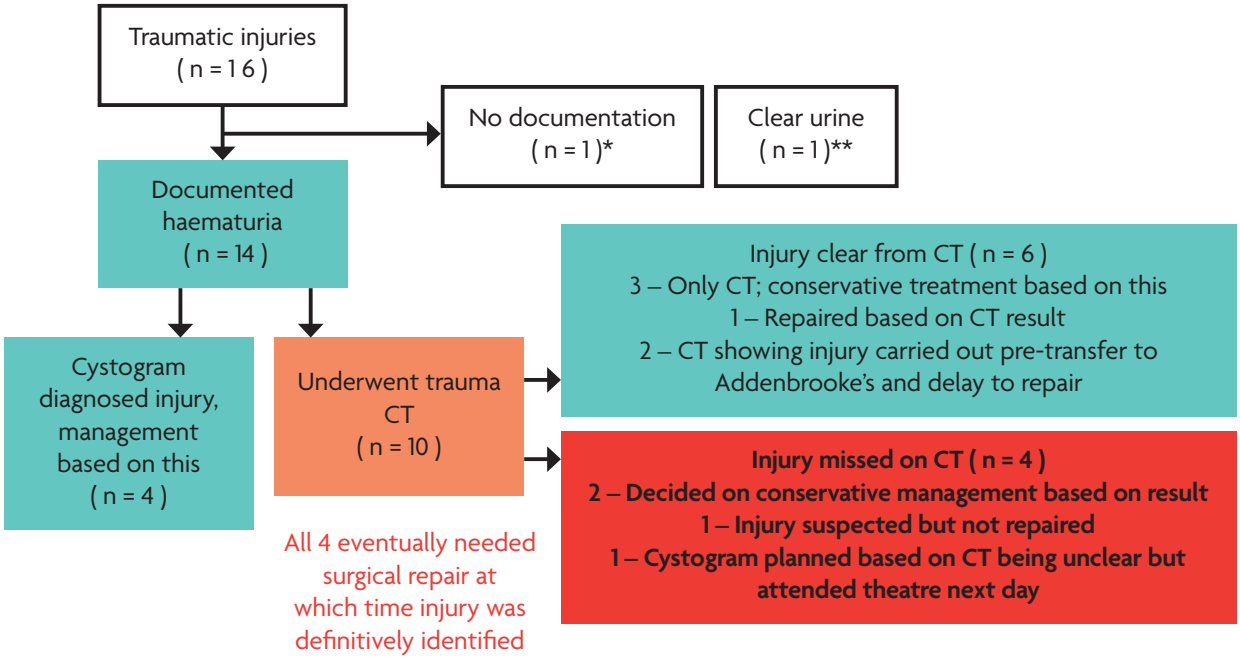

*Figure 1: Traumatic bladder injuries identified in our case series [3]. 4/14 traumatic BI with haematuria on presentation underwent recommended diagnostic cystogram, with injury missed by initial CT in another four (subsequently diagnosed intraoperatively). *Injury identified and repaired at another centre, pre-transfer to our centre. **Underwent CT pre-transfer to our centre, documented clear urine on arrival. Injury identified during pelvic fracture fixation, unclear whether iatrogenic vs. traumatic cause.*

Bladder injury (BI) is uncommon, and patients are typically managed by large multidisciplinary teams, dealing concomitantly with other injuries or diagnoses. BI can be categorised by cause (traumatic vs. iatrogenic) or anatomical location (intraperitoneal vs. extraperitoneal), requiring differing approaches to diagnosis and management. The British Association of Urological Surgeons (BAUS) provided its last consensus statement on BI in 2021 [1] and the European Association of Urology (EAU) provides yearly guidance on urological trauma [2]. We present a summary of current best practice and lessons learned from a review of 63 cases of BI in a major trauma centre between January 2017 and January 2021 [3].

Traumatic BI occurs in up to one quarter of severe pelvic fractures (generally extraperitoneal), particularly associated with >1cm displacement of the pelvic ring. Blunt abdominal trauma is most commonly associated with intraperitoneal rupture at the bladder dome. Visible haematuria is the cardinal sign and in the context of trauma should prompt active investigation with urology involvement. In our series, only four out of fourteen patients with traumatic BI underwent a diagnostic cystogram, and although all patients underwent trauma CT, four bladder injuries were missed using this imaging modality alone (Figure 1). This finding highlights the importance of active investigation.

Importantly, in order to generate pressures sufficient for diagnosis, the bladder must be filled retrogradely with 300-350ml of dilute contrast medium; passive bladder filling (e.g., catheter clamping) is not sufficient. This is not new guidance, but it is important to highlight that the necessary input from multiple teams in the trauma setting can mean that the possibility of BI can be overlooked.

Iatrogenic BI

The majority of cases of iatrogenic BI are associated with risk factors related to difficult peritoneal dissection, such as extensive tumour and previous abdominal surgery [4]. In urology, placement of a mid-urethral sling via the retropubic route has a risk of approximately 5%; and BI is not uncommon in transurethral resection of bladder tumour. Traditionally, lesions are closed via open surgery, however, our series showed a trend towards repair via minimally invasive approaches (i.e., laparoscopic/robotic route), which appears to be associated with a shorter length of stay compared to open repair (Figure 2). In our series, minimally invasive repairs were carried out mostly in gynaecological cases with intraperitoneal injury, with only two of 16 occurring during robotic prostatectomy where the repair was carried out using the existing robotic approach. All

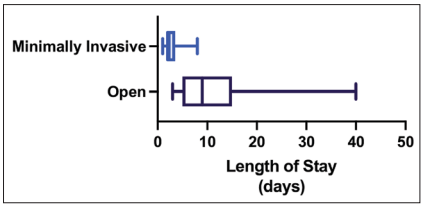

Figure 2: Length of stay following primary repair of iatrogenic bladder injury by surgical approach. 'Minimally invasive' included 12 laparoscopic, 2 robotic and 2 via existing vaginal approach. Box and whiskers represent range, median and interquartile range for length of stay in days.

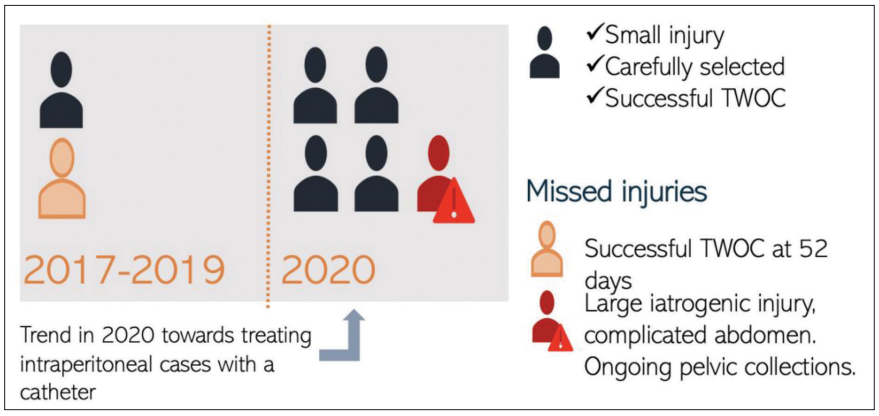

Figure 3: Cases of intraperitoneal injury treated conservatively [3]. Five patients with simple intraperitoneal injuries that had been identified early, were managed successfully without surgical repair.

patients having minimally invasive repair required no further procedures and had either no leak at check cystogram or a successful trial without catheter. Minimally invasive approaches, therefore, can be safe alternatives to conversion to open repair, a sentiment reflected in BAUS guidance [1].

Conservative management of intraperitoneal injury

A conservative management strategy of catheterisation and observation is recommended for extraperitoneal injuries. Intraperitoneal BI, however, is associated with urine extravasation, in some cases leading to sepsis and death, and therefore is conventionally managed with surgical repair. We sought to understand an apparent trend [2] to manage small, uncomplicated intraperitoneal BI conservatively. Seven of fifty-one intraperitoneal BIs in our series were treated with a catheter alone (Figure 3). Five were small (<2cm), isolated injuries, which were identified immediately – these successfully underwent conservative management, despite two of them being traumatic ruptures (by current EAU guidance, recommended for surgical repair). A further case was managed with a catheter alone due to a missed injury and the catheter was successfully removed after 52 days. The final case had a poor outcome: iatrogenic injury was initially missed, and surgical repair was deemed unsafe due to a complicated abdomen (injury occurred during removal of an adherent cystic pelvic mass requiring urological, gynaecological and general surgical joint input). Evidence on this topic is weak due to low patient numbers and unpredictability of cases which would make performing a multicentre randomised trial difficult.

Should all patients undergo follow-up cystography?

The BAUS 2021 consensus statement recommends a follow-up cystogram prior to catheter removal for all cases to ensure injury resolution, and advises catheterisation for two to three weeks following injury [1]. In our series, follow-up cystogram was performed in 47/63 BI prior to catheter removal, which identified two unresolved injuries. EAU 2023 guidance suggests patients with complex injury, or those with poor wound healing, benefit most from follow-up cystography, which could allow for omission of unnecessary investigation in healthy individuals with simple, operatively repaired injuries [2,5,6].

In summary, the key to successful management of BI is to adequately understand the nature of the injury (location, size) and the individual patient context in which it has occurred. This strategy is achieved by high index of suspicion, proper investigation with well-executed retrograde cystography, and close follow-up.

TAKE HOME MESSAGES

- It is important to organise a retrograde cystogram (with 300-350ml dilute contrast medium) to avoid missing a traumatic bladder injury – trauma CT alone misses a substantial proportion.
- Minimally invasive techniques of surgical repair are a safe alternative to open repair and are associated with shorter length of stay.
- Selected intraperitoneal injuries may be managed safely with a conservative approach.
- Arrange follow-up cystogram to identify an ongoing leak, particularly in patients at risk of poor wound healing or those with a complex injury.

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