

Diagnostic Imaging Pathways - Lower Urinary Tract Trauma

Population Covered By The Guidance

This pathway provides guidance for imaging adult trauma patients with suspected injuries to their lower urinary tract.

Date reviewed: August 2013

Date of next review: 2017/2018

Published: August 2013

Quick User Guide

Move the mouse cursor over the **PINK** text boxes inside the flow chart to bring up a pop up box with salient points.

Clicking on the **PINK** text box will bring up the full text.

The relative radiation level (RRL) of each imaging investigation is displayed in the pop up box.

SYMBOL	RRL	EFFECTIVE DOSE RANGE
	None	0
	Minimal	< 1 millisieverts
	Low	1-5 mSv
	Medium	5-10 mSv
	High	>10 mSv

Pathway Diagram

Date reviewed: August 2013
 Please note that this pathway is subject to review and revision.

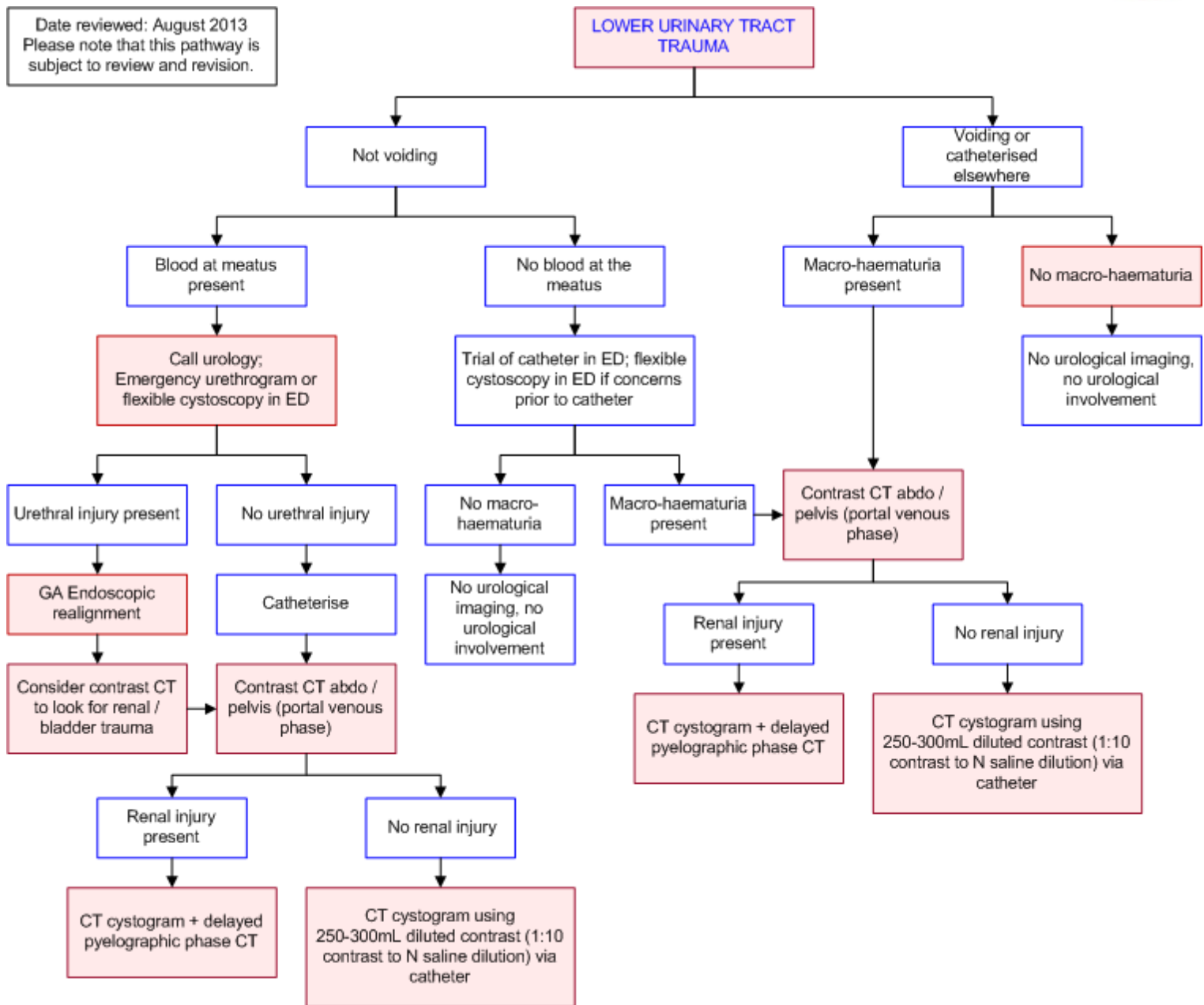


Image Gallery

Note: Images coming soon

Teaching Points

- In patients with lower urinary trauma, imaging is only indicated where the patient demonstrates gross haematuria
- When performing a CT cystogram study, the bladder should be adequately filled with 250-300mL of diluted contrast, administered via catheter. The dilution ratio should be 1:10 (eg. 50 ml of Omnipaque 300 (300mg iodine/mL) mixed with 500ml normal saline)

Computed Tomography (CT) Cystogram

- Conventional CT of the abdomen / pelvis has a poor sensitivity of 50-60% for detecting blunt bladder injuries. [11,12](#) Its role in this setting is to identify other abdominal injuries
- The accuracy of CT for detecting and categorising bladder injuries can be greatly improved with a CT cystogram
- Indications for this study include gross haematuria, pelvic fractures or high clinical suspicion of bladder injury [13](#)
- Recent studies support the use of retrograde filling of the bladder with dilute iodinated contrast. [19](#) Using this technique, the reported sensitivity for detecting bladder rupture ranges from 95% to 100% and the specificity is 100%. [13-16](#) These figures are comparable to conventional retrograde cystography [13](#)
- For categorising the type of bladder injury, the accuracy of a CT cystogram for identifying extraperitoneal injury is similar to conventional cystography. However, the sensitivity is slightly lower for intraperitoneal injury (94% versus 100%) [13](#)
- Multidetector CT with multiplanar reformation may help better localise the site of bladder rupture [16](#)
- In order to minimise exposure to radiation, time and costs, CT cystograms can be performed as part of the screening abdomino-pelvic CT without the need for post-void images [1,5,13](#)

Computed Tomography (CT) Abdomen / Pelvis

- CT is more sensitive and specific in the diagnosis of renal trauma. It is the diagnostic modality of choice in imaging patients with suspected blunt renal trauma [1](#)
- CT not only provides precise anatomic and functional information but also detects other coexisting intra-and extraperitoneal injuries at the same time [1](#)
- MRI equals CT in correctly grading blunt renal injuries and detecting the presence and size of perirenal hematomas [1](#)

Bladder Trauma

- There is no sufficient Class I data supporting standards regarding evaluation of bladder and urethral trauma. Around 10% to 15% of patients with pelvic fractures sustain bladder injuries whereas more than 70% of bladder injuries are associated with pelvic fractures [1](#)
- Bladder rupture is significantly associated with pubic symphysis diastasis, sacroiliac diastasis, and sacral, iliac and pubic rami fractures but not with isolated acetabular fractures [2,3](#)
- The clinical indicators for bladder injury are
 - Suprapubic pain or tenderness
 - Inability to void, low urine output, clots in urine
 - Signs of major perineal trauma: swelling or hematoma, blood at the urethral meatus
 - Unresponsiveness, intoxication, altered sensation
 - Free intraperitoneal fluid on CT scan or ultrasound
 - Pre-existing bladder outlet obstruction, bladder surgery, or bladder abnormality
 - Abdominal distention, hypoactive bowel sounds
 - Increased serum BUN and/or creatinine
- When should bladder imaging be considered a priority in blunt trauma patient?
 - Current literature suggests that immediate imaging is essential only in the event of gross hematuria with pelvic fracture [4](#)



- In atypical patients without the classic combination of pelvic fracture and gross hematuria, the presence of clinical indicators should guide one to screen for bladder injury
- In the absence of the clinical predictors, immediate bladder imaging is not warranted [4](#)

Microhaematuria in Bladder Trauma

- While grossly clear urine in a trauma patient without a pelvic fracture virtually eliminates the possibility of a bladder rupture, between 2-10% of patients with bladder rupture may demonstrate microhaematuria or have no haematuria at all [5,6](#)
 - Cass et al. describes a large series of patients with bladder injuries, in which 80% of the patients with rupture had gross hematuria. However, six patients with <30 red blood cells/high power field (RBC/HPF) had bladder ruptures, and 16 patients without any haematuria also had bladder ruptures [6](#)
 - However, other studies by Morgan et al. and Avey et al. found no bladder ruptures in patients with <25 RBC/HPF and <30 RBC/HPF, respectively [2,7](#)
- A recent prospective study of blunt trauma patients showed that bladder imaging is required for gross hematuria, even when no pelvic fracture is suspected, but is unnecessary for microscopic hematuria [8](#)

Emergency Retrograde Urethrogram

- The presence of blood at the urethral meatus should preclude any attempts at urethral instrumentation until the entire urethra is adequately imaged. Often a suprapubic catheter is inserted and a retrograde urethrogram is performed when appropriate [5](#)
- Radiologic evaluation with a cystogram and post-wash out film and a retrograde urethrogram allow immediate diagnosis of bladder and urethral injury [17](#)
- Retrograde urethrogram should be performed in all patients with fracture of sacroiliac joint and pubic ramus in addition to perirectal or scrotal hematoma, blood at the meatus, and/or high riding prostate. Patients with urethral injuries examined less than 1 hour after injury may not show physical findings [18](#)

References

References are graded from Level I to V according to the Oxford Centre for Evidence-Based Medicine, Levels of Evidence. [Download the document](#)

- [1.](#) Holevar M, J Christopher DiGiacomo, Ebert J, Luchette F, Nagy K, Nayduch D, et al. **Practice management guidelines for the evaluation of genitourinary trauma 2003.** Eastern Association For The Surgery of Trauma. (Level II evidence)
- [2.](#) Morgan DE, Nallamala LK, Kenney PJ, Mayo MS, Rue LW. **CT cystography: radiographic and clinical predictors of bladder rupture.** AJR Am J Roentgenol. 2000;174(1):89-95. (Level II evidence)
- [3.](#) Aihara R, Blansfield J, Millham F, LaMorte W, Hirsch E. **Fracture locations influence the likelihood of rectal and lower urinary tract injuries in patients sustaining pelvic fractures.** J Trauma. 2002;52(2):205-8. (Level III evidence)
- [4.](#) Morey AF, Iverson AJ, Swan A, Harmon WJ, Spore SS, Bhayani S, et al. **Bladder rupture after blunt trauma: guidelines for diagnostic imaging.** J Trauma. 2001;51(4):683-6. (Level II)



- evidence)
5. Lynch D, Martinez-Pineiro L, Plas E, Serafetinidis E, Turkeri L, Santucci R, et al. **Guidelines on urological trauma**. European Association of Urology 2008. (Level II evidence)
 6. Cass A, Luxenberg M. **Features of 164 bladder ruptures**. J Urol. 1987;138(4):743-5. (Level III evidence)
 7. Avey G, Blackmore C, Wessells H, Wright J, Talner L. **Radiographic and clinical predictors of bladder rupture in blunt trauma patients with pelvic fracture**. Acad Radiol. 2006;13(5):573-9. (Level III evidence)
 8. Brewer ME, Wilmoth RJ, Enderson BL, Daley BJ. **Prospective comparison of microscopic and gross hematuria as predictors of bladder injury in blunt trauma**. Urology. 2007;69:1086-9. (Level II evidence)
 9. Fuhrman G, Simmons G, Davidson B, Buerk C. **The single indication for cystography in blunt trauma**. Am Surg. 1993;59:335-7. (Level II evidence)
 10. Hochberg E, Stone N. **Bladder rupture associated with pelvic fracture due to blunt trauma**. Urology. 1993; 41(6):531-3. (Level II evidence) [View the reference](#)
 11. Mee SL, McAninch JW, Federle MP. **Computerized tomography in bladder rupture: diagnostic limitations**. J Urol. 1987;137(2);207-9. (Level III evidence)
 12. Haas CA, Brown SL, Spirnak JP. **Limitations of routine spiral computerized tomography in the evaluation of bladder trauma**. J Urol. 1999;162(1);51-2. (Level II evidence)
 13. Quagliano PV, Delair SM, Malhotra AK. **Diagnosis of blunt bladder injury: a prospective comparative study of computed tomography cystography and conventional retrograde cystography**. J Trauma. 2006;61(2):410-21; discussion 421-2. (Level III evidence)
 14. Deck AJ, Shaves S, Talner L, Porter JR. **Computerized tomography cystography for the diagnosis of traumatic bladder rupture**. J Urol. 2000;164(1);43-6. (Level III evidence)
 15. Peng MY, Parisky YR, Cornwell 3rd EE, Radin R, Bragin S. **CT cystography versus conventional cystography in evaluation of bladder injury**. AJR Am J Roentgenol. 1999;173(5):1269-72. (Level III evidence)
 16. Chan DP, Abujudeh HH, Cushing GL Jr., Novelline RA. **CT cystography with multiplanar reformation for suspected bladder rupture: experience in 234 cases**. AJR Am J Roentgenol. 2006;187(5):1296-302. (Level III evidence)
 17. del Villar RG, Ireland GW, Cass AS. **Management of bladder and urethral injury in conjunction with the immediate surgical treatment of the acute severe trauma patient**. J Urol. 1972;108:581-5. (Level III evidence)
 18. Lowe MA, Mason JT, Luna GK, Maier RV, Copass MK, Berger RE. **Risk factors for urethral injuries in men with traumatic pelvic fractures**. J Urol. 1988;140:506-7. (Level III evidence)
 19. Wirth GJ, Peter R, Poletti PA, Iselin CA. **Advances in the management of blunt traumatic bladder rupture: experience with 36 cases**. BJU Int. 2010;106;1344-9. (Level III evidence)

Information for Consumers

Information from this website	Information from the Royal Australian and New Zealand College of Radiologists' website
Consent to Procedure or Treatment Radiation Risks of X-rays and Scans	Computed Tomography (CT) Iodine-Containing Contrast Medium

[Computed Tomography \(CT\)](#)

[Radiation Risk of Medical Imaging During Pregnancy](#)

[Radiation Risk of Medical Imaging for Adults and Children](#)

[Urethrogram](#)

Copyright

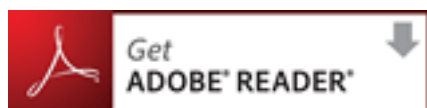
© Copyright 2015, Department of Health Western Australia. All Rights Reserved. This web site and its content has been prepared by The Department of Health, Western Australia. The information contained on this web site is protected by copyright.

Legal Notice

Please remember that this leaflet is intended as general information only. It is not definitive and The Department of Health, Western Australia can not accept any legal liability arising from its use. The information is kept as up to date and accurate as possible, but please be warned that it is always subject to change

File Formats

Some documents for download on this website are in a Portable Document Format (PDF). To read these files you might need to download Adobe Acrobat Reader.



[Legal Matters](#)