UROLOGICAL TRAUMA AND BLADDER RECONSTRUCTION

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Trauma

Investigating patients with suspected renal trauma

Condition	Investigation
Hypotensive patients needing immediate surgery	Single shot intravenous urography
Hypotensive patients with microscopic haematuria	Computed tomography (or urography if not available)
Normotensive patients with macroscopic haematuria	
All children with haematuria	

Renal trauma

Ten per cent of patients with blunt or penetrating injuries of the abdomen have associated renal trauma. Evaluation begins with a history of the mechanism of the injury, which is important for predicting the likely complications. Investigations of likely renal injury must go hand in hand with the investigation of other likely injuries, and vigilance should be maintained at all times.

Patients admitted with severe abdominal injury and shock will need immediate laparotomy. In these patients one shot intravenous urography should be performed in theatre to confirm that both kidneys are functioning. Patients found to have either frank haematuria or microscopic haematuria and clinical shock should ideally be investigated with contrast enhanced computed tomography, which is better than urography in patients with suspected renal trauma. In patients with blunt trauma and microscopic haematuria but normal blood pressure, the incidence of important injury is small, and imaging is not needed. If microscopic haematuria persists for more than six weeks then intravenous urography and cystoscopy should be performed to exclude a coincidental tumour.

A different approach is needed in children, in whom no correlation between degree of haematuria and severity of injury has been found. Some studies have stated that all children presenting after trauma with haematuria (whether microscopic or macroscopic) should be investigated with computed tomography as the likelihood of important renal injury is greater than in adults.

Angiography is used less often in cases of renal trauma and is now confined to occasions when an injury to the vascular pedicle is suspected but not visible enough in a computed tomogram.

Less than 10% of patients with confirmed renal trauma need surgery, and the decision to operate should be based on the patient's clinical status and the results of imaging. Small perirenal haematomas discovered at laparotomy should be left alone, as the kidney may heal spontaneously and any interference may lead to further bleeding, necessitating a nephrectomy. Larger haematomas may indicate an important injury, and the decision on whether to open the retroperitoneum is a difficult one.

Angiograms showing renal trauma before embolisation (top) and after embolisation (bottom).

Urethrogram showing urethral rupture.

Urethral injuries

Injuries of the anterior urethra commonly occur after straddle injuries, whereas those affecting the posterior urethra are common after pelvic trauma. Vigilance is needed in both instances. All patients with urethral injuries should be referred to a urologist before any attempt is made to pass a catheter. The absence of blood at the meatus is not an indication that injury is trivial. If no blood is present at the urethral meatus, but the patient is having difficulty passing urine, then urethral catheterisation may be tried gently. Urethral injuries associated with blood at the meatus should be investigated with urethrography, and if extravasation is present a suprapubic catheter should be inserted.

Testicular injuries

Recent studies have shown that most testicular injuries may be correctly diagnosed with ultrasound examination. However, as the risks of undiagnosed testicular trauma include atrophy and testicular loss, all patients with serious scrotal injury (as indicated by severe swelling and bruising of the scrotum) should undergo scrotal exploration unless ultrasonography shows unequivocally that the testes are normal.

Bladder reconstruction

Bladder reconstruction

- Augmentation
- Substitution (substitution cystoplasty or continent diversion)

Augmentation

Bladder augmentation is performed for severe bladder instability that is non-responsive to anticholinergic drugs. This condition usually affects women, in whom it typically causes symptoms of severe urinary frequency, nocturia, and urgency of micturition.

Top: Bladder cut open for a clam ileocystoplasty.
Bottom: A 20 cm length of ileum (cut open lengthways) anastomosed to bladder.

The procedure of choice for augmentation is a clam ileocystoplasty, in which a segment of ileum (but not the terminal ileum) is isolated on its blood supply and opened along the antimesenteric border to provide a patch of bowel. The bladder is cut open in two like a clam, and the bowel is sutured in place. Incision of the bladder in this way interrupts the unstable bladder contractions. Before a clam ileocystoplasty, however, patients should be taught clean intermittent self catheterisation, as after surgery they may have difficulty voiding. The surgeon should not therefore do the operation if a patient cannot or does not want to perform self catheterisation.

Substitution

Bladder substitution may be needed in patients wishing to avoid an ileal conduit after cystectomy either for bladder cancer or for one of the benign bladder diseases that lead to severe bladder dysfunction. The choice of procedures is between a substitution cystoplasty and continent diversion.

Anastomosis of neoreservoir, formed from caecum of terminal ileum, to urethral stump.

Continent stoma. Here the appendix is used for catheter access into neoreservoir.

Complications of bladder reconstruction

Early

Failure to void (after bladder augmentation)
Anastomotic leakage
Bowel obstruction

Late

Formation of stones
Metabolic derangements
Stomal stenosis and parastomal hernia
Risk of malignancy

Key references

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Substitution cystoplasty—This procedure, also known as orthotopic bladder substitution, entails the creation of a new reservoir from bowel segments. The ureters are implanted at the proximal end, and the neobladder is then sutured to the bladder neck. The new bladder can be made from ileum, the ileocaecal portion of the bowel, or the colon alone, and none of these options seems to be better than the others. The segment to be used is first opened along the antimesenteric border. This prevents the progression of peristaltic waves, which may lead to high pressures in the reservoir. The exact way in which the bowel is folded on to itself to make the reservoir does not seem to be critical, but the best shape for the final reservoir is as close to a sphere as possible. This maximises the reservoir's volume and the wall tension, while keeping the filling pressure of the reservoir as low as possible. This last consideration is most important for preventing back pressure on the upper tracts and eventual deterioration of renal function.

Continent diversion—When the neobladder cannot be sutured to the bladder neck or the urethra, continent diversion may avoid the need for an ileal conduit. A tube (usually made from ureter, ileum, or appendix) is used to connect the neobladder to the anterior abdominal wall, and continence is maintained by inserting the inner end of this tube into the neobladder with a submucosal tunnel. The bladder is emptied by intermittent catheterisation of the continent stoma.

Complications of bladder reconstruction

About 10% of patients may need laparotomy after bladder substitution, predominantly for bowel obstruction. Stone formation occurs in 8% of patients—risk factors include the use of non-absorbable sutures and staples, urinary infection with urea splitting organisms, and metabolic acidosis. Such stones may not be accessible with endoscopy, particularly if the patient has had a continent diversion as described above, and percutaneous or open stone removal may be needed.

The use of ileum or colon for bladder substitution may lead to hyperchloraemic metabolic acidosis. Sodium and chloride ions are absorbed from the urine across the bowel segments, and bicarbonate ions are excreted, leading to acidosis.

Patients having a continent diversion are naturally particularly concerned about the appearance of the stoma, and great care should be taken in its formation. Stomal complications include stenosis and parastomal hernias. The risk of stomal stenosis may be reduced by attaching a triangle of abdominal skin to the stomal edge to prevent contracture.

Previous work with ureterosigmoidostomy has shown that patients are at risk of developing adenocarcinoma at the sites of ureteric implantation into the bowel, although the latent period may be as long as 20 years. The risk of tumour in patients undergoing bladder substitution or augmentation is not known.

The line drawings were adapted with permission from *Rob and Smith's Operative Surgery—Genitourinary Surgery*. 5th ed. Vol 1. Whitfield H, ed. London: Chapman and Hall, 1993.

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