

# ABDOMEN & PELVIS

## Assessment and Management of Major Abdominal Trauma

1. All patients with suspected abdominal injuries who remain cardiovascularly unstable in spite of full resuscitative measures should undergo immediate emergency damage control laparotomy.
2. Most stable patients with abdominal trauma will benefit from CT imaging to identify visceral injury or bleeding sites. CT scanning will determine best management - conservative, interventional radiology, or surgical repair.
3. In the presence of a pelvic fracture, a binder should be in place before laparotomy is performed.
4. Damage control surgery or interventional radiology procedure should be undertaken concurrently with haemostatic resuscitation.
5. In the haemodynamically stable blunt abdominal trauma patient, abdominal CT with IV contrast should be performed to identify and assess injury severity.
6. Patients with CT evidence of high grade injury are more likely to require operative management, however treatment decisions depend on stability of patient and not grade of injury.
7. If high-grade liver injuries are present on CT, consider contacting the on-call hepatobiliary surgeon at University Hospital Bristol.
8. In patients with a low risk pelvic fracture and no evidence of urethral injury on physical examination, it is reasonable to make one attempt at passage of a Foley catheter.

## General Principles in Management of Abdominal Trauma

### Primary Survey

The aim of the primary survey in abdominal trauma is to identify patients needing immediate damage control laparotomy: patients with suspected abdominal injuries and uncontrollable haemorrhage in spite of full resuscitative measures should undergo early damage control laparotomy.

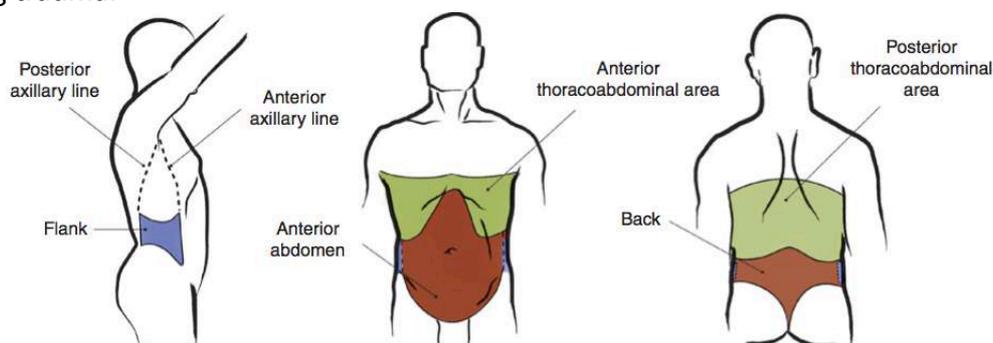
**In the presence of a pelvic fracture, a binder or external fixator should be in place before laparotomy is performed**

Unstable patients with diffuse peritonitis, evisceration or impalement after abdominal trauma should also undergo surgery as soon as possible after arrival in the Emergency Department. If CT scan cannot be completed within 15 mins of arrival, consider transfer of patient to theatre for emergency laparotomy.

### Secondary Survey

Secondary survey should aim to identify additional signs indicating the need for operative management of conditions that may not have been identified on imaging or during primary assessment.

The abdomen should be examined in all regions identified below, particularly in the context of penetrating trauma.



#### Signs to identify on secondary survey:

- Abrasions, bruising or seat belt sign - 11.9% of patients with "seat belt" contusions require subsequent laparotomy
- Periumbilical (Cullens) or flank (Grey-Turners) ecchymosis
- Genital or perineal ecchymosis (pelvic or urological injury)
- Lower thoracic rib creptitation (association with hepatic/splenic injury)

## Operative Management of Abdominal Trauma Patients

**Where damage control surgery is required, immediate transfer to theatre should be arranged and massive haemorrhage protocol activated.**

### Damage Control Surgery

Damage control surgery (DCS) has been shown to reduce mortality in severely and multiply injured patients. DCS involves immediate operative control of haemorrhage and gastrointestinal contamination; intraperitoneal packing, decontamination and temporary abdominal closure achieved concurrently with haemostatic resuscitation, patient warming and management of coagulation. The resuscitation phase continues during transfer and following arrival on the intensive care unit.

Once the patient is stabilised on intensive care, further operative management can be undertaken to achieve definitive treatment of the patient's injuries.

**The aim is to complete the laparotomy within an hour and for the patient to be transferred to ICU.**

In theatre the patient should be exposed from nipples to knees so groins are exposed if needed for vascular surgery. A laparotomy, thoracotomy and major vascular set should be available at start of procedure.

A generous midline abdominal incision should be used. Trauma laparotomy should be performed in a standard fashion by packing the four quadrants and evaluating the intra-abdominal organs in a systematic fashion, and when indicated, exploring the retroperitoneum.

Injuries to the gastrointestinal tract should be evaluated and repaired in a systematic manner. Control of intra-abdominal haemorrhage should be the first priority to minimise the need for transfusion, followed by control of gastrointestinal contamination.

Please refer to NBT Damage Control Laparotomy protocol for detailed guidance.

A focused team brief occurs at the start of surgery lead by the TTL.

Situation reports occur every 10 minutes to ascertain haemodynamic state of patient and surgical progress.

At an hour if haemodynamic stability has not been achieved, a second opinion is sought from the TTL or ICU consultant to ascertain whether continuing surgical intervention is appropriate.

## Diagnostic Laparoscopy

Diagnostic laparoscopy is rarely useful in major trauma except for inspecting the diaphragm in thoraco-abdominal wounds, although some studies suggest it may be useful in evaluating the depth of wound tracts and identifying visceral injury in patients with equivocal peritoneal penetration.

## Selection of Abdominal Trauma Patients for Non-Operative Management

### Penetrating Abdominal Trauma

Laparotomy is not routinely indicated in haemodynamically stable patients with abdominal stab wounds without signs of peritonitis or diffuse abdominal tenderness (away from the wounding site) in centres with surgical expertise.

Laparotomy is not indicated in haemodynamically stable patients with abdominal gunshot wounds if the wounds are tangential and is no peritonism.

### Blunt Abdominal Trauma

Laparotomy is not indicated in the haemodynamically stable patient without peritonitis presenting with an isolated blunt hepatic or splenic injury or abdominal free fluid without evidence of solid organ injury.

Management should consist of imaging followed by serial examinations, ideally by the same surgeon or trainee if possible.

### Solid Organ Injuries

In the haemodynamically stable blunt abdominal trauma patient without peritonitis, an abdominal CT scan with intravenous contrast should be performed to identify and assess the severity of injury to the liver and spleen.

The initial management of patients with blunt hepatic or splenic trauma should be mandated by their haemodynamic status rather than their grade of hepatic injury.

The severity of hepatic injury or splenic injury (as suggested by CT grade or degree of haemoperitoneum), neurologic status, age of more than 55 years, and/or the presence of associated injuries are not absolute contraindications to a trial of non-operative management in a haemodynamically stable patient.

## Management of Liver Injuries

The initial management of patients with blunt hepatic trauma should be mandated by their haemodynamic status rather than their grade of hepatic injury.

The AAST grading system is most useful for predicting the likelihood of success with non-operative management, which is higher for low-grade injuries (Grade I, II, III) compared with high-grade injuries (Grade IV, V). Patients with Grade VI injuries are universally haemodynamically unstable, mandating surgical intervention.

If high-grade liver injuries are present on CT please contact the on-call hepatobiliary surgeon at University Hospitals Bristol. Haemodynamically unstable patients require urgent, damage control laparotomy.

Control of hepatic haemorrhage is approached in a step-wise fashion. Initial control of bleeding is performed with manual compression, portal clamping or perihepatic packing. Ongoing mild-to-moderate bleeding from the parenchyma can be controlled using topical haemostatic agents, electrosurgical techniques, and ligation of the parenchymal vessels. If there is difficulty in controlling bleeding please contact the hepatobiliary surgeon on call at University Hospital Bristol; more severe injuries may require liver suturing techniques or hepatic artery ligation may be needed. If these techniques fail, the segment of liver may need to be resected.

Non-operative management is the treatment of choice for haemodynamically stable patients with hepatic injury. It consists of observation and supportive care with the adjunctive use of arteriography and hepatic embolisation.

Patients who are haemodynamically stable but demonstrate extravasation from the liver on (CT) have higher failure rates with non-operative management. These patients should undergo arteriography and possible liver embolisation followed by observation and serial haemoglobin determination.

### **Follow-Up Care:**

There are few data to guide the routine care and follow-up of patients with hepatic injury who have been managed non-operatively. No definitive recommendations have been established regarding the need or timing of follow-up imaging, need for or duration of bed rest, timing of return to daily activities and/or exercise, time to initiate prophylactic or therapeutic anticoagulation.

A length of stay between 3-5 days depending on grade of injury would be appropriate for patients with isolated hepatic trauma. It is a common recommendation that patients avoid strenuous activities for six weeks. For patients with higher grade injuries, strenuous physical activity is restricted for a longer period of time up to three months.

## Management of Splenic Injuries

The initial management of patients with splenic trauma should be mandated by their haemodynamic status rather than their grade of injury.

**Haemodynamically unstable splenic injury patients need urgent laparotomy or radiologic splenic embolisation.**

The decision to perform splenectomy versus splenic salvage (ie, splenorrhaphy, partial splenectomy) is made based upon the grade of injury, associated injuries, patient condition and experience of the surgeon. The small future risk of overwhelming post-splenectomy sepsis needs to be balanced against the more significant risk of recurrent haemorrhage.

When considering splenic salvage, the surgeon must determine whether the patient can tolerate rebleeding and reoperation for the small, but real, risk of recurrent haemorrhage. Splenectomy is often a more appropriate choice for patients with multiple injuries or comorbidities who may not tolerate a significant or recurrent episode of hypotension or a second surgical procedure.

Splenectomy is more appropriate for patients requiring urgent surgical management of other significant injuries that preclude taking the extra time needed for splenic salvage. In the setting of damage control, delayed splenic salvage can be considered (within 24 to 48 hours) for low-grade splenic injuries, provided that the bleeding is controlled with packing. Splenectomy is the safest option, given that most patients who require damage-control surgery are on the brink of physiological collapse and will poorly tolerate recurrent haemorrhage.

### **Non Operative Management and Embolisation:**

Haemodynamically stable patients with blunt or penetrating splenic injuries may be initially observed safely. Patients who meet the criteria for observation but who require intervention to manage extra-abdominal injuries (eg, leg fracture stabilisation) can also be safely observed.

The duration of observation should be based upon the grade of splenic injury, nature and severity of other injuries, and the patient's clinical status.

The largest case series published (24,000 participants) showed an observation period of three days identifies at least 95 percent of patients who would require some form of intervention. Of all patients who required surgical intervention in this series, 90% required surgery within 24 hours, 94% by 48 hours, and 95% by 72 hours. Higher-grade injury ( $\geq$ III) generally requires longer observation periods. Those with Grade IV injuries have a 53% chance of failure of non-operative management. The authors' recommendation was for observation for 3-5 days depending on grade of injury.

There is debate over the difference in the rate of survival, length of hospital stay or length of ICU stay in patients who have successful non-operative management versus those that fail non-operative management. The most recent data shows failure of non-operative management to have a detrimental effect.

#### **Contraindications to Non-Operative Management:**

Relative contraindications include a high ISS, higher AAST grade splenic injury (Grades III-V), age >55 years, presence of a moderate to large haemoperitoneum, active contrast extravasation, refusal of blood transfusion in the setting of pre-existing anaemia, portal hypertension, or altered neurologic status precluding adequate serial abdominal examination.

#### **Embolisation:**

Splenic embolisation is available 24/7 at North Bristol NHS trust. Where available, embolisation is potentially most useful when employed selectively in transient responders to resuscitation or haemodynamically stable patients who have CT findings that include active contrast extravasation, splenic pseudoaneurysm, or large volume haemoperitoneum.

Splenic embolisation is associated with risks including bleeding, pseudoaneurysm formation at the arterial puncture site, splenic infarction, splenic/subdiaphragmatic abscess, inadvertent embolisation of other organs (eg. kidneys) or lower extremities, allergic reaction to contrast and contrast-induced nephropathy. In spite of these risks, embolisation is less invasive and significantly reduces morbidity in correctly selected and managed patients.

Patients who fail observation require either splenic embolisation, or operative management. Common reasons include: haemodynamic instability, diffuse peritoneal signs, falling haemoglobin attributed to splenic haemorrhage.

#### **Post splenectomy vaccination**

Immunisation is recommended for asplenic patients, since splenectomy impairs opsonisation of encapsulated organisms. All splenectomy patients should be immunised at the time of discharge, regardless of the postoperative day if they have not already received the appropriate vaccinations.

Asplenic patients should receive a booster dose of HiB/Men C vaccine and a single dose of pneumococcal polysaccharide vaccine. They also receive yearly influenza vaccinations.

#### **Advice to patient**

A recent systematic review suggested to advise patients to rest at home for 3 weeks and avoid high-risk activities (e.g. contact sports, mountain biking, skiing etc) for up to 3 months. However, there is a lack of consensus on this with recommendations varying from 3 weeks to 6 months. There is some evidence to suggest higher grade injuries take longer to heal.

## Management of Bowel Injuries

CT abdomen is the most sensitive non-invasive imaging test for identifying specific intra-abdominal injuries in haemodynamically stable patients with blunt injury. Findings should be evaluated in the context of the patient's clinical condition. Intraperitoneal free air, vascular beading, abrupt vessel termination, or extra-luminal contrast are highly suggestive of injury.

**Patients with CT findings suggestive of bowel injury require urgent laparotomy.**

Those patients who have sustained penetrating injury which has not breached the peritoneal cavity or blunt trauma with no CT findings suggestive of injury may be treated conservatively.

Maintain a high index of suspicion for bowel injury if initial CT findings do not show free fluid or free air. Persistent lactic acidosis an indication for laparotomy.

### **Operative Management of Bowel Injuries.**

Patients who are haemodynamically stable with limited extra-abdominal injuries should undergo definitive management of their bowel injuries at initial exploration.

In damage control surgery (DCS), repair of gastrointestinal injury should be delayed until after haemodynamic stabilisation, (typically within 24 hours). Contamination is controlled by stapling off bowel ends and resecting damaged bowel. Formation of a defunctioning stoma is delayed until definitive surgery. Repair should be undertaken no later than 48 to 72 hours after injury.

The anterior and posterior surfaces of the stomach should be inspected for signs of contusion or laceration. The posterior surface can be examined after opening the lesser sac. Ligating a few of the short gastric arteries will facilitate exposure. Small gastric perforations can be identified by injecting air into the nasogastric tube to insufflate the stomach and then filling the abdomen with saline to cover the stomach while observing for air bubbles. Alternatively, [methylene blue](#) can be instilled into the stomach via the nasogastric tube and the stomach inspected for leakage.

The entire bowel and mesentery, beginning from the ligament of Treitz, should be examined. All abnormalities should be thoroughly evaluated and tagged (eg, bowel clamp), but definitive repair should not be undertaken until the entire length of bowel has been examined.

Evaluation of duodenal injury requires mobilising the duodenum from its retroperitoneal attachments. The pancreas, which is commonly injured as well, should also be examined. *Duodenal and pancreatic injuries are discussed in detail separately.*

If there is evidence of large bowel injury, the involved region of the colon should be fully mobilised to allow inspection of the colon circumferentially.

Active mesenteric arterial bleeding can usually be controlled with simple ligation. Embolisation may be appropriate for patients with a transient response to resuscitation.

Due to the rich collateral blood supply to most areas of the small intestine, limited ligation of mesenteric arterial vessels will not result in bowel compromise. Multiple ligations, proximal arterial branch ligation, or mesenteric resection may necessitate resection of the associated bowel. Once mesenteric bleeding or injury have been controlled viability of the bowel should be assessed.

A defunctioning stoma may be required in the presence of an open bony injuries to any body part to limit contamination.

## Management of Pancreatic and Duodenal Injuries

Damage control to manage duodenal injuries involves rapid closure of the injured segment or resection of full-thickness injury without re-establishing continuity. For suspected pancreatic duct injuries, wide drainage is used, but if injury is distal, a quick distal pancreatectomy can be performed. In these injuries or where there is uncertainty, the oncall consultant in hepatobiliary surgery at University Hospitals Bristol should be contacted.

Bleeding from the pancreas distal to the head of the pancreas can usually be controlled with packing; however, high grade injuries to the head of the pancreas, may also involve the duodenum, and are often associated with bleeding that cannot be controlled by packing. In these cases resection without reconstruction may be needed.

To resect the proximal duodenum and pancreas, the pylorus, pancreatic neck, and proximal jejunum are stapled across and transected, the common bile duct is ligated, and the biliary tract is drained using tube cholecystostomy. Closed suction drains are placed to control duodenal and pancreatic secretions. Following resuscitation and stabilisation, definitive resection and reconstruction (Whipple) can be performed by the hepatobiliary team at UH Bristol.

For high grade injuries to the upper GI tract please contact the Upper GI surgical team at the Bristol Royal Infirmary.

## Management of Renal Injuries

**History and examination:** the mechanism of injury may suggest a renal injury (rapid deceleration injury or direct blow to flank). Most renal injury in UK is due to blunt trauma but examine to exclude penetrating trauma. Consider pre-existing renal disease (eg single kidney). Record any changes in haemodynamic stability – any change may indicate significant renal injury.

**Diagnostic:** Check urine for haematuria in all patients with suspected renal injury both visually and by dipstick. A significant renal injury (eg PUJ disruption, segmental arterial thrombosis) may still be present in the absence of haematuria. Baseline serum creatinine should be noted to assess for existing renal injury or impairment. Check haemoglobin levels.

**Imaging:** CT with contrast and delayed images if the patient is stable will evaluate the grade of renal injury, the presence and uptake of contrast by the contralesional kidney and will image other retroperitoneal structures.

### **Indications for imaging with CT:**

Blunt trauma patients with visible haematuria or non visible haematuria and haemodynamic instability

Patients with history of a rapid deceleration injury and/or significant other injuries

All patients with a history of abdominal/lower thoracic penetrating trauma

### **Management**

#### **Conservative management:**

Blunt renal injuries – in the presence of haemodynamic stability most renal injuries can be managed expectantly. Grade 1-3 managed with bed rest and observation. Grade 4-5 if haemodynamically stable and have no other indications for exploration can be managed expectantly with bed rest and observation.

Penetrating renal injuries – in the presence of haemodynamic stability and where there are no other indications to explore, renal injuries can be managed conservatively.

In both circumstances, repeat imaging of significant renal injuries (Grades 3-5) 48-72 hours after presentation is required to re assess progress and potential complications.

**Interventional radiology:**

Angiography with selective embolisation is the first line option in the absence of other indications for immediate open surgery.

Indications for angiography:

- Embolisation for active haemorrhage
- Pseudoaneurysm
- Vascular fistula

The aim is to reduce the need for open surgery and potentially a nephrectomy. In cases of multi trauma or high operative risk the main renal artery may be embolised as definitive treatment or followed by interval nephrectomy.

**Surgical management:**

Indications for open surgery:

- Continuing haemodynamic instability due to renal injury which is unresponsive to fluid resuscitation
- Expanding or pulsatile peri-renal haematoma identified at exploratory laparotomy
- Exploration for associated injuries
- Vascular grade 5 injuries if embolisation is not suitable or fails

Parenchymal Grade 5 injuries may be managed conservatively if they are stable. The need for intervention increases in cases with ongoing requirement of blood and fluid, large peri-renal haematoma (>3.5cm) and the presence of contrast extravasation.

The overall aim of exploration after renal trauma is control of haemorrhage and renal tissue salvage. Stable haematoma detected during exploration should not be opened. Intra-operatively, renal reconstruction should be attempted only when haemorrhage is controlled and there is enough viable renal parenchyma.

Non-operative management is the treatment of choice in most renal injuries.

**Follow up:** The risk of complications increases with renal injury grade. Repeat imaging should be undertaken at 48-72 hours in grade 3-5 to reduce the risk of missing complications. Repeat imaging is required if there is fever/loin pain/change in Hb. Long term, nuclear medicine scans are undertaken after significant renal injury to assess functional recovery.

## Urological Injuries

All patients suffering high-energy trauma must have examination of the perineum and genitalia including a rectal examination and the findings documented in the medical records.

Urethral injury is rare in isolated acetabulum, ilium or sacrum fractures. Other low risk fractures include: single ramus fractures and ipsilateral rami fractures without posterior ring disruption

In patients with a low risk pelvic fracture (see above) and no evidence of urethral injury on physical examination (blood at meatus or presence of haematuria), A single, gentle attempt at catheterisation, by an experienced doctor, is permissible. A 16F soft, silicone catheter should be used.

The procedure and the presence of clear or blood stained urine must be documented in the medical records.

If the catheter will not pass or passes and drains only blood, do NOT inflate balloon. Withdraw catheter and perform a retrograde urethrogram. The finding of blood stained urine mandates a retrograde cystogram via the catheter.

If a urethral catheter cannot be passed, a suprapubic catheter will need to be inserted either percutaneously or via open cystotomy if the patient is required to have an emergency laparotomy.

If there is a urethral or bladder injury, the on-call urologist should be informed immediately so that a treatment plan can be formulated and documented.

The placement of a suprapubic catheter may alter the timing of pelvic fracture surgery and so the pelvic fracture service should be involved at an early stage.

A percutaneous, suprapubic catheter should be placed using a Seldinger technique under ultrasound control by a doctor experienced in this technique. The skin insertion point MUST be in the midline and should be 3 to 4 fingers-breadths above the symphysis. A 16F silicone catheter should be used.

In females, suspected urethral injury mandates discussion with urology; urethrography is not indicated in the emergency department.

Bladder injuries are associated with pelvic fracture or a blow to an overdistended bladder. They may be intraperitoneal (requires surgical repair) or extraperitoneal (may be managed conservatively).

If a bladder injury is suspected, haematuria is cardinal sign, place a urethral catheter (consider associated urethral injury – see above) and leave on free drainage. A CT with contrast done for

trauma assessment may identify large bladder ruptures but will not exclude small leaks. To exclude small perforation a stress retrograde cystogram is required (minimum 350ml dilute contrast) via a urethral catheter. Irrigation should not be used in the presence of bladder perforation.

Patients with microscopic haematuria, but without apparent significant genitourinary injury, should be referred for routine outpatient urology follow-up.

## Management of Major Blood Vessel Injuries

Damage to major blood vessels will require urgent referral to the on-call vascular surgeon. See separate vascular injuries guideline.

## Abdominal Wall Closure

### Laparostomy

Following trauma surgery, a decision to close the abdomen with or without skin closure depends upon the ability to approximate the fascial edges, the amount of intra-abdominal contamination, the potential for anastomotic breakdown, and the need to perform a second-look operation.

In patients undergoing damage control surgery and in those with a planned second-look operation to assess bowel viability, the abdomen should be left open and a temporary abdominal closure used. Leaving the abdomen open may also be more prudent in patients who are at risk for abdominal compartment syndrome.

The preferred method of this at North Bristol NHS Trust is with a negative pressure system (Ab Thera trademark KCI). The system is kept in theatres on both level 2 and level 3. The plastic liner is placed over the abdominal contents into the paracolic gutters. 2 sponge layers are applied and the pressure is usually set at 125mmHg. It can be set lower if there is concern about bleeding. However, the intention is that packing should control the bleeding before application of the dressing

If re-look laparotomy does not occur to undertake definitive surgery, the dressing should be changed every 48 hours, up to 72 hours maximum. In the absence of a requirement for further surgery, the presence of a laparostomy is to reduce oedema, prevent intra-abdominal hypertension and reduce contamination. If an abdomen is left open the aim is to close it within 10 days. After this it is unlikely that fascial closure will be achieved.

The preferred method of closure within this period is primary closure but sometimes a mesh is necessary to bridge the fascial gap. The choice of mesh in this situation is a vicryl mesh

Management of the open abdomen should be consultant lead. The leads for the open abdomen at NBT, Miss Burt and Miss Pullyblank are available for advice.

### **Long term management of the open abdomen**

If fascial closure is not achieved then the dressing is changed to a conventional VAC dressing. Insertion of a vicryl mesh to bridge the fascial defect will aid changing to conventional Vac Rx. It is essential that the mesh and bowel are protected with Adaptic touch (trademark) or equivalent before applying the sponge foam. Once the wound has granulated then healing can be facilitated by a Skin graft.

Longer term, the patient may require abdominal wall reconstruction as they will be left with a muscle defect and incisional hernia.

## **Additional Considerations**

### **Antibiotics**

Prophylactic intravenous antibiotics should be given to all patients who require trauma laparotomy. Antibiotic prophylaxis should be as specific as possible and directed at the site of injury. If upper and lower tract injuries are suspected, or the site and severity are unknown, broad-spectrum coverage is appropriate.

For patients who require abdominal exploration, a single dose of prophylactic antibiotics given within one hour of incision is appropriate. In the face of hollow viscus injury, antibiotics can be continued, and provided there has been no delay in identification and surgical management, no more than 24 hours should be needed.

### **Venous Thromboembolism Prophylaxis**

Where possible, all hospitalised patients with traumatic injuries should receive at least one mode of VTE prophylaxis. Use a combination of pneumatic compression devices and low molecular weight heparin. Patients at risk who do not have a contraindication to antithrombotic therapy should receive pharmacologic prophylaxis irrespective of their mobility.

## Tetanus

**Patients not known to have immunity against tetanus should receive prophylaxis if they sustain a tetanus prone wound. Tetanus prone wound is defined as:**

- Wounds or burns that require surgical intervention that is delayed for more than six hours
- Wounds or burns that show a significant degree of devitalised tissue or a puncture-type injury, particularly where there has been contact with soil or manure
- Wounds containing foreign bodies
- Compound fractures
- Wounds or burns in patients who have systemic sepsis

## Management of Pelvic and Acetabular Fractures

North Bristol NHS Trust Major Trauma Centre standards of practice are based on:

- British Orthopaedic Association Audit Standards for Trauma “The Management of Patients with Pelvic Fractures”, January 2018
- British Orthopaedic Association Audit Standard for Trauma “The Management of Urological Trauma Associated with Pelvic Fractures”, August 2016
- NICE Guideline NG37: Fractures (complex): assessment and management, February 2016

The Trust is fully compliant with all of the above guidelines.

Key Points and guidance which follow are drawn from the above national guidance as well as expert experience and consensus from the specialist pelvic and acetabular service and North Bristol NHS Trust. Where standards of care exceed or surpass the above guidelines, this is clearly stated in the guidelines which follow.

### Key Points

1. All patients with suspected pelvic fractures should have a pelvic binder applied as part of their initial management if not already applied prehospital.
2. The trauma team should confirm correct application and position of pelvic binder during initial primary survey in the Emergency Department.
3. Patients presenting with cardiovascular instability secondary to pelvic injury need prompt volume resuscitation in addition to the correct application of a pelvic binder. This resuscitation should follow the NBT Major Haemorrhage protocol. Resuscitation should take place in one location wherever possible to minimise delays.
4. Patients with suspected pelvic fractures from high-energy trauma should have a CT scan with IV contrast including head, chest, abdomen and pelvis on admission. This should include a head to toe scanogram.
5. Imaging (trauma scan) should be performed prior to theatre as this is essential to any decision making.
6. Decisions regarding ongoing treatment (ITU, theatre for packing / ex fix and/or interventional radiology) should be discussed between TTL, Orthopaedic and IR consultants directly and not go through junior colleagues on their respective teams.

7. All polytrauma patients require a binder-off X-ray after resuscitation, even in the presence of a 'negative' CT scan because a well-applied pelvic binder can mask a catastrophic pelvic ring injury.
8. The primary treatment of patients sustaining pelvic injury who are haemodynamically unstable is pelvic stabilisation (with initial binder placement) and resuscitation. If a patient remains unstable, they may require pelvic packing in theatre.
9. The only indication for IR selective embolisation is patients remaining unstable, with active arterial bleeding on imaging, who do not need to go to theatre for any other reason. The presence of arterial blush on the initial scan is not an absolute indication for IR. A decision to go down any of these paths must not delay the need for prompt resuscitation with blood products, guided by dynamic measures of clotting (e.g. ROTEM).

## Emergency Management of all Pelvic and Acetabular Fractures

- These guidelines apply to all suspected pelvic ring injuries except for simple pubic rami fractures.
- Pelvic fractures (except for simple pubic rami fractures) warrant trauma team activation.
- Suspected pelvic ring injuries should have a pelvic binder correctly applied as early as possible, ideally in the prehospital phase of initial patient care.
- The trauma team should ensure correct position and presence of pelvic binder. The pelvic binder should be centered over the greater trochanters.
- Minimal patient handling must apply until the pelvis is "cleared"; the trauma team ***should not test for pelvic mechanical stability***.
- Inspect and document any injuries to the perineum, rectum and vagina in all cases of suspected pelvic ring fracture.

## Vertical Shear Injury

In addition to application of a pelvic binder, skeletal traction using a distal femoral traction pin (protecting the knee joint) should also be applied as soon as possible and while still within the Emergency Department as decided by the on-call orthopaedic consultant.

## Lateral Compression Injury

This rarely requires emergency stabilisation. There is no contraindication to applying a pelvic binder but other sources of haemorrhage should be sought. Pelvic binder should be removed once the diagnosis is made and haemodynamic stability is established.

## Haemodynamic Instability Associated with Suspected Pelvic Fracture

- Patients presenting with cardiovascular instability secondary to pelvic injury need prompt haemostatic (i.e. blood component) resuscitation in addition to the correct application of a pelvic binder.
- The major haemorrhage protocol should be activated and shock packs 1 + 2 as requested. Blood components should be transfused as per the major haemorrhage protocol until cardiovascular stability is restored.
- Resuscitation should take place in one location wherever possible to minimise delays.
- All patients require IV tranexamic acid as soon as possible and ideally within an hour of injury. See separate guideline.
- All patients with blunt polytrauma undergoing damage control laparotomy should have imaging of the pelvis before surgery (X-ray or CT). A pelvic binder should be in-situ during surgery and this should not be removed for a post binder pelvic X-ray until the patient is haemodynamically stable.
- Following pelvic binder application concurrent with haemostatic resuscitation via the major haemorrhage protocol, primary treatment of patients sustaining pelvic injury who are haemodynamically unstable is surgical pelvic stabilisation.
- The primary treatment of patients sustaining pelvic injury who are haemodynamically unstable is pelvic stabilisation (with initial binder placement) and resuscitation. If a patient remains unstable after shock pack 2, they may require pelvic packing in theatre.
- The only indication for IR selective embolisation is patients who remain unstable, with active arterial bleeding on imaging, who do not need to go to theatre for any other reason. The presence of arterial blush on the initial scan is not an absolute indication for IR. A decision to go down any of these paths must not delay the need for prompt resuscitation with blood products, guided by dynamic measures of clotting (e.g. ROTEM).

## Decision Making in Unstable Patients

Decisions relating to subsequent or ongoing treatment (e.g. theatre for packing / external fixation / interventional radiology / ITU) should be discussed between trauma team leader, Orthopaedic and Interventional Radiology Consultants directly. These decisions **must not** be communicated or taken by non-consultant grade doctors on their respective teams.

These cases are rare and should be reviewed by governance structures within major trauma and relevant specialities to promote shared learning and guide future treatment decision making.

## Imaging in Suspected Pelvic Ring Fracture

- Imaging should **always** be performed prior to theatre as this is essential to any decision making.
- Patients with suspected pelvic fractures from high-energy trauma should have a CT scan with IV contrast including head, chest, abdomen and pelvis on admission. This should include a head to toe scanogram.
- In the very rare case when CT scanning cannot be performed then an AP pelvic radiograph must be performed prior to theatre.
- CT scanning of the entire spine, is recommended in all cases of displaced pelvic ring injuries and acetabular fractures.
- All polytrauma patients require a “binder off” X-ray after resuscitation, even in the presence of a ‘negative’ CT scan because a well-applied pelvic binder can mask a catastrophic pelvic ring injury.
- A team member competent in application of a pelvic binder and with the skills, knowledge and competence and resources to manage acute decompensation of a trauma patient should be present for removal of binder and during acquisition of “binder off” x-rays due to rare but potentially dangerous risk of patient deterioration following removal of pelvic binder. The binder should be immediately re-applied if this occurs

## Management of Specific Injuries

### Urological Injuries

- All patients suffering high-energy trauma must have examination of the perineum and genitalia including a rectal examination and the findings documented in the medical records.
- Urethral injury is rare in isolated acetabulum, ilium or sacrum fractures. Other low risk fractures include: single ramus fractures and ipsilateral rami fractures without posterior ring disruption
- In patients with a low risk pelvic fracture (see above) and no evidence of urethral injury on physical examination (blood at meatus or presence of haematuria), A single, gentle attempt at catheterisation, by an experienced doctor, is permissible. A 16F soft, silicone catheter should be used.
- The procedure and the presence of clear or blood stained urine must be documented in the medical records.
- If the catheter will not pass or passes and drains only blood, do NOT inflate balloon. Withdraw catheter and perform a retrograde urethrogram. The finding of blood stained urine mandates a retrograde cystogram via the catheter.
- If a urethral catheter cannot be passed, a suprapubic catheter will need to be inserted either percutaneously or via open cystotomy if the patient is required to have an emergency laparotomy.
- If there is a urethral or bladder injury, the on-call urologist should be informed immediately so that a treatment plan can be formulated and documented.
- The placement of a suprapubic catheter may alter the timing of pelvic fracture surgery and so the pelvic fracture service should be involved at an early stage.
- A percutaneous, suprapubic catheter should be placed using a Seldinger technique under ultrasound control by a doctor experienced in this technique. The skin insertion point MUST be in the midline and should be 3 to 4 fingers-breadths above the symphysis. A 16F silicone catheter should be used.

## Open Pelvic Fracture

Early diagnosis of an open pelvic injury is essential. It is mandatory to involve the on call general surgical consultant and/or gynaecologist as soon as the diagnosis is made.

- Prior to formal debridement wounds should be handled only to remove gross contamination and to allow photography, then dressed with a saline-soaked gauze (or haemostatic gauze if required) and covered with an occlusive film. 'Mini-washouts' outside the operating theatre environment are not indicated.
- Open pelvic fractures associated with wounds to the lower abdomen, groin, buttocks, perineum, anus (including sphincters) and rectum require urgent assessment by a consultant general or colorectal surgeon and wound debridement. Clinically and/or radiologically proven or suspected injuries to the anus and/or rectum may initially require construction of a defunctioning stoma. Nursing care of wounds to the perineum or buttocks may also require a defunctioning stoma. This should be placed away from the potential surgical wounds required for pelvic reconstruction.
- Wounds should be debrided:
  - ▶ Immediately for highly contaminated wounds (agricultural, aquatic, sewage) or when there is an associated vascular compromise.
  - ▶ Within 12 hours of injury for all other open injury patterns
- Definitive soft tissue closure or coverage should be achieved within 72 hours of injury if it cannot be performed at the time of debridement
- Basic principles of care of open fracture care apply:
  - ▶ antibiotic prophylaxis for infection
  - ▶ pelvic stabilisation by external fixation.

## Acetabular Injuries

### Combined Acetabular and Pelvic Ring Injury

It is important to distinguish between pelvic and acetabular fracture, as the latter injury does not require external fixation, which will be ineffective and may interfere with later definitive surgical fixation. Acetabular fractures and fracture-dislocations can sometimes be made worse by application of a pelvic binder.

## Hip Dislocation

Examine for signs of hip dislocation, joint incongruity, associated femoral head or neck fracture and neurological injury. Perform AP radiograph.

Should be reduced within 6 hours and placed on skeletal femoral traction. Occasionally an anti-rotation boot is also required if the joint is very unstable. It is mandatory to perform a detailed neurological and vascular assessment of the limb(s) before and after reduction of a dislocation. If the hip is irreducible, remains highly unstable or a new neurological lesion develops after reduction, urgent advice should be sought from one of the pelvic and acetabular surgeons.

## Ipsilateral Acetabular Fracture and Femoral Fracture

When stabilising the femoral fracture, avoid any incisions around the hip if possible, to avoid compromising later acetabular surgery. Alternatives to standard anterograde femoral IM nailing include temporary skeletal traction, external fixation, plate fixation or retrograde femoral nailing. If possible, please discuss the surgical plan with us.

## Imaging

**Plain X-rays:** AP pelvis, Judet oblique views of whole pelvis

**Spine:** CT scanning of the entire spine, is recommended in all cases of acetabular fracture.

A combined pelvic and acetabular fracture will require AP pelvis radiograph plus inlet/ outlet views and Judet oblique views of the whole pelvis.

## DVT Prophylaxis

Start Clexane 40mg s/c od (or other LMWHeparin) within 24 hours of admission unless there is a contraindication, such as allergy to heparin, intracranial haemorrhage, an unstable spinal fracture or persisting haemodynamic instability.

We advise the addition of a proton pump inhibitor (e.g omeprazole 20mg PO/NG BD) or ranitidine 150mg PO/NG BD for gastric protection. NSAIDs should be stopped and not used for analgesia.

## Documentation

The patient should have a full neurological examination recorded and the findings on rectal and vaginal examinations noted. It is essential the findings of the primary and secondary surveys are clearly documented.

All patients should undergo tertiary survey at 24 hours – see tertiary survey protocol.

## Referral From Trauma Units

Please refer patients with pelvic trauma as soon as possible, preferably by the next working day as our target is to transfer the patient within 48 hours of injury.

Even if the patient is not fit for transfer immediately, it is important that we are made aware, to facilitate the further management. Late referrals of patients may compromise subsequent care or result in further delay in arranging transfer and treatment.

Use the pelvic injury referral form when referring a pelvic fracture. The form can be found in Appendix S (page 279).

Our initial point of contact is via the Orthopaedic Department at North Bristol NHS Trust on 0117 414 1623 who would then direct you to one of the pelvic surgeons (Mr Ward, Mr Chesser, Mr Acharya,). Out of hours, the on-call Orthopaedic Registrar can be contacted.

Out of hours through Southmead Hospital switchboard (0117 9505050), who will then contact the on-call trauma orthopaedic consultant.

A **referral form** outlining the pertinent information required when referring a pelvic and acetabular fracture can be found in Appendix S. It is expected that initial imaging will be completed in the referring hospital.

While arranging transfer of the patient, the appropriate investigations and treatment of associated injuries should be pursued. If it is necessary to keep the pelvic binder on for a longer period of time, the binder should be released intermittently and pressure areas ***must*** be checked and documented regularly every 24 hours. When removing pelvic binders, caution is advised as this may precipitate haemodynamic instability.

It is usually most appropriate for the patient to be transferred back to the referring hospital after pelvic surgery and we will arrange further outpatient follow up care at North Bristol where appropriate.

If you have any comments for clarification or suggestions for improvement, please let us know.

## Abdomen & Pelvis References

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### Pelvic and Acetabular Fractures Perioperative Checklist, Management and Referral

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