

## Abdominal trauma

Identifying serious intra-abdominal pathology can be a challenge. The mode of abdominal injury may cause other injuries that can distract attention from more serious problems that are undiagnosed at presentation.

There are two types of abdominal trauma:

### Blunt abdominal trauma

This can result from either compression (secondary to a direct blow or against a fixed external object – eg, a seat belt), or from deceleration forces. The liver and spleen are the most frequently damaged organs. CT scanning has increased the identification of abdominal injuries.

### Penetrating abdominal trauma

This implies that either a gunshot wound (or other high-velocity missile/fragment), shrapnel or a stab wound has entered the abdominal cavity.

- A gunshot wound is associated with high-energy transfer and the extent of intra-abdominal injuries is difficult to predict. The path of the missile is unpredictable and secondary missiles – eg, bone fragments or fragments of the bullet – can inflict other injuries. The velocity of military firearms and hunting rifles is much higher than that of civilian handguns and therefore has a much higher energy transfer. Shotgun injuries, especially at close range, are frequently associated with massive tissue damage and should be regarded as high-energy transfer injuries.
- Stab wound injuries can be inflicted by many objects other than knives, including knitting needles, garden forks, wire, fence railing, pipes and pencils. They are usually more predictable with regard to injured organs. However, a high index of suspicion must be maintained to avoid missing occult injuries.

# Assessment

## History

Initially, evaluation and resuscitation occur simultaneously.

In general, do not obtain a detailed history until life-threatening injuries have been identified and therapy has been initiated. However, to predict injury patterns better and to identify potential pitfalls, ascertain the mechanism of injury from bystanders, paramedics or police.

Hypotension and tachycardia are predictors of significant intra-abdominal injuries<sup>[1]</sup>. Even if normotensive upon casualty department arrival, consider the patient as having an increased risk.

## Abdominal examination

- Initial examination. After appropriate primary survey and initiation of resuscitation, focus attention on secondary survey of the abdomen.
- For life-threatening injuries requiring emergency surgery, comprehensive secondary survey should be delayed until the patient has been stabilised.
- Victims of blunt trauma who have a benign abdomen upon initial presentation, should have frequent serial examinations, in conjunction with the appropriate diagnostic studies, such as abdominal CT scan and bedside ultrasonography. This will ensure that occult abdominal injuries are picked up quickly.

## Inspection

- Examine the abdomen to determine the presence of external signs of injury. Note patterns of abrasion and/or bruising.
- People injured in motor vehicle collisions may present with a 'seat belt sign' (bruising along the site of the lap portion of the seat belt), which is associated with a high rate of injury to the abdominal organs<sup>[2]</sup>. The seat belt sign is particularly associated with an increased risk of gastrointestinal and pancreatic injuries in children<sup>[3]</sup>.

- Observe the respiratory pattern, since abdominal breathing may indicate spinal cord injury. Note abdominal distention and any discoloration.
  - Bradycardia may indicate the presence of free intraperitoneal blood in a patient with blunt abdominal injuries.
  - Cullen's sign - ie periumbilical ecchymosis - may indicate retroperitoneal haemorrhage. However, this symptom usually takes several hours to develop. Flank bruising and swelling may raise suspicion for a retroperitoneal injury.
  - Inspect the genitals and perineum for soft tissue injuries, bleeding and haematoma.
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### **Auscultation**

- Abdominal bruit may indicate underlying vascular disease or traumatic arteriovenous fistula.
- During auscultation, gently palpate the abdomen while noting the patient's reactions.

### **Percussion**

- Percussion tenderness constitutes a peritoneal sign.
- Tenderness indicates further evaluation and probably surgical referral is required.

### **Palpation**

- Carefully palpate the entire abdomen while assessing the patient's response. Note abnormal masses, tenderness and deformities.
- Fullness and doughy consistency may indicate intra-abdominal haemorrhage. Crepitation or instability of the lower thoracic cage indicates the potential for splenic or hepatic injuries associated with lower rib injuries.
- Pelvic instability indicates the potential for lower urinary tract injury as well as pelvic and retroperitoneal haematoma. Open pelvic fractures are associated with mortality exceeding 50%.

- Perform rectal and bimanual vaginal pelvic examinations to identify potential bleeding and injury.
- Perform sensory examination of the chest and abdomen to evaluate the potential for spinal cord injury. Spinal cord injury may interfere with the accurate assessment of the abdomen by causing decreased or absent pain perception.
- Abdominal distention may result from gastric dilation secondary to assisted ventilation or swallowing of air.
- Signs of peritonitis (eg, involuntary guarding or rigidity soon after an injury) suggest leakage of intestinal content. Peritonitis due to intra-abdominal haemorrhage may take several hours to develop.

## Investigations

- **FBC:** normal haemoglobin and haematocrit results do not rule out significant haemorrhage. Blood transfusion should not be withheld in patients who have relatively normal haematocrit but have evidence of clinical shock, serious injuries (eg, open-book pelvic fracture) or significant ongoing blood loss.
- **Rapid bedside blood-glucose determination:** particularly important for patients with altered mental status.
- **Urinalysis:** indications for diagnostic urinalysis include significant trauma to the abdomen and/or flank, gross haematuria, microscopic haematuria associated with hypotension and significant deceleration mechanism of injury.
- **Serum or urine pregnancy test:** obtain this for all females of childbearing age.
- **Coagulation profile:** obtain prothrombin time (PT)/activated partial thromboplastin time (aPTT) in patients who have a history of blood disorders or those who have synthetic problems (eg, cirrhosis), or for patients who take anticoagulants.
- **Blood type, screen, and crossmatch:** until crossmatched blood is available, use O negative or type-specific blood.

- **Arterial blood gas (ABG):** initial metabolic acidaemia results from the lactic acidosis that accompanies shock. A moderate base deficit indicates the need for aggressive resuscitation and determination of the aetiology.
- **Drug and alcohol screens:** these should be performed on trauma patients who have alterations in their level of consciousness.
- **Focused abdominal sonography (ultrasound) for trauma (FAST):**
  - Ultrasound is regarded as the investigation of choice for early diagnostic investigations in patients with suspected blunt abdominal trauma<sup>[4]</sup> .
  - FAST is the investigation of choice in haemodynamically unstable patients<sup>[5]</sup> .
  - FAST's diagnostic accuracy is generally equal to that of diagnostic peritoneal lavage (DPL). Free fluid in a haemodynamically unstable patient indicates the need for emergency laparotomy<sup>[6]</sup> .
  - Although the sensitivity of ultrasound is too low for definite exclusion of abdominal organ injury, it has been argued by some that ultrasound-based clinical pathways enhance the speed of primary trauma assessment, reduce the number of CT scans and cut costs.
  - However, a Cochrane review found that there is insufficient evidence to justify promotion of ultrasound-based clinical pathways in diagnosing patients with suspected blunt abdominal trauma<sup>[4]</sup> .

- **CT scan:**
  - Although expensive and potentially time-consuming, CT scan often provides the most detailed images of abdominal trauma. It is the investigation of choice in haemodynamically stable patients<sup>[5]</sup> .
  - A negative FAST without confirmation by CT may result in missed intra-abdominal injuries<sup>[7]</sup> .
  - For stable patients with blunt abdominal trauma who are FAST-positive but haemodynamically stable, confirmation by CT is preferred for better understanding of the intra-abdominal injuries and to decide between operative and non-operative management<sup>[7]</sup> .
- Laparoscopy:in trauma patients this has been shown to be effective, with better diagnostic outcomes than traditional laparotomies for some patients<sup>[8]</sup> <sup>[9]</sup> .
- **Rigid sigmoidoscopy:** is indicated for patients presenting with injuries in the pelvis or if blood is found on rectal examination.

## Abdominal trauma management

Rapid prehospital transportation of patients with penetrating abdominal injuries to a trauma centre is essential. The time interval from abdominal injury to control of haemorrhage is the dominant variable defining patient survival. As a result, urban centres with advanced prehospital systems and experienced trauma surgeons often show impressive survival rates despite patients' major vascular injuries<sup>[10]</sup> .

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### Initial management

- Perform a rapid primary survey to identify immediate life-threatening problems.
- Resuscitation as required.

### Further management

- Laparotomy may be required. Although the rate of non-therapeutic laparotomies after penetrating wounds to the abdomen should be minimised, this should never be at the expense of a delay in the diagnosis and treatment of abdominal injury<sup>[11]</sup> . However:
  - Non-operative management is being increasingly used for blunt traumatic injury, as a result of the availability of multidetector computerised tomography (MDCT) scan and the development of minimally invasive intervention options such as angio-embolisation<sup>[12]</sup> .
  - Solid organ injury in haemodynamically stable patients can often be managed without surgery<sup>[5]</sup> .
  - Routine laparotomy is not necessarily indicated in haemodynamically stable patients with abdominal stab wounds without signs of peritonitis or diffuse abdominal tenderness<sup>[11]</sup> .
- Patients who undergo laparotomy may require routine perioperative antibiotics.
- Non-steroidal anti-inflammatory drugs (NSAIDs) have potential to cause haemorrhage and should probably be avoided. Minimise use of analgesia in patients admitted for observation.
- Be careful when prescribing analgesia to patients who are discharged.
- At the time of discharge, patients should be given written information describing signs of undiagnosed injury; increased abdominal pain or distention, nausea and/or vomiting, weakness, light-headedness, fainting or new bleeding in urine or faeces should prompt immediate return for further examination.

The 'lethal triad' of acidosis, hypothermia, and coagulopathy has been recognised as a significant cause of death in patients with traumatic injuries. In order to prevent the lethal triad, two factors are essential: early control of bleeding and prevention of further heat loss. In patients with major abdominal trauma, damage control surgery (DCS) avoids extensive procedures on unstable patients, stabilises potentially fatal problems at initial operation, and applies staged surgery after successful initial resuscitation. It is not currently known whether DCS is superior to immediate surgery for patients with major abdominal trauma<sup>[13]</sup> .

Damage control resuscitation may lead to postoperative intra-abdominal hypertension or abdominal compartment syndrome. Also, in some clinical situations, the abdomen cannot be closed due to the visceral oedema, the inability to control any source of infection or the necessity to re-explore (as a 'planned second-look' laparotomy) or complete previously initiated damage control procedures, or in cases of abdominal wall disruption. The open abdomen in trauma and non-trauma patients has been proposed to be effective in preventing or treating deranged physiology in patients with severe injuries or critical illness when no other options exist. Its use, however, remains controversial and should only be considered in patients who would most benefit from it<sup>[14]</sup> .

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## Further reading

- [Guidelines on Urological Trauma](#); European Association of Urology (2015)
- [Rehabilitation after traumatic injury](#); NICE guideline (January 2022)
- [Hajibandeh S, Hajibandeh S, Gumber AO, et al](#); Laparoscopy versus laparotomy for the management of penetrating abdominal trauma: A systematic review and meta-analysis. *Int J Surg*. 2016 Oct;34:127-136. doi: 10.1016/j.ijisu.2016.08.524. Epub 2016 Aug 26.

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