ABDOMINAL TRAUMA MODULE

INTRODUCTION

Blunt abdominal trauma most commonly occurs in the setting of motor vehicle accidents, pedestrian related trauma, direct blows and falls. In these situations, blunt trauma in general may involve a spectrum of injury from minor, single-system to devastating multi-system trauma, often making the diagnosis of blunt abdominal trauma challenging. Adding a degree of difficulty is the fact that physical examination of the abdomen in this setting is often unreliable due to altered level of consciousness, intoxication and the presence of distracting injuries. Bleeding may occur concurrently in several body compartments with concealed haemorrhage being the second most common cause of death after CNS injury in trauma.

Any penetrating injury from the nipples to the groin crease anteriorly and the tips of the scapulae to the gluteal skin folds inferiorly should be considered as a potential penetrating intra-abdominal injury, and assessed as such.

For blunt and penetrating abdominal trauma, the primary goal of assessment is to identify the patient cohort that require timely intra-operative management. This may be for ongoing haemodynamic instability involving vascular or solid organ injury requiring immediate haemorrhage control in theatre or to surgically investigate actual or suspected hollow visceral and mesenteric injuries. Of note is the increasing application of non-operative management for blunt hepatic, splenic and renal injuries in adult patients and the rising preference for interventional radiology as an adjunct to non-operative management when these organs are injured.

INJURY PATTERNS

It is important to remember that that some organs are tethered or fixed as they pass from intra-abdominal space to the retroperitoneum or vice versa, and that some organs have vascular pedicles (spleen, kidneys).

Principal biomechanics of injury for blunt abdominal trauma include acceleration / deceleration and direct transfer of force due to impact:

- **Rapid deceleration** results in the differential movement amongst adjacent intra-abdominal structures. This produces shear forces that cause vascular pedicles to tear (e.g. spleen, kidneys), vascular injuries (mesentery and mesenteric arteries), solid organs injuries (liver at Ligamentum Teres), and hollow visceral injuries at points of tethering or transition (duodenum at the Ligament of Trietz, second and third parts of the duodenum).

- **Direct transfer of force** results in crush and compression. Solid organs (spleen, liver, kidneys, pancreas) are crushed between the anterior abdominal wall and the vertebra. Compression results in a sudden rise in intra-luminal pressure within a hollow visceral, causing in disruption. Increased intra-abdominal pressure may result in disruption of the diaphragm.

For penetrating injury, a different set of injury pattern occurs. Stab wounds are low velocity, with injury occurring to tissue directly in the path of the instrument through laceration. Any stab wound to the lower chest, flank, pelvis or back as described
above should be assumed to have caused an intra-abdominal injury until proven otherwise.

Gunshots cause injury through several different processes:

- Direct tissue injury from the bullet or fragments of the bullet
- Via secondary missiles such as bone
- Transfer of energy

It is often difficult to identify the trajectory of a bullet clinically, as they do not always travel in a straight line.

**Solid Visceral Injuries**

Injuries to solid organs produce morbidity and mortality through haemorrhage. Signs and symptoms of haemorrhage are non-specific. Skin changes, hypotension and tachycardia are not universal, abdominal distension is a late sign of blood loss into the intra-abdominal cavity, peritonism is variable with haemoperitoneum early on, and younger patients may maintain normal vital signs in the face of significant blood loss. Patients with penetrating trauma in particular may initially manifest a bradycardic / vagal response due to blood in the intra-abdominal space rather than a tachycardia.\(^6\)

The spleen is the most commonly injured organ in blunt abdominal trauma and is present in over 60% of intra-abdominal injury.\(^1\)

The liver is the second most common solid organ injured in blunt abdominal trauma, and the most common solid organ injured in penetrating abdominal trauma. In blunt abdominal trauma, hepatic injury is the most common cause of mortality, due to the fact that it contains major vessels\(^7\):

- Inferior vena cava
- Hepatic veins
- Hepatic artery
- Portal vein

The most commonly injured part of the liver is the posterior segment of the right lobe - this is important to note, as injury here can cause retroperitoneal rather than peritoneal bleeding, which may not be picked up on the FAST exam.

**Hollow Visceral and Mesenteric Injuries**

Injuries to these organs are more uncommon – occurring in 5% of cases of blunt abdominal trauma who require laparotomy.\(^8\) Half of these injuries involve the small bowel (proximal jejunum near Ligamentum of Trietz, distal ileum), followed by colonic, duodenal then gastric injuries in order of frequency. Despite being less common than solid organ injury, it is important to diagnose these injuries as delayed diagnosis is associated with increased morbidity and mortality associated with intra-abdominal contamination and resulting sepsis plus ongoing haemorrhage from injured mesenteric vessels.

Doudenal injuries most commonly result from a crushing injury of the duodenum against the spine (steering wheel, bicycle handlebars). They are associated with chance fractures of T12, L1, L2 pancreatic, liver and splenic injuries.
In hollow visceral and mesenteric injuries, clinical findings of abdominal pain and guarding are non-specific and peritonism may be delayed for several hours.

**Retroperitoneal Injuries**

The kidneys are injured in up to 10% of blunt trauma, and blunt trauma is responsible for 90% of renal injuries. The kidneys are well protected by muscles, fascia and lower ribs, so considerable force is required to cause injury. This means looking for associated injuries is important – e.g. fractured lower ribs, vertebral fractures. Flank haematoma and haematuria may indicate renal injury, although if the renal pedicle is avulsed there may be no haematuria.

Pancreatic injuries are rare. They accompany deceleration injuries and are most common in the mid-body of the pancreas as it is crushed against the spinal column (handlebar injuries, unrestrained drivers v steering wheel). They may be associated with burst fractures of L1,2.

**Diaphragmatic Injuries**

Rupture of the diaphragm occurs in < 2% patients hospitalised with blunt thoracoabdominal trauma, and up to 8% of patients being surgically explored for trauma have an incidental finding of diaphragmatic injury. Diaphragmatic injury is more common in penetrating thoracoabdominal trauma, particularly if there is evidence of injury above and below the diaphragm.

**Penetrating Injury**

In general, for patients with significant penetrating abdominal injury, consider the following, which may help decide what immediate intervention is required:

a. **Pulseless** = major vascular injury. Decision making revolves around when patient became pulseless and the need for immediate laparotomy
b. **Haemodynamically unstable** = vascular and / or solid organ injury and / or haemorrhage from another site. These patients require immediate operation and consideration as to which compartment the patient is bleeding into and hence which compartment should be opened first (FAST scan has a role here)
c. **Haemodynamically normal** = hollow visceral injury, pancreas or renal until otherwise proven, with time to investigate

**ASSESSMENT**

**HISTORY**

Ensure a comprehensive handover from QAS with particular consideration of mechanism. The mechanism is an important aid when trying to determine possible patterns of injury.

- Evidence of airway injury
- Evidence of ventilatory impairment
- Evidence of circulatory impairment
- GCS (important confounder of clinical examination in blunt abdominal trauma)
- Chest trauma, pelvic trauma which may suggest abdominal trauma; spinal trauma which may mask abdominal injuries
- Specific abdominal features - abdominal pain / tenderness / seat belt sign

**EXAMINATION**

Immediate priority is to identify life threats:

**AIRWAY**  
Associated injuries, altered level of consciousness

**BREATHING**  
Associated injuries, ventilator distress or impending failure

**CIRCULATION**  
Global makers of hypoperfusion: altered level of consciousness, tachycardia, hypotension, cool peripheries, being mindful that intra-abdominal haemorrhage may cause a bradycardia / vagal response and critically injured patients may have normal cardiovascular and respiratory parameters

Associated injuries – tension pneumothorax, massive haemothorax, cardiac tamponade (see Chest Trauma Module); pelvic trauma (see Pelvic Trauma Module), Long bone injuries (deformity)

Abdominal signs suggesting potential for intra-abdominal haemorrhage – seat belt sign, bruising, laceration, abdominal distension (late sign), pain including lower chest wall pain, guarding, peritonism, evisceration. Be mindful of a “normal” abdominal examination in a patient with ALOC, intoxication or distracting injuries

For penetrating intra-abdominal trauma, the patient should be log-rolled once to identify / exclude stab wounds to the back, buttocks, peri-anal area. If this has been done pre-hospital with a good handover of same, there is no need to repeat, especially in unstable patients. Excess movement risks clot disruption.

**INVESTIGATION**

- Standard baseline trauma bloods including:
  - **Blood gas** will reveal ventilation inadequacy and evidence of hypoperfusion
  - Note that LFTs and Lipase are not sensitive or specific for liver and pancreatic injury

- **Urine**: Blunt trauma - frank haematuria indicates an injury anywhere along the renal and genitourinary tract. Microscopic haematuria in the setting of hypotension warrants further investigation as the degree of haematuria does not correspond to the degree of injury. Penetrating trauma - macroscopic haematuria indicates renal or bladder injury

- **ECG** is routine in trauma patients, especially patients with chest trauma

- **FAST (Focused Abdominal Sonography for Trauma)** can be performed in blunt abdominal injuries to identify haemoperitoneum. The primary role of FAST
is in unstable patients suffering from blunt trauma to direct the team to the abdomen as a source of bleeding, facilitating early laparotomy.

Advantages:
- Sensitive when performed by experienced practitioner, in the range of 63-100%, approaching 100% in haemodynamically unstable patients\textsuperscript{12}
- Specific, especially in the setting of haemodynamic instability
- Rapid (2 mins) and can be performed simultaneously with resuscitation efforts
- Can be performed in the pre-hospital environment
- Reproducible and repeatable
- No radiation

Disadvantages:
- Insensitive test in a stable patient with blunt abdominal trauma
- Does not detect site of bleeding, grade of injury or if the intra-abdominal fluid is in fact blood, ascites or urine
- Does not visualise retroperitoneum
- Not sensitive for bowel or diaphragmatic injuries
- Operator dependent
- Suboptimal in some patient groups (patients with overlying subcutaneous emphysema, dilated loops of bowel, obesity)

Conclusion: Very useful test in haemodynamically unstable blunt trauma patients to identify the intra-abdominal compartment as the likely source of haemorrhage; has replaced DPL (Diagnostic Peritoneal Lavage) in this setting

- **CXR** is performed routinely in significant blunt and penetrating trauma
- May identify a thoracic cause for hypoperfusion (see Chest Trauma Module)
- May identify sub-diaphragmatic air (needs to be interpreted with caution as may be from a hollow viscous injury or may be air entrained into the abdomen)
- May identify a ruptured diaphragm particularly if the stomach bubble or a coiled NGT are visualised in the left hemithorax

Supine CXR demonstrating diaphragmatic rupture (Left and Right Hemidiaphragm)

- **Pelvic x-ray** may suggest a pelvic source for haemorrhage (see Pelvic Trauma Module)
- **CT imaging** is the investigation of choice for patients who are stable enough. Stability is often a judgement call guided by history and examination features.

**Advantages:**
- Diagnostic test of choice for patients who may be managed non-operatively
- Detection of solid organ (spleen, liver, kidney) approaching 100% sensitivity
- Specific for solid organ injury
- Identification of volume of haemoperitoneum
- Can visualise retroperitoneum
- Injury grading (see below for the American Association for the Surgery of Trauma (AAST) CT injury scales for liver, spleen and kidney injuries
- Contrast CT assists in identifying active bleeding (contrast blush) and pseudoaneurysms and thus may identify patients who may benefit from interventional radiology
- CT angiography will assist in identifying vascular injury associated with blunt and penetrating trauma, as well as active bleeding (extravasation of contrast)
- Enables surgically planning and prioritising, especially in there is more than one injury
- May allow for the path of a penetrating injury to be identified

**Disadvantages:**
- Radiation, although the dose is reducing significantly with newer scanners
- Requirement to leave the resuscitation bay
- CT grading of injury may not be consistent with clinical picture and does not always predict success for non-operative management
- May miss hollow visceral and mesenteric injuries
- Not easily repeatable; single snapshot in time
- False negatives regarding intra-abdominal breach in penetrating trauma

Conclusion: Investigation of choice for haemodynamically stable patients with blunt abdominal trauma. A contrast CT and CT angiogram are invaluable tools to aid in determining whether a patient may potentially benefit from IR (patients with a contrast “blush”). The classic example is the patient with an unstable pelvic fracture and negative FAST. There is an evolving practice to take less stable patients to CT to assist surgical planning / pre “IR”. The decision to take an unstable patient to CT should be made by senior clinicians, in the presence of the Trauma Surgeon and Interventional Radiologist and only where there is the capacity to continue the resuscitation in CT, where the CT is next to the trauma bay, and with a definite “exit” strategy if the patient becomes more unstable.
Ancillary Tests

Deep Peritoneal Lavage (DPL): DPL has been superseded by the FAST Exam. DPL may still have a role in patients who are haemodynamically unstable, non-abdominal sources of bleeding have been excluded and an intra-abdominal source of bleeding is still suspected. However in this scenario, the FAST scan can be repeated.

Serial Examination: In the right circumstances (stable patient, no indications for immediate theatre) serial examination has excellent sensitivity and specificity for the evaluation of penetrating abdominal trauma. Ideally, the patient should be admitted for 24 hours with regular examination for abnormal vital signs and peritonitis preferably by the same surgeon.

Local Wound Exploration: Should be done in theatre with appropriate lighting by the surgeon who will open the abdomen or perform the laparoscopy if the wound exploration is equivocal or positive for penetrating the anterior abdominal fascia. This procedure should not be carried out in the ED.

Laparoscopy: Becoming more frequently used by surgeons, especially in the setting of suspected bowel / mesenteric injuries and to determine whether penetrating trauma has breached the peritoneum or diaphragm. The main advantage is that it avoids non-therapeutic laparotomies and the inherent complications associated with that procedure.
## American Association for the Surgery of Trauma Injury Scales

### Liver

<table>
<thead>
<tr>
<th>Grade</th>
<th>Injury Description</th>
</tr>
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<tbody>
<tr>
<td>I</td>
<td>Haematoma</td>
</tr>
<tr>
<td></td>
<td>Subcapsular, &lt;10% surface area</td>
</tr>
<tr>
<td>Laceration</td>
<td>Capsular tear, &lt;1cm parenchymal depth</td>
</tr>
<tr>
<td>II</td>
<td>Haematoma</td>
</tr>
<tr>
<td></td>
<td>Subcapsular, 10-50% surface area, non-expanding</td>
</tr>
<tr>
<td></td>
<td>Intraparenchymal &lt; 10 cm diameter, non-expanding</td>
</tr>
<tr>
<td>Laceration</td>
<td>1-3cm parenchymal depth, &lt;10cm length</td>
</tr>
<tr>
<td>III</td>
<td>Haematoma</td>
</tr>
<tr>
<td></td>
<td>Subcapsular, &gt;50% surface area or expanding; ruptured subcapsular or parenchymal haematoma</td>
</tr>
<tr>
<td></td>
<td>Intraparenchymal haematoma &gt;10cm or expanding</td>
</tr>
<tr>
<td>Laceration</td>
<td>&gt; 3cm parenchymal depth</td>
</tr>
<tr>
<td>IV</td>
<td>Haematoma</td>
</tr>
<tr>
<td></td>
<td>Ruptured intraparenchyma haematoma with active bleeding</td>
</tr>
<tr>
<td>Laceration</td>
<td>Parenchymal disruption involving 25-75% of hepatic lobe or 1-3 Coinaud's segments within a single lobe</td>
</tr>
<tr>
<td>V</td>
<td>Laceration</td>
</tr>
<tr>
<td>Vascular</td>
<td>Parenchymal disruption involving &gt;75% of hepatic lobe or &gt;3 Coinaud's segments within a single lobe</td>
</tr>
<tr>
<td></td>
<td>Juxtahepatic venous injuries ie. retrohepatic vena cava/central major hepatic veins</td>
</tr>
<tr>
<td>VI</td>
<td>Vascular</td>
</tr>
<tr>
<td></td>
<td>Hepatic Avulsion</td>
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### Spleen

<table>
<thead>
<tr>
<th>Grade</th>
<th>Injury Description</th>
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<tbody>
<tr>
<td>I</td>
<td>Haematoma</td>
</tr>
<tr>
<td></td>
<td>Subcapsular, &lt;10% surface area</td>
</tr>
<tr>
<td>Laceration</td>
<td>Capsular tear, &lt;1cm parenchymal depth</td>
</tr>
<tr>
<td>II</td>
<td>Haematoma</td>
</tr>
<tr>
<td></td>
<td>Subcapsular, 10-50% surface area, non-expanding</td>
</tr>
<tr>
<td></td>
<td>Intraparenchymal &lt; 5 cm diameter, non-expanding</td>
</tr>
<tr>
<td>Laceration</td>
<td>1-3cm parenchymal depth, &lt;1-3 cm length, not involving a trabecular vessel</td>
</tr>
<tr>
<td>III</td>
<td>Haematoma</td>
</tr>
<tr>
<td></td>
<td>Subcapsular, &gt;50% surface area or expanding; ruptured subcapsular haematoma, active bleeding</td>
</tr>
<tr>
<td></td>
<td>Intraparenchymal haematoma &gt;5 cm or expanding</td>
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<tr>
<td>Laceration</td>
<td>&gt; 3cm parenchymal depth or involving trabecular vessel</td>
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<tr>
<td>IV</td>
<td>Haematoma</td>
</tr>
<tr>
<td></td>
<td>Ruptured intraparenchyma haematoma with severe active bleeding</td>
</tr>
<tr>
<td>Laceration</td>
<td>Laceration involving segmental or hilar vessel producing major devascularisation (&gt;25% of spleen)</td>
</tr>
<tr>
<td>V</td>
<td>Laceration</td>
</tr>
<tr>
<td>Vascular</td>
<td>Completely shattered spleen</td>
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<tr>
<td></td>
<td>Hilar vascular injury that devascularises the spleen</td>
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# Kidney

## Grade

<table>
<thead>
<tr>
<th>Grade</th>
<th>Injury Description</th>
</tr>
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<tbody>
<tr>
<td>I</td>
<td>Contusion</td>
</tr>
<tr>
<td></td>
<td>Haematoma</td>
</tr>
<tr>
<td></td>
<td>Microscopic or gross haematuria, urological studies normal</td>
</tr>
<tr>
<td>II</td>
<td>Haematoma</td>
</tr>
<tr>
<td></td>
<td>Laceration</td>
</tr>
<tr>
<td></td>
<td>Nonexpanding perirenal haematoma confined to renal retroperitoneum</td>
</tr>
<tr>
<td></td>
<td>&lt;1cm parenchymal depth of renal cortex without urinary extravasation</td>
</tr>
<tr>
<td>III</td>
<td>Laceration</td>
</tr>
<tr>
<td></td>
<td>&gt;1cm depth of renal cortex, without collecting system rupture or urinary extravasation</td>
</tr>
<tr>
<td>IV</td>
<td>Laceration</td>
</tr>
<tr>
<td></td>
<td>Vascular</td>
</tr>
<tr>
<td></td>
<td>Parenchymal laceration extending through the renal cortex, medulla and collecting system</td>
</tr>
<tr>
<td>V</td>
<td>Laceration</td>
</tr>
<tr>
<td></td>
<td>Vascular</td>
</tr>
<tr>
<td></td>
<td>Shattered Kidney</td>
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<tr>
<td></td>
<td>Avulsed hilum</td>
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## Management

### Goals of management:

1. **Integrated Trauma team approach**
   - Initiate trauma activation system: ALERT or RESPOND depending on mechanism and physiological parameters. If RESPOND, notify Surgical Consultant as a part of the RESPOND.
   - Manage in a trauma resuscitation bay with comprehensive non-invasive monitoring.

2. **Address Life threatening injuries**

3. ** Expedite definite care i.e. surgery as indicated**

### Resuscitation

#### Airway & Breathing

- Apply O₂ titrating to Sats ≥ 94%.
- Manage any associated chest injuries.
- Perform RSI and mechanically ventilate if respiratory failure evident or imminent. In the setting of haemorrhagic shock, RSI may be potentially perilous and, if possible, may be better delayed until the patient is in theatre with a surgeon about to make the incision.

#### Circulation

Identify and manage extra-abdominal sites of haemorrhage:

- External – compression, sutures, packs.
- Chest – ICC.
- Pelvis – splint.
- Soft tissue compartments – pull fractured long bones to length and splint.
Resuscitate patient with principles of **damage control resuscitation** if evidence of uncontrolled haemorrhage while expediting surgical control of bleeding.

- Activate Massive Transfusion Protocol where applicable
- Haemostatic Resuscitation - 1:1:1 red cells:FFP:platelets to correct acute coagulopathy of trauma / prevent development of coagulopathy
- Aim to restore radial pulse or SBP ~ 80
- Minimise crystalloid use – worsens acidosis and coagulopathy, associated with longer ICU stay, more multi-organ dysfunction
- Warm all fluids
- Tranexamic Acid 1g bolus & 1g infusion over 8h if within 3 hours of injury
- Minimise the period of permissive hypotension – expedite surgical care to control haemorrhage

**Specific therapy**

**Indications for Laparotomy:**

**Absolute and Immediate**
- Blunt and Penetrating Abdominal Trauma – Haemodynamically unstable and positive FAST
- Penetrating Trauma back, flank, abdomen– Haemodynamically unstable irrespective of FAST

**Absolute**
- Sub-diaphragmatic free gas
- CT diagnosed injury requiring surgery – e.g. hollow-visceral rupture
- Evisceration
- Diffuse peritonism

**Relative**
- Solid organ injury – more likely to be managed conservatively where possible
- Haemoperitoneum on CT without a clear source (suggests mesenteric injury)
- Penetrating – patients with an unreliable examination i.e. associated neurological injury, intoxication

Selective non-operative management is being embraced more readily for solid organ injury, sometimes with high grade injury in haemodynamically stable patients, where the patient can be closely observed. The decision to manage non-operatively rests with the surgical consultant who has ongoing responsibility for the patient. See below (Additional Information / Controversies) for more detailed discussion.

**Supportive therapy**

- Antibiotic cover for contaminated penetrating injuries / bowel perforation
- Keep NBM if awaiting surgical intervention or at risk of ventilatory compromise
- IV fluid maintenance
- Adequate analgesia
- Antiemetics
- Keep warm
- Ensure normoglycaemia
- Ensure documentation completed
Disposition

Patients who are being managed non-operatively with high grade solid organ injuries should ideally be managed in a HDU or ICU setting

Additional Information / Controversies

- **Selective non-operative management** of solid organ injuries is fast becoming the norm in patients who are haemodynamically stable, do not have peritonism, and are in centres with the capability to conduct serial examinations, closely observe and take to theatre / IR where observation has failed. This is despite the presence of factors previously thought to preclude it i.e. the grade of the lesion, the volume of haemoperitoneum, Age > 55 or associated injuries.4,5
- Selective non-operative management may incorporate IR.
- When used appropriately, this strategy has a success rate ranging from 82-100% for hepatic blunt trauma.4 The success rates are lower for splenic injury with failure rates of 8-38%.5 The benefits of selective non-operative management include reduced number of non-therapeutic laparotomies, fewer intra-abdominal complications, earlier discharge, reduced cost and, interestingly, reduced transfusion rates.4,5
- The presence of possible hollow-viscous injury precludes this strategy. Patients with solid organ injuries who require ongoing fluid resuscitation to maintain hemodynamic stability, have multiple solid-organ injuries (i.e. liver and spleen), a higher grade injury, a higher total Injury Severity Score (ISS), large haemoperitoneum, or contrast extravasation / pseudoaneurysm on CT scan are more likely to fail nonoperative management.4,5
- These patients require a period of close observation, serial clinical examination, serial Hb / haematocrit and bed rest, although the duration for this is not known.
- Complication rates (i.e. biliary leak) increase with the grade of the injury. Uncertainty exists regarding the frequency of Hb measurements, abdominal examination, time and extent of monitoring, triggers for operative / IR management, timing of repeat imaging, duration of reduced activity

- **Selective non-operative management for penetrating injury** is more controversial. It is being more often considered for patients with stab wounds who are haemodynamically stable without peritonism or diffuse pain distant from the wound, a CT that shows now obvious intra-abdominal injury and who have a reliable examination. This is based on the 23-53% of such patients with stab wounds (low energy mechanism) having negative laparotomies and negative laparotomies having a surprisingly high complication rate of up to 20% (solid organ / hollow viscous injury, pneumonia, wound infection, DVT etc).17 Gun shot wounds are higher energy injuries with a lower negative laparotomy rate of 5.3-27%.17

- **Resuscitative thoracotomy** for blunt trauma. Survival is quoted as <1%6 - as such most clinicians would consider blunt trauma a contra-indication to emergency thoracotomy.

- **REBOA** – Resuscitative Endovascular Balloon Occlusion of the Aorta. There are case studies and case series discussing this topic and a prospective study occurring at The Alfred (ACE Trial). Indications include haemodynamically unstable patients with haemorrhage from pelvic fracture or intra-abdominal source who are too unstable to transfer immediately to theatre or IR. Aims to
replace resuscitative thoracotomy as a less invasive means to gain haemorrhage control. 14,15,16

- Patients who present pulseless from penetrating intra-abdominal injury have a major vascular injury until proven otherwise. These patients require immediate laparotomy. If this cannot be expedited, and loss of signs of life occurred within the previous 5-10 minutes, ED thoracotomy and cross clamping / compressing the aorta, while being a poor second option (as it will open a second cavity, promote heat and blood loss, does not address the site of haemorrhage and may delay the laparotomy), may be the only chance of salvaging this patient. 3 This procedure is extremely low yield, and should only be considered by appropriately senior clinicians.

References

7. Maini A ED Trauma Critical Care ‘Blunt Abdominal Trauma Part 2 – Grading Hepatic Injury’ edtcc.blog