

Traumatic vascular injuries Guidelines for North Bristol Trust
Management of bleeding and acute ischaemia following trauma

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Aims: Discuss the management of bleeding and acute ischaemia secondary to traumatic vascular injury

Fewer than 10% of patients with polytrauma have associated vascular injuries but these can cause significant mortality and morbidity. Major uncontrolled bleeding remains the leading cause of preventable death in trauma patients (ref 1). A high degree of suspicion of vascular injury and specific exclusion by the trauma team is required. These guidelines include specific recommendations from the European guideline from the multidisciplinary task force for advanced bleeding care in trauma (ref 2)

One third of all trauma patients with bleeding arrive in hospital with a coagulopathy (acute trauma coagulopathy (ref 3) and the management of this must be in parallel with the control of anatomical vascular injuries.

Vascular injuries may have significant sequel, acute haemorrhage may be overt, contained (muscle compartment) or concealed (e.g. pleural cavity). It may be immediate or delayed with rebleeding. A contused artery may be initially patent but later thrombose and so ischaemia may be acute or delayed. Control of haemorrhage and restoration of perfusion are key to the resolution of vascular injury.

Diagnosis

History- the mechanism of injury, blood loss prior to hospital and underlying previous vascular disease should be sought when possible.

Examination

Assessment should be carried out according to ATLS principles and life threatening conditions should be managed. Vascular injuries may present with hard or soft signs

Hard signs	Active pulsatile bleeding Shock with ongoing bleeding Absent distal pulses Signs and symptoms of acute ischaemia Expanding haematoma Thrill or Bruit
Soft signs	History of severe bleeding Diminished distal pulse Injury of anatomically related structure Multiple fractures and extensive soft tissue injury Injury in anatomical area of major blood vessel

Extensive soft tissue swelling may make evaluation difficult but a diminished or reduced distal pulse is due to arterial occlusion until proven otherwise.

A concern raised of significant vascular injury from the mechanism, assessment or investigations should prompt contact with the on call vascular consultant via switchboard.

Management principles in haemodynamically stable patients with suspected peripheral vascular injuries

- Patients with a normal vascular examination and Ankle brachial pressure index of >0.9 may be discharged if otherwise well.
- Patients with an abnormal vascular physical examination or an ABPI < 0.9 require arterial imaging
- Once vessel injury with distal circulation compromise is detected the NBT network oncall vascular surgeon should be contacted via the NBT switchboard.
- **Patients with hard signs of arterial injury need the network on call vascular surgeon contacting as soon as possible, further imaging may not be required to confirm management**
- Patients with hard signs of arterial injury (pulsatile bleeding, bruit thrill, expanding haematoma) should be surgically explored and repaired, restoration of perfusion to an extremity with an arterial injury must be performed in less than six hours, fasciotomies should be performed liberally if there is any significant concern that compartment syndrome may occur (prolonged ischaemia or significant soft tissue injury)

Investigations

- CT angiography is used as the primary diagnostic study in major trauma patients with a suspected vascular injury
- Patients whose mechanism of injury or pre hospital history includes hard signs of vascular injury should be discussed early with the on call vascular consultant at NBT through switchboard as soon as possible so that plans to access theatres may get underway in readiness for the patients arrival.
- Patients in whom the vascular injury becomes evident on clinical assessment or imaging and is life or limb threatening should be discussed with the on call vascular consultant through switchboard.

Major trauma patients with massive haemorrhage at vascular spoke hospitals (ref 6)

- 1. Patients presenting with life threatening post trauma haemorrhage will not bypass their local hospital that has the capacity to stop it. Their life threatening haemorrhage will be treated in the first major hospital they pass, after this has been dealt with they will be admitted to the Major trauma and arterial centre for ongoing management.**
- 2. If the patient has been admitted to their local hospital and their haemorrhage only becomes evident whilst an inpatient the non-availability of a surgeon with vascular expertise should not prolong haemorrhage- the priority is control of bleeding**
3. Recommended treatment consists of rapid laparotomy (if intra-abdominal) and control of haemorrhage using direct pressure or arterial clamps until a local surgeon with vascular experience arrives.
4. The role of the local surgeon with vascular experience is to repair, reconstruct or ligate the artery or vein that is bleeding (veins are usually safer ligated)

5. The network on call vascular surgeon should be contacted early via the NBT switchboard and will either.
 - Offer advice;** bleeding can be profuse without injury to a major vessel. Many vessels can be simply ligated and this is well within the remit of a surgeon of any speciality
 - Attend in person:** Unless there is a vascular surgeon on site
 - Transfer Patient:** This only becomes an option once the haemorrhage is controlled and the patient is haemodynamically stable

Principles of resuscitation and prevention of further bleeding

- The time between injury and procedure to stop the bleeding should be minimised. (Over half of trauma deaths occur within 24 hours of injury (ref 4))
- Tourniquets can be used to stop life threatening haemorrhage pre surgery, This is a simple and effective method to acutely control haemorrhage, the time span for there removal should be as short as possible but can be 2-4 hours. Especially with mangled extremities they are superior to pressure bandages (ref 5)
- The physician should clinically assess the extent of traumatic haemorrhage using mechanism of injury, patients physiology, anatomical injury pattern and patients response to resuscitation
- Patients with haemorrhagic shock and an identified bleeding source need immediate bleeding control unless resuscitation is successful. Endovascular embolization should be treatment of choice for bleeding from blunt abdominal trauma (if available). Early discussion with Interventional Radiology advised.
- Patients with haemorrhagic shock and an unidentified bleeding source require immediate assessment of the chest, abdominal cavity and pelvis both clinically and with CT if readily available (otherwise CXR + FAST scan)
- Patients who are suspected clinically of having thoracic or abdominal bleeding who have a high risk mechanism of injury require CT even if haemodynamically stable
- Initial haematocrit level has a low sensitivity of detecting those patients needing surgical intervention, it should be performed but normal value must not reassure the clinicians. Serum lactate and base deficit should also be taken

- Post traumatic coagulopathy is common and should be assessed using thromboelastogram based methodology. Close liaison with the haematologist with the use of massive transfusion protocol should occur.
- Patients with pelvic ring disruption in haemorrhagic shock require immediate pelvic stabilisation (pelvic binder). CT angiography should be undertaken. Early involvement of Interventional Radiology is advised for embolization if appropriate.
- Patients bleeding from the pelvis despite stabilisation and endovascular control/embolisation require early pre peritoneal packing (not intraperitoneal laparotomy in the first instance).
- Hard signs of intra thoracic bleeding require thoracotomy, if done as an emergency by the general or vascular surgeons at NBT then the thoracic surgeons at UHBT should be informed via switchboard and will attend as soon as possible.
- Thoracic arterial injuries that become evident on CT imaging should be discussed with the on call vascular, interventional radiology and thoracic surgical consultants.
- If abdominal bleeding is not treatable endovascularly or if there are other abdominal injuries requiring surgery then early control should be with abdominal packing and damage limitation surgery
- Ongoing active bleeding intraoperatively despite packing is an indication for aortic cross clamping

Reference

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