

**VANDERBILT UNIVERSITY MEDICAL CENTER
DIVISION OF TRAUMA AND SURGICAL CRITICAL CARE**

Penetrating extremity injury

Background: Peripheral vascular injury can result in significant morbidity and mortality. Acute vascular insufficiency may present at the extremes of hemorrhage versus ischemia. The purpose of this document is to provide an algorithm for diagnosis and management of penetrating extremity trauma.

1. Physical examination findings
 - a. hard signs
 - i. significant hemorrhage
 - ii. expanding hematoma
 - iii. bruit/thrill
 - iv. ankle/pressure index <0.9
 - v. P's
 1. Pulseless
 2. Poikilothermia
 3. Paresthesia
 4. Pallor
 5. Pain
 - b. soft signs
 - i. diminished but palpable pulse
 - ii. neurologic deficit
 - iii. small to moderate hematoma
 - iv. proximity injury
2. Diagnosis
 - a. ankle pressure index
 - i. normal is >0.9
 - ii. excludes significant peripheral vascular injury
 - iii. abnormal mandates further examination
 1. surgical exploration
 2. CT angiography
 3. formal angiography
 - iv. only reliable for mainline versus side branch vessels
 - b. physical examination
 - i. neurologic abnormality implies potential proximity injury
 - ii. pulse quality is notoriously unreliable
 - iii. evaluate closely for signs of possible compartment syndrome
 - c. vascular ultrasound
 - i. frequently unavailable, reliability unclear
 - d. CT arteriogram
 - i. easily obtained, minimal complications
 - ii. may be useful to exclude significant injury
 - iii. streak artifact with retained ballistic fragment

- e. formal arteriogram
 - i. may be performed in radiology or the operating room
 - ii. arterial cannulation with 18-20-French angiocatheter with direct injection of full strength contrast
 - iii. digital subtraction may be utilized
 - f. direct exploration
 - i. gold standard for patient with hard signs
3. Initial management
- a. ATLS protocol to rule out other significant injuries
 - b. physical examination essential to identify neurovascular status
 - i. motor function
 - ii. pain with passive motion
 - iii. neurologic deficit
 - iv. pulse character
 - v. ballistic injuries and trajectory
 - c. management of hemorrhage
 - i. direct pressure
 - ii. proximal tourniquet
 - iii. ? Balloon tamponade
 - iv. operative exploration
 - d. management of ischemia
 - i. further diagnostic measures
 - ii. potential operative exploration
 - e. management of compartment syndrome
 - i. calf>thigh>forearm/hand
 - ii. may occur in blunt trauma with tibial fracture or more proximal vascular injury
 - iii. ischemia reperfusion injury
 - iv. requires fasciotomy
 - f. vascular shunt viable option for both arterial or venous injury if lethal triad, unstable
 - i. Argyle shunts
 - ii. any available conduit
 - g. consider prophylactic fasciotomy if postoperative physical exam unreliable
 - i. particularly for combined arterial and venous injuries
 - h. venous injuries typically ligated but not without significant morbidity
 - i. may consider venous reconstruction
4. special considerations
- a. operative considerations
 - i. proximal control
 - 1. difficult regions such as distal external iliac arteries, subclavian/axillary may require wide, atypical exposure
 - ii. repair versus interposition graft
 - 1. rare injury amenable to primary arteriorrhaphy
 - 2. either contralateral reverse staff in his graft or size matched PTFE is suitable
 - iii. local heparin
 - iv. catheter thromboembolectomy
 - v. post-reconstruction arteriogram

1. should verify with the operating room preoperatively to make sure that the OR table is compatible with fluoroscopy
- b. recommend vascular surgery consultation for difficult anatomic regions or injury patterns
 - i. below knee injuries
 - ii. proximal upper extremity
 - iii. requirement of significant venous reconstruction
- c. postoperative antiplatelet therapy and follow-up

Revised 2011, Oliver L. Gunter, M.D., FACS