EMC 360 Acute Fluid and Respiratory Disorders

Pneumatic Anti-Shock Garment

B. pp 318-321

Hubble Trauma text

chapter 21

Objectives

Upon completion of this lecture, the learner should be able to:

- Review the determinants of cardiac output and blood pressure and the physiological principles that account for PASG raising of measured BP.
- List indications and contraindications for PASG in trauma.
- Discuss problems and complications of PASG, including deflation and compartment syndrome.

Cardiovascular Physiology

Factors affecting cardiac output and blood pressure

- BP ≈ HR x SV x PVR

Factors affecting stroke volume

- Positive
  - Preload (primarily: IV NS, and slight: PASG)
- Negative
  - Afterload (PASG)

PASG Controversies

- Mattox, et al found no advantage to MAST application in hypotensive ***urban*** patients with mostly penetrating injuries to the chest with ***short*** transport times.
- However, the removal of PASG from ambulances is controversial.
  - particularly for services with long transport times

Biomechanics of the PASG

- Cardiac Output and Blood Pressure
  - Autotransfusion
    - Slight effect: ≈ 250cc to preload
  - Increased afterload
    - increases blood pressure
    - may increase flow to vital organs
  - Adverse biomechanics
    - CO declines over time with PASG (baroreceptors and afterload)
    - Increased BP may accentuate bleeding

Control of Hemorrhage

- If external pressure lowers vessel wall pressure, then the rate of flow into the injured area should slow. (Bernoulli's law)
- An injured vessel wall allows pressure to force the laceration open.

  (Laplace's law)
  - Externally compressing the vessel wall tension should decrease the size of the laceration and the bleeding

Control of Hemorrhage, cont

- Possible worsening of hemorrhage
  - Hemorrhage above the level of the garment increases because of increased vessel wall pressures of the vessels above the PASG

Immobilization of Fractures

Effective air splint

- Stabilizes fractures
- Improves fracture alignment (pelvic)
- Reduces tissue damage
- Tamponades venous bleeding

Use of the PASG

- Acceptable when hypotension present and there is a need to:
  - Control hemorrhage from vessels which can be compressed by the garment including
    - abdominal aorta
    - femoral artery
  - Stabilize a pelvic fracture
  - Refractory anaphylactic shock, neurogenic shock
  - Raise blood pressure in severe traumatic hypotension

Use of the PASG

PASG may be helpful
and are probably not harmful in:

- Pelvic fracture without hypotension
- Penetrating injury to the abdomen
- Urologic hemorrhage
- Ob/Gynecologic hemorrhage
  - including ruptured ectopic

Contraindications of PASG

- Known or suspected bleeding or injury above the level of the garment including
  - penetrating chest trauma
  - non-penetrating, blunt chest trauma
  - cardiac tamponade
- Limited lower extremity trauma
  with no hypotension
- Pulmonary edema

Contraindications of PASG

- Abdominal evisceration

- Diaphragmatic rupture

Deflation Procedure

- Release 10 mm Hg * of pressure from abdominal compartment.
- Reassess vital signs. If heart rate increases by 5-10 bmp or if BP decreases by 5 mm Hg, discontinue deflation. Provide 200-250 cc fluid challenge. If ineffective re-inflate section.
- Repeat until abdominal section is deflated.
- Repeat procedure for each leg separately *

* 110 mmHg / 10 = 11 minutes x 3 = 33 minutes

Complications

- Environmental effects
  - T° and Pressure
- Complications of use
  - Decreased tidal vol. (diaphragmatic excursion)
  - Nausea, vomiting, or incontinence from compression of abdominal organs
  - Compartment syndrome, especially if application > ***2*** hours and > ***30*** mmHg
  - Inadvertent rapid deflation

Summary

We have discussed:

- Determinants of CO and BP and the principles that account for PASG raising of measured BP.
- Indications and contraindications for PASG.
- Complications and problems of PASG, including deflation and compartment syndrome.