Joint Trauma System

Pelvic Fracture Care

Clinical Practice Guideline (CPG) Training

Joint Trauma System Trauma Care Educational Program

Disclosure/Disclaimer

- No financial disclosures
- The view(s) expressed herein are those of the author(s) and do not reflect the official policy or position of Brooke Army Medical Center, the U.S. Army or Air Force Medical Department, the U.S. Army or Air Force Office of the Surgeon General, or the Department of Defense or the U.S. Government.

Agenda

- Purpose
- Summary
- Background
- Evaluation
- Treatment
- Performance Improvement (PI) Monitoring
- References
- Appendices
- Contributors

Purpose

- These slides are based on the JTS Pelvic Fracture Care CPG which provides a brief review for the stabilization and treatment of pelvic fractures sustained in combat casualties.
- Date of CPG publication: 15 Mar 2017
- JTS CPGs are evidence-based guidelines developed by subject matter experts in the military and civilian communities. CPGs are compiled from DoD Trauma Registry data, health data abstracted from patient records and after action reports.
- Information contained in this presentation is only a guideline and not a substitute for clinical judgment.

Summary

- Open pelvic fractures in the combat environment have become more common most likely secondary to the increased prevalence of blast mechanisms of injury.
- Pelvic fractures are primarily stabilized with external fixation or using sheets/pelvic binders centered over the greater trochanters.
- Pelvic fractures may require surgical intervention to control ongoing hemorrhage.

Background

- Pelvic fractures in the combat environment tend to be more complex, more difficult to classify, and more commonly open than in civilian trauma.
- Often associated with other severe injuries.
- Death often a result of acute blood loss and associated injuries.
- Pelvic fractures can be a complex challenge as sharp spikes of bone from the fracture can lacerate surrounding soft tissues and cause bleeding.

Background

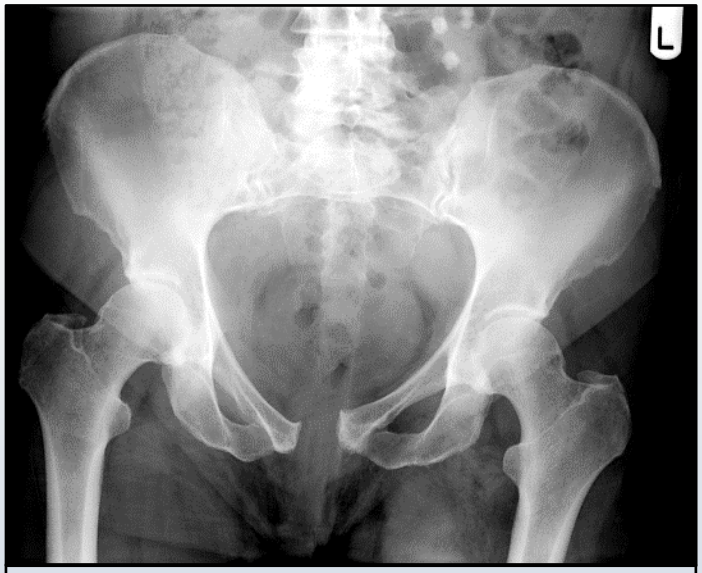
- Common sources of bleeding:
  - Fracture surfaces
  - Retroperitoneal venous plexus
  - Gluteal artery
- Damage possible to hollow viscera, L5 nerve root, and lumbar plexus

Open pelvic fracture with traumatic amputation of right lower extremity. Open Pelvic fractures are common with dismounted complex blast injury.

Evaluation

Evaluation begins with complete trauma evaluation and assessment of hemodynamic stability.

- Evaluate all possible sources of bleeding.
- A thorough examination of the pelvis and perineum is required as part of this examination.



Open book pelvic fracture

Treatment: Stabilization

- Initial stabilization is done with whatever means available.
  - Options include:
    - Pelvic Binder
    - Sheet/Fabric
    - Pelvic external fixation
    - Bean or sandbags
  - If unable to determine pelvic fracture stabilization, stabilize with sheet or binder.
  - Taping knees and ankles together can minimize additional rotational movement.
- Pelvic binders (all varieties) are correctly placed by centering over the greater trochanter of the femur.

Pelvic fracture from blunt mechanism stabilized with sheet. Note taping of knees and ankles.

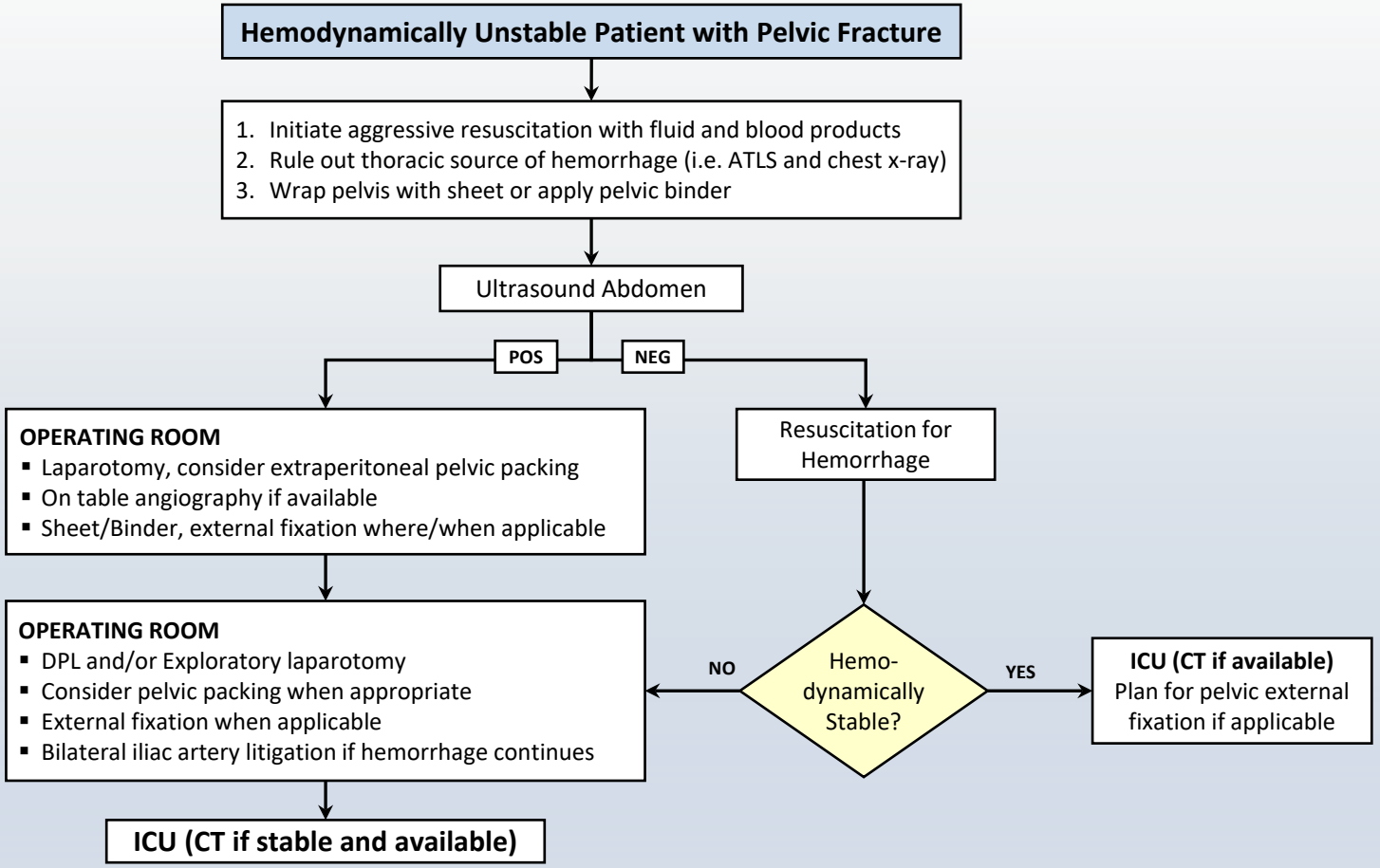
Treatment

- Venous bleeding is most common from blunt pelvic fractures and can be controlled with a pelvic binder.
  - 70% of hemorrhage from blunt trauma is venous.
  - Generally controllable with maneuvers that reduce pelvic volume and stabilize pelvis.
- Less commonly, arterial bleeding is present and often requires procedural interventions including:
  - Embolization.
  - Pelvic packing.
  - Bilateral internal artery ligation.

Treatment

- If requiring procedural intervention, temporary aortic occlusion may help control life-threatening hemorrhage.
- Given the rare availability of endovascular embolization in the deployed setting, pelvic packing is considered the next best option.
  - Performed preferably through suprapubic incision.
  - Avoid intraabdominal approach unless required for other injuries.
- Bilateral internal iliac artery ligation is considered a last resort.

Treatment Algorithm



PI Monitoring

- Population of Interest

  Patients diagnosed with pelvic fracture.

- Intent (Expected Outcomes)
  - Patients in the population of interest with hemodynamic instability (SBP < 100 or HR >100) receive pelvic stabilization (binder or external fixation).
  - Pelvic fracture patients who remain hemodynamically unstable after 2 units of blood product transfusion undergo hemorrhage control procedure at the same level of care where diagnosed (exploratory laparotomy, preperitoneal packing, REBOA, and/or interventional angiography embolization).

PI Monitoring

- Performance/Adherence Metrics
  - Number and percentage of patients in the population of interest with hemodynamic instability (SBP < 100 or HR >100) who receive pelvic stabilization (binder or external fixation).
  - Number and percentage of patients with pelvic fracture who remain hemodynamically unstable after 2 units of blood product transfusion undergo hemorrhage control procedure at the same level of care where diagnosed (exploratory laparotomy, preperitoneal packing, REBOA, and/or interventional angiography embolization).
- Data Source
  - Patient Record
  - Department of Defense Trauma Registry

References

1. Lewandowski L, Kluk M, Gordon WT. Outcomes and complications of open combat-related pelvic fractures. Unpublished data.
2. Lopez PP. Unstable pelvic fractures: the use of angiography in controlling arterial hemorrhage. J Trauma. 2007 Jun. 62(6 Suppl):S30-1.
3. Poole GV, Ward EF, Muakkassa FF. Pelvic fracture from major blunt trauma. Outcome is determined by associated injuries. Ann Surg. 1991 Jun. 213(6):532-8; discussion 538-9.
4. Dalal SA, Burgess AR, Siegel JH, et al: Pelvic fracture in multiple trauma: Classification by mechanism is key to pattern of organ injury, resuscitative requirements, and outcome. J Trauma 1989;29:981-1002.
5. McMurtry R, Walton D, Dickinson D, Kellam J, Tile M: Pelvic disruption in the polytraumatized patient: A management protocol. Clin Orthop Relat Res 1980; 151:22-30.
6. Bosch U, Pohlemann T, Haas N, Tscherne H: Classification and management of complex pelvic trauma [German]. Unfallchirurg 1992;95:189- 196.
7. Mucha P Jr, Farnell MB: Analysis of pelvic fracture management. J Trauma 1984;24:379-386.
8. Smith W, Williams A, Agudelo J, et al. Early Predictors of Mortality in Hemodynamically Unstable Pelvis Fractures. Jl Orthop Trauma. 2007;21(1):31-37.
9. Davis JM, Stinner DJ, Bailey JR, Aden JK, Hsu JRand the STREC Consortium investigators. Factors Associated With Mortality in Combat-related Pelvic Fractures. J Am Acad Orthop Surg 2012; 20(suppl 1):S7-S12
10. Joint Trauma System, High bilateral amputations and dismounted complex blast injury, 01 Aug 2016.
11. Ben-Menachem Y, Coldwell DM, Young JW, Burgess AR: Hemorrhage associated with pelvic fractures: Causes, diagnosis, and emergent management. AJR Am J Roentgenol 1991;157:1005-1014.

References

12. Agolini SF, Shah K, Jaffe J, Newcomb J, Rhodes M, Reed JF III: Arterial embolization is a rapid and effective technique for controlling pelvic fracture hemorrhage. J Trauma 1997;43:395- 399.
13. Hak D, Smith W, Suzuki T. Management of Hemorrhage in Life-threatening Pelvic Fracture. J Am Acad Orthop Surg. 2009;17:447-4
14. DuBose J, Inaba K, Barmparas G, Teixeira PG, Schnüriger B, Talving P, Salim A, Demetriades D. Bilateral internal iliac artery ligation as a damage control approach in massive retroperitoneal bleeding after pelvic fracture. J Trauma. 2010 Dec;69(6):1507-14.
15. Biffl W, Smith W, Moore E, et al. Evolution of a Multidisciplinary Clinical Pathway for the Management of Unstable Patients with Pelvic Fractures. Annals of Surgery. 2001;233(6):843-850.
16. Croce MA, Magnotti LJ, Savage SA, Wood GW II, Fabian TC: Emergent pelvic fixation in patients with exsanguinating pelvic fractures. J Am Coll Surg 2007;204:935-942.
17. Agolini SF, Shah K, Jaffe J, Newcomb J, Rhodes M, Reed JF III: Arterial embolization is a rapid and effective technique for controlling pelvic fracture hemorrhage. J Trauma 1997;43:395- 399.
18. Miller PR, Moore PS, Mansell E, Meredith JW, Chang MC: External fixation or arteriogram in bleeding pelvic fracture: Initial therapy guided by markers of arterial hemorrhage. J Trauma 2003;54:437-443.
19. Gourlay D, Hoffer E, Routt M, Bulger E: Pelvic angiography for recurrent traumatic pelvic arterial hemorrhage. J Trauma 2005;59(5):1168-1174.
20. Smith WR, Moore EE, Osborn P, et al. Retroperitoneal packing as a resuscitation technique for hemodynamically nstable patients with pelvic fractures: report of two representative cases and a description of technique. J Trauma 2005 Dec;59(6):1510-4
21. Osborn PM, Smith WR, Moore EE, et al. Direct retroperitoneal pelvic packing versus pelvic angiography: A comparison of two management protocols for haemodynamically unstable pelvic fractures. Injury 2009 Jan:40(1):54-60 .

CPG Appendices

- **Appendix A:** Pelvic Fracture Clinical Pathway
- **Appendix B:** Additional Information Regarding Off-label Uses in CPGs

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