Joint Trauma System

High Bilateral Amputations and Dismounted Complex Blast Injury (DCBI)

Clinical Practice Guideline (CPG) Training

Joint Trauma System Trauma Care Educational Program

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Purpose

- These slides are based on the JTS High Bilateral Amputations and Dismounted Complex Blast Injury CPG which review indications for and the procedures associated with the initial management of bilateral lower extremity amputations with associated pelvic/perineal injuries
- Date of CPG publication: 01 Aug 2016
- 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.

Agenda

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- Operative Considerations
- Operative Treatment
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- Amputation
- Perioperative Management
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- Appendices (N/A)
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Summary

- DCBIs represent one of the most challenging cohorts of surgical patients from management of the initial injury through definitive reconstruction.
- Aggressive resuscitation and operative management are required.
- These injuries are associated with a high incidence of both morbidity and mortality.

Background

- Initial survival depends on a coordinated team approach with simultaneous volume resuscitation with blood and immediate hemorrhage control.
- Later, patients are at risk for sepsis and multi-organ failure.
- DCBI pattern consists of bilateral lower extremity amputations with associated pelvic/perineal injuries.
  - Most often proximal amputations.
  - Frequently includes upper extremity injuries.
  - High incidence of mortality and morbidity.

Initial Evaluation & Treatment

- Patients with DCBI often arrive in extremis with tourniquets in place and no IV access, given associated upper extremity amputations.
  - Rapid vascular access with an intra-osseous line may be a useful adjunct to begin resuscitation.
  - Large-bore central access should be considered early.
  - Immediately activate mass transfusion protocol.

Dismounted blast injury with proximal lower extremity amputation and open pelvis fracture

Initial Evaluation & Treatment

Preoperative studies may include chest and pelvis radiographs, ultrasound/ diagnostic peritoneal lavage and head CT if clinical signs of brain injury that may require operative intervention.

Imaging should not degrade resuscitation or delay surgical hemorrhage control.

Dismounted blast injury with lower extremity traumatic amputation

Initial Evaluation & Treatment

- Patients with DCBI may present with CPR in progress.
  - Interventions such as resuscitative thoracotomy and endovascular aortic balloon occlusion may be appropriate.
  - Mortality is estimated to be greater than 90% if a DCBI patient requires resuscitative thoracotomy.
- Patients with DCBI will consume a large number of resources, and prudent assessment of resource allocation should be done prior to procedures such as resuscitative thoracotomy.

Operative Considerations

- Initial goals of surgical treatment are limited primarily to hemorrhage and contamination control which often require teams of general and orthopaedic surgeons to address the various injuries as efficiently as possible.
- Level of vascular control is dependent on injury and should be achieved ultimately at the most distal level possible.
  - The strategy of walking clamps down from proximal control points to distal points is prudent.
  - The benefit of hemorrhage control must be balanced with the risk of distal ischemia.
  - Avoid permanent ligation of both internal iliac arteries, if possible, to avoid buttock necrosis.

Operative Treatment (I)

- Iliac vein injuries should be shunted or repaired rather than ligated.
- Arterial injuries should be managed, when possible, with shunting followed by formal repair at subsequent operations.
- Care should be taken to avoid exclusion of the profunda femoris during shunting or repair in order to perfuse the soft tissue and muscle.

Operative Treatment (2)

- Wounds to the perineum and perianal region from fragments dictate proctoscopy to evaluate the rectum.
- Rectal clot/active bleeding, pelvic disruption, or an open pelvis, are all reasons to divert the fecal stream.
  - If diversion required, divert the fecal stream by stapling the sigmoid at the pelvic brim early to facilitate further exposure and vascular control.
  - Definitive colostomy should be delayed until the patient is more stable.

Operative Treatment (3)

- Injuries to the genitourinary structures are common. Focus on hemorrhage control, urinary control, and reservation of tissue for later reconstruction.
- Use of temporary abdominal closure is advised.

Open pelvic fracture with severe genitourinary trauma

Operative Treatment (4)

DCBI wounds are typically complex and extensive, and adequate initial surgical debridement is critically important.

- Systematic debridement of all non-viable tissue is required to reduce bioburden and later risk of sepsis
- Blast wounds tend to evolve. If tissue is questionable and not contaminated, it should be maintained and addressed at later operations
- Avoid leaving marginally viable tissue behind.

Dismounted blast injury with extensive soft tissue destruction

Operative Treatment (5)

- Do not close traumatic wounds until multiple adequate debridements with serial stability and maturation demonstrated.
- Preferred initial dressings include:
  - Dakin's soaked gauze
  - Moist-to-dry gauze
  - Antibiotic bead pouches
  - Negative pressure wound therapy

Operative Treatment (6)

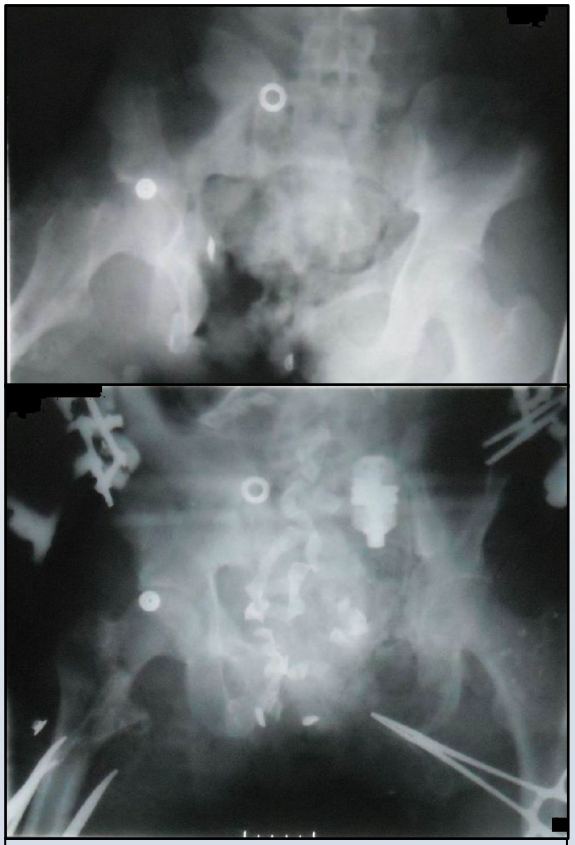
Early orthopaedic involvement focuses on hemorrhage control and pelvic ring stability.

- Additional tourniquets may be required after initial resuscitation.
- Pelvic and perineal packing is helpful for tiny vessels.
- Early control of pelvic stability can be done with the use of clamped sheets or commercial pelvic binders centered over the greater trochanters.

External Fixation

External fixation may be preferable to prolonged use of binders.

- Anterior superior iliac spine/crest or anterior inferior spine pins are both appropriate.
- Anterior inferior spine pins provide the greatest reduction control but require fluoroscopy and surgeon experience.



Before (top) and after (bottom) external pelvic fixation of open pelvic ring and acetabular fractures

External Fixation

- The patient may have multiple traumatic amputations.
  - Revisions or completion amputations should occur at the most distal-viable level.
  - Double ligate all named vessels.
  - Preserve all healthy tissue, even if it is an atypical rotational flap, to allow for later reconstruction.
- External fixation of long bone fractures should be accomplished during the index procedure when possible.
- Smaller bone and joint fractures should be addressed after initial operative resuscitation.

Amputation

- Once stabilized, complete imaging including “Pan Scan” computed tomography and plain film examinations to evaluate for occult injury.
- Serial debridement should regularly occur.
  - Initially every 24 hours when < 72 hours from time of injury.
  - In sub-acute phase (3-7 days post injury), debridements may require less frequent operations if there is viable tissue and no ongoing necrosis or persistent contamination.

Perioperative Management

- Initial systemic antibiotic selection should avoid empiric broad spectrum antibiotics and should focus on narrow spectrum antibiotics based on the *Infection Prevention in Combat-Related Injuries CPG*.
- DCBI patients, even with bilateral lower extremity amputations, are at high risk of development of deep vein thrombosis.
  - Appropriate DVT/PE prophylaxis should be started when coagulopathy is reversed.
  - If contraindications to chemical prophylaxis, consider inferior vena cava filter.

Perioperative Management

- Coordinate dressing changes and repeat debridements with anticipated patient transport through the trauma system.
- The treating surgeon should maintain a low threshold to perform additional debridements prior to evacuating the patient, to prevent unacceptable intervals between debridements.
- The patient should remain NPO for the flight, so they are prepared for the next operation at the next role of care.

PI Monitoring

- Population of Interest

  All combat casualties with bilateral lower extremity amputations, at least one above the knee, with mechanism of injury explosive/IED or landmine, dismounted.

- Intent (Expected Outcomes)
  - The pelvis is stabilized prehospital or immediately on arrival to the hospital with pelvic binder or junctional tourniquet placement in all patients with bilateral lower extremity amputations.
  - All patients who undergo laparotomy have temporary abdominal closure at first operation (or reason to safely close abdomen is documented).
  - All patients with high bilateral lower extremity injuries have a documented rectal exam and have a documented proctoscopy if perineal/peri-rectal penetrating wounds are present.
  - When GU injury is present, debridement conserves tissue to the greatest extent possible.
  - All patients with dismounted complex blast injury have a second debridement performed within 24 hours of the initial debridement.
  - All patients have VTE prophylaxis started within 24 hours (or documented reason why contraindicated).

PI Monitoring

- Performance/Adherence Measures
  Number and percentage of patients in the population of interest:
  - who have the pelvis stabilized prehospital or immediately on arrival to the hospital with pelvic binder or junctional tourniquet placement.
  - who undergo laparotomy and the number who have temporary abdominal closure at first operation (or reason to safely close abdomen documented).
  - who have documented rectal exam.
  - who have perineal/peri-rectal penetrating wounds who have a documented proctoscopy.
  - who have injury to external genitalia who have preservation of injured testicle(s) at the initial operation.
  - who have a second debridement performed within 24 hours of the initial debridement.
  - who have VTE prophylaxis started within 24 hours (or documented reason why contraindicated).
  - who survive evacuation from first MTF and the number who survive to final discharge from role 3/role 4.
- Data Source
  - Patient Record
  - Department of Defense Trauma Registry

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