High Bilateral Amputations and Dismounted Complex Blast Injury

Part of the Joint Trauma System (JTS) Clinical Practice Guideline (CPG) Training Series
This CPG provides evidence-based guidelines for the treatment of dismounted complex blast injuries (DCBI).

This presentation is based on the High Bilateral Amputations and Dismounted Complex Blast Injury 01 Aug 2016 CPG (ID:22). It is a high-level review. Please refer to the complete CPG for detailed instructions. Information contained in this presentation is only a guideline and not a substitute for clinical judgment.
Agenda

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Summary

- Dismounted complex blast injuries require a team approach and significant resources.

- Aggressive resuscitation and operative management are required.
Background

- 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.

Dismounted blast injury with proximal lower extremity amputation and open pelvis fracture
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.
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.
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.
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 amount of resources, and prudent assessment of resource allocation should be done prior to procedures such as resuscitative thoracotomy.
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 at all possible to avoid buttock necrosis.
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.
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.
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.
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
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.
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.
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.
**Intent (Expected Outcomes)**

- All patients at high risk for rectal injury are evaluated to eliminate the chance of missed injury.
- All patients who undergo laparotomy have temporary abdominal closure to reduce chance for compartment syndrome and facilitate abdominal re-look and washout up range.
- All patients receive or are considered for venous thromboembolism prophylaxis as soon as clinically able.

**Data Source**

- Patient Record
- Department of Defense Trauma Registry (DoDTR)
Performance/Adherence Measures

- Proctoscopic examination was performed and documented during the index operation in these patients with fragmentation wounds to the perineum and perianal areas.

- In these patients undergoing laparotomy for vascular control and/or presence of intraabdominal injury, temporary abdominal closure was employed at the index operation.

- Appropriate venous thromboembolism prophylaxis was initiated in a timely fashion or, if not, adequate documentation as to why not exists in the medical record and physician note.


11. Labler L, Trentz O. The use of vacuum assisted closure (VAC) in soft tissue injuries after high energy pelvic trauma.  


Contributors

- LtCol Wade Gordon, USAF, MC
- LCol Max Talbot, RCMS, CF
- CDR Mark Fleming, MC, USN
- John Shero, MHA
- LTC Benjamin Potter, MC, USA
- CAPT Zsolt Stockinger, MC, USN

Slides: Maj Andrew Hall, MC, USAF
Photos are part of the JTS image library unless otherwise noted.