

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

**Damage Control Surgery**

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1. Indications for abbreviated laparotomy
  - a. Trauma and emergency general surgery patient in extremis
    - i. coagulopathy, hypothermia, acidosis
    - ii. inability to complete definitive operation secondary to depleted physiologic reserve
    - iii. question of bowel viability
    - iv. massive visceral edema precluding primary fascial closure
    - v. consideration for massive intra-abdominal contamination
    - vi. consideration for triage or resource management
2. Temporizing abdominal closure
  - a. Barker vacuum pack
    - i. perforated bowel isolation bag
    - ii. safety towels with radiopaque marker
    - iii. 10/19-French JP drains x 2
    - iv. adhesive barrier dressing (e.g. Ioban)
  - b. Proprietary dressings may be used as suitable (KCI Abthera)
  - c. Should be changed every 48-72 hours
    - i. can be performed at bedside
3. Time to subsequent operative procedure.
  - a. Unplanned reexploration should be done in the face of ongoing surgical bleeding.
    - i. Normothermia, no evidence of ongoing coagulopathy, hypovolemic shock
  - b. Reexploration should be performed when patient has regained physiologic reserve
    - i. Resuscitation endpoints determined by attending surgeon/intensivist
      1. lactate clearance
      2. restoration of acid base status
      3. correction of coagulopathy
      4. normothermia
  - c. Time and packing of abdomen should not exceed 72 hours to mitigate development of intra-abdominal abscess
  - d. Serial washouts should be considered for massive contamination
  - e. Abdominal irrigant should be warm crystalloid solution
  - f. definitive closure recommended within 8 days of index operation
4. Abdominal compartment syndrome (see intra-abdominal pressure monitoring algorithm)
  - a. monitor bladder pressures in all patients who have received significant resuscitation (e.g. massive transfusion protocol)
    - i. if bladder pressures greater than 15-20 mmHg
      1. consider systemic paralysis
      2. low tidal volume to minimize peak pressure
      3. preferential resuscitation with colloid and vasopressors
      4. GI decompression
      5. consider diuresis or renal replacement therapy
5. Contaminated-dirty abdomen and tertiary peritonitis
  - a. Defined as gross purulent fluid in more than one quadrant
  - b. Irrigation should be performed with warm crystalloid solution

## 6. Abdominal fascial closure

- a. Primary fascial abdominal closure should be evaluated at each laparotomy
  - i. Unclosable abdomen
    1. excessive tension on suture line(s)
    2. increase in peak pressures, inducing abdominal compartment syndrome
    3. loss of abdominal domain
  - b. Options for unclosable abdomen
    - i. Absorbable prosthetic (Vicryl) with planned ventral hernia and subsequent skin flap closure or skin graft (see below)
    - ii. Biologic prosthetic
    - iii. Partial closure
    - iv. insertion of non-biologic prosthetic mesh (PTFE) with serial plication
  - c. Indications for continued open abdomen
    - i. visceral edema with inability to close primarily
    - ii. loss of abdominal domain
    - iii. considered for contaminated-dirty abdomen
    - iv. question of bowel viability

## 7. Planned ventral hernia

- a. Once intra-abdominal issues have been corrected and patient is not a candidate for primary closure by postinjury day 8, attending surgeon must consider course of planned ventral hernia
- b. small ventral defect (less than 10 cm wide)
  - i. consider skin only closure
  - ii. biologic prosthetic closure with or without skin closure
    1. with or without bipedicle flaps
- c. large ventral defect (greater than 10 cm wide) Vicryl mesh closure with either subcutaneous flap or planned split-thickness skin grafts when wound has granulated

## Selected references

- [1] Miller RS, Morris JA, Jr., Diaz JJ, Jr., Herring MB, May AK. Complications after 344 damage-control open celiotomies. *J Trauma*. 2005;**59**: 1365-1371; discussion 1371-1364. Morbidity associated with wound complications from the open abdomen remains high (25%). Morbidity is associated with the timing and method of wound closure and transfusion volume, but independent on injury severity. Also, delayed primary fascial closure before 8 days is associated with the best outcomes with the least charges.
- [2] Teixeira PG, Salim A, Inaba K, *et al*. A prospective look at the current state of open abdomens. *Am Surg*. 2008;**74**: 891-897. Definitive fascial closure can be achieved in 85 per cent of cases. In conjunction with biologics, closure can be achieved in 93 per cent of cases. Failure to primarily close the abdomen is associated with a significantly higher risk for entero-atmospheric fistula occurrence.
- [3] Diaz JJ, Jr., Mejia V, Subhawong AP, *et al*. Protocol for bedside laparotomy in trauma and emergency general surgery: a low return to the operating room. *Am Surg*. 2005;**71**: 986-991. The protocol standardized the conduct of BSL procedure to allow for a low return to OR rate of 5.8 per cent and had an overall in-hospital mortality rate of 23.3 per cent. Primary fascial closure of the abdomen had a significantly reduced hospital stay. BSL allowed trauma OR charges of dollar 5,300 per cases with 2.12 hours per cases savings.
- [4] Duttaroy DD, Jitendra J, Duttaroy B, *et al*. Management strategy for dirty abdominal incisions: primary or delayed primary closure? A randomized trial. *Surg Infect (Larchmt)*. 2009;**10**: 129-136. Delayed primary closure is a sound incision management technique that should be utilized for dirty abdominal incisions. It significantly lowers the rate of superficial SSI as well as fascial dehiscence and reduces the mean CIH time and hospitalization. The short-term cosmetic appearance is superior.
- [5] Boele van Hensbroek P, Wind J, Dijkgraaf MG, Busch OR, Carel Goslings J. Temporary closure of the open abdomen: a systematic review on delayed primary fascial closure in patients with an open abdomen. *World J Surg*. 2009;**33**: 199-207.

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