

**UAMS MEDICAL CENTER**  
**ACS SERVICES MANUAL**

**SUBJECT:** Management of Open Abdomen

**PAGE:** 1 of 3

**SUPERCEEDS:** HTS for Open Abdomen (Nov 2016)

**EFFECTIVE:** 12/15/2022

**RECOMMENDATION(S):** Kyle J. Kalkwarf, MD

**APPROVAL:** 12/15/2022

**CONCURRENCE(S):** Trauma Faculty

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**PURPOSE:**

To provide guidelines for the early management of patients with an open abdomen following damage control laparotomy using methods demonstrated to achieve improved fascial closure rates and decreased surgical site infections.

**DEFINITIONS:**

**DCL:** Damage Control Laparotomy is associated with improved survival when employed in an appropriate population of severely injured trauma patients to attenuate or avoid the “bloody vicious cycle” of acidosis, hypothermia, and coagulopathy.

The current indications for DCL include:

- liver bleeding controlled by packing
- persistent hypotension that prevents safe bowel anastomosis
- treatment for abdominal compartment syndrome
- allow for second-look surgery to evaluate bowel viability
- quick transportation to interventional radiology for endovascular embolization
- expeditious completion of initial surgery during a massive casualty event where the trauma center is overwhelmed.

**DPR:** Direct Peritoneal Resuscitation is a method of continuously saturating an open peritoneal cavity with a hyperosmotic peritoneal dialysis solution.

**HTS:** Hypertonic Saline refers to 3% NaCl at 30 mL/hr in this protocol. It has been shown to decrease intestinal edema, assist in diuresis, and results in early fascial closure while increasing the percentage of patients discharged with a closed fascia.

**Open Abdomen:** Laparotomy incision where the fascia remains open.

**FASCIAL CLOSURE TECHNIQUES:**

**Open Abdomen Negative Pressure Therapy: Abthera**

- Demonstrated to improve fascial closure by actively removing fluid to reduce edema, limit the loss of insensible peritoneal fluid through evaporation, provide medial tension to minimize fascial retraction and loss of domain, protect abdominal contents from the external environment, protect the fascial from temporary sutures.
- When not performed for abdominal compartment syndrome and if there is not a high risk of abdominal compartment syndrome, **the abdominal wall fascia should be reapproximated as much as possible** to the midline to prevent unnecessary fascial retraction, which decreases the chances of later fascial closure. This is performed by “**providing medial tension upon foam collapse to help maintain fascial domain**”-Abthera instructions.
- “**125 mmHg** of continuous mode therapy is recommended for efficient fluid removal rates”-Abthera

**Hypertonic saline infusion:**

- Demonstrated to prevent and reverse resuscitation-induced intestinal edema in rat models and mitigate the systemic inflammatory response secondary to intestinal ischemia-reperfusion injury.
- It limits intestinal edema, assists in diuresis, results in early fascial closure, and improves the percentage of

*These guidelines were prepared by the UAMS ACS Division. They are intended to serve only as a guideline based on current review of the medical literature and practice. They are neither policies nor protocols. Their use is at the discretion of the managing physician.*

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patients discharged with intact fascia without an increased incidence of acute kidney injury.

- **HTS PROTOCOL**
  - 3% normal saline is infused at a 30 mL/hr fixed rate via a central venous catheter.
  - Resuscitation with crystalloid or blood products should continue to be provided as dictated by the patient's clinical picture (e.g., providing additional fluids for patients with low UOP or increasing pressor requirements).
- Contraindications:
  - Serum sodium >160 mEq/L
  - Renal failure requiring CRRT (unless the nephrology service is willing to allow hypernatremia)
  - If a patient is hyponatremic (Na <129), sodium levels should be checked every 8 hours to ensure that correction does not occur faster than 0.5 mEq/L/hr (4 mEq/L over 8 hours)

**Direct Peritoneal Resuscitation:**

- Infusing hyperosmotic fluid into the abdomen causes rapid and sustained dilation of the arterioles, especially those in the intestine, which reduces organ ischemia and cellular hypoxia. Studies have demonstrated that using DPR after hemorrhagic shock can reduce organ edema, improve liver blood flow, and reduce serum levels of inflammatory cytokines. When used for hemorrhage or sepsis, it results in faster abdominal closure, a higher primary fascial closure rate, and reduced abdominal complications.
- DPR is beneficial in patients with:
  - significant contamination, pus, or fecal burden, because of its ability to continuously "wash" the abdomen. This results in a reduced SIRS response and deep surgical site infections.
  - contraindications to HTS infusion (CRRT or hypernatremia).
- **DPR PROTOCOL**
  - a 19F silicone elastomer round Blake drain or large red rubber catheter is placed in the left upper lateral quadrant (e.g., the location of an open g-tube) and directed around the root of the mesentery along the left pericolic gutter and down into the pelvis.
  - DPR solution = **2.5% glucose-based peritoneal dialysis solution (Dianeal (Baxter))**.
  - First hour: bolus of 800 mL
  - Rate until subsequent laparotomy: 400 mL/hr.

**Tube Feeds:**

- Bowel discontinuity is a contraindication to tube feeding, but an open abdomen is not.
- Patients with an open abdomen should receive at least trickle tube feeds to provide nutrition and limit the harmful effects of starvation and a lack of enteral nutrition.

**Other:**

- There is no evidence that aggressive diuresis with medications or dialysis improves fascial closure rates.

**Monitoring Parameters:**

- Time to abdominal closure (hospital days); denote if unable to close abdomen
- Use of HTS or DPR protocols (exclude dialysis patients)

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**References:**

1. Rotondo MF, Schwab CW, McGonigal MD, Phillips GR, Fruchterman TM, Kauder DR, Latenser BA, Angood PA. 'Damage Control': An Approach for Improved Survival in Exsanguinating Penetrating Abdominal Injury. *J Trauma*. Sept 1993;35(3):375-383.
2. Smith JW, Garrison RN, Matheson PJ, Franklin GA, Harbrecht BG, Richardson JD. Direct peritoneal resuscitation accelerates primary abdominal wall closure after damage control surgery. *Journal of the American College of Surgeons*. 2010 May 1;210(5):658-64.
3. Harvin JA, Mims MM, Duchesne JC, Cox Jr CS, Wade CE, Holcomb JB, Cotton BA. Chasing 100%: the use of hypertonic saline to improve early, primary fascial closure after damage control laparotomy. *Journal of Trauma and Acute Care Surgery*. 2013 Feb 1;74(2):4
4. Frazee RC, Abernathy SW, Jupiter DC, Hendricks JC, Davis M, Regner JL, Isbell T, Smith RW, Smythe WR. Are commercial negative pressure systems worth the cost in open abdomen management? *Journal of the American College of Surgeons*. 2013 Apr 1;216(4):730-3.
5. Fox N, Crutchfield M, LaChant M, Ross SE, Seamon MJ. Early abdominal closure improves long-term outcomes after damage-control laparotomy. *Journal of Trauma and Acute Care Surgery*. 2013 Nov 1;75(5):854-8.
6. Smith JW, Garrison RN, Matheson PJ, Harbrecht BG, Bennis MV, Franklin GA, Miller KR, Bozeman MC, Richardson JD. Adjunctive treatment of abdominal catastrophes and sepsis with direct peritoneal resuscitation: indications for use in acute care surgery. *Journal of Trauma and Acute Care Surgery*. 2014 Sep 1;77(3):393-9.
7. Weaver JL, Smith JW. Direct peritoneal resuscitation: a review. *International Journal of Surgery*. 2016 Sep 1;33:237-41.
8. Loftus TJ, Efron PA, Bala TM, Rosenthal MD, Croft CA, Smith RS, Moore FA, Mohr AM, Brakenridge SC. Hypertonic saline resuscitation following emergent laparotomy and temporary abdominal closure. *The journal of trauma and acute care surgery*. 2018 Feb;84(2):350.
9. Loftus TJ, Efron PA, Bala TM, Rosenthal MD, Croft CA, Walters MS, Smith RS, Moore FA, Mohr AM, Brakenridge SC. The impact of standardized protocol implementation for surgical damage control and temporary abdominal closure after emergent laparotomy. *The journal of trauma and acute care surgery*. 2019 Apr;86(4):670.
10. <https://www.acelity.com/-/media/Project/Acelity/Acelity-Base-Sites/shared/PDF/abthera-advance-ifu.pdf>