An Algorithm to Avoid Missed Bowel Injuries "AMBI" in Blunt Abdominal Trauma Patients

1. **Goal:** Provide useful guidelines for the management of patients at risk for a bowel or mesenteric injury following blunt abdominal trauma who do not have an immediate need for surgical intervention.

2. **Background:**
    a. For the purposes of this guideline, significant bowel and/or mesenteric injury is that which requires immediate surgical intervention. There are three main mechanisms that may cause bowel or mesenteric injury in blunt trauma: direct blow, rapid deceleration, or sudden increase in intra-abdominal pressure.[8]
    b. Significant bowel and/or mesenteric injury is estimated to occur in 5% of blunt abdominal trauma patients.[3]
    c. Clinical and diagnostic expertise are limited as a significant blunt bowel and/or mesenteric injury can be evasive to detect with computed tomographic (CT) scans, and signs of peritonitis can take hours to develop.[3, 6] Physical examination of a trauma patient can be complicated by multiple other injuries, neurological injuries to the head and spinal cord, medications that can mask pain, or altered mental status. [4,7] CT scans have high sensitivity (87-95%) and specificity (4884%) for detecting blunt bowel and mesenteric injury.[1] Relying on clinical assessments alone can result in negative laparotomy rates as high as 40%.[7] The synthesis of both CT images and clinical pictures is required for decision making regarding the abdominal trauma patient.
    d. Significant bowel injuries require immediate operative intervention. A delay in diagnosis of only 5-8 hours can result in morbidity and mortality, and the longer the time to operative treatment, the higher the mortality. Patients with a delay in diagnosis of a small bowel injury were 19.3 times more likely to die than patients without such delay in one study[4].
    e. Missed bowel injuries for the trauma patient result in significant morbidity and mortality. Delay to surgical management can result in complications such as intraabdominal abscess, pneumonia, wound infection, sepsis, wound dehiscence, acute respiratory distress syndrome, enterocutaneous fistula, adhesive bowel obstruction, incisional hernia, additional surgeries, prolonged hospitalization, and mortality.[2, 6, 8]

3. **Treatment**
    a. The clinical management of blunt abdominal trauma patients includes: CT, physical examination, and laboratory values.
    b. The treatment for a significant bowel or mesenteric injury is surgical correction.

Options for repair depend on patient injury and surgeon expertise and preference.[1]

i. Hand sewn: one or two layer technique
ii. Stapler

c. Abdominal closure after surgery depends on the patients' need for subsequent operations and the level of contamination which may complicate wound closure.[1]

i. Temporary abdominal closure
ii. Closure of abdominal fascia
    1. Loose approximation of skin with staples
    2. Closure of skin

APPENDIX A: Detailed AMBI Guidelines for Physicians

A. Initial Assessment of Patient in Trauma Bay

If systolic BP <90 mmHg, the patient is considered hemodynamically unstable. In this case, send the patient to the OR for abdominal exploration. If hemodynamically stable, proceed to *B.*

B. ED Evaluation

There are 2 components to the initial ED Evaluation: the CT scan and the clinical exam. Scoring instructions for each component are as follows:

CT Scan

- Assign 1.5 points for the presence of ***each*** "hard" CT sign (pneumoperitoneum, bowel discontinuity, GI contrast extravasation, traumatic abdominal wall hernia [TAWH]). *Note that the presence of just 1 hard sign warrants a trip to the OR.*

- Assign 0.33 points for the presence of ***each*** "soft" CT sign (mesenteric wall/vessel irregularity, mesenteric fat stranding, mesenteric hematoma, free fluid without solid organ injury, decreased bowel wall enhancement, and a radiographic seatbelt sign)

Clinical Exam

Using your own judgment in the context of the patient's clinical picture, assign ***either*** a score of "0" or "1" for the clinical exam based on your observation of the presence or absence of the following: rebound tenderness, guarding, abdominal pain, abdominal seatbelt sign (linear ecchymosis on the abdomen, above the ASIS)

- "0" implies that the patient's clinical presentation alone is ***NOT*** suspicious for a bowel injury

- "1" implies that the patient's clinical presentation alone ***IS*** suspicious for a bowel injury

Common error: The individual clinical exam findings are ***NOT*** worth 1 point each, rather 1 point ***as a whole***.

Add the patient's CT score to the clinical exam score. If this value is ≥ 1.5, take the patient to the OR. If < 1.5, proceed to *C.*

C. Serial Exams

If the patient's total score at this point is <1.5, serially examine the patient every 3-6 hours for 12 hours. Serial exams include both clinical and laboratory evaluation. Scoring instructions for each component are as follows:

Clinical Exam

Score in the same manner as the initial clinical exam from *B*, taking the following additional findings into consideration: vital sign changes (decreased BP, increased pulse), fever, progressive abdominal distention, and the need for ongoing resuscitation with IV fluids.

Laboratory Evaluation

Assign ***either*** a score of "0" or "1" for the laboratory evaluation based on the presence or absence of the following: failure to clear acidosis, significant leukocytosis, significant drop in Hg/Hct ("significant drop" is up to provider discretion).

Add the patient's Serial Exams score (new clinical exam + laboratory evaluation). If this value ≥ 2, send the patient to the OR. If <2, proceed to *D*.

D. Repeat CT

If the patient's total score from *C* was < 2, perform a repeat abdominal CT using IV + PO contrast at 12-24 hours. Score this CT as follows:

- If the repeat CT shows any signs of worsening compared to the original CT, assign a score of "2," and send the patient to the OR.
- If CT is unchanged, assign a score of "0," and proceed to *E*.

E. Monitor for Possible Discharge

Continue monitoring the patient for 12 hours. If there is no change in the patient's clinical presentation after 12 hours, the patient can be considered for discharge.

Sources:

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