

## **Blunt bowel and mesenteric injury: A WTA Multicenter Prospective Observational Study**

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### **Background**

Computed tomography (CT) scan of the abdomen has been used for 30 years to evaluate the stable blunt abdominal trauma patient; however, the early diagnosis of blunt bowel and mesenteric injury (BBMI) remains a challenge. Delayed diagnosis and intervention of BBMI lead to significant morbidity and mortality<sup>1,2</sup>. Several studies<sup>3-6</sup> have concluded that CT scan and physical examination alone are not adequate to diagnose BBMI. A recent retrospective single institution study<sup>7</sup> combined clinical variables and physical examination signs to CT findings to create the BIPS (Bowel Injury Predictive Score). Three predictors present on admission (CT scan grade of bowel and mesenteric injury of 4, white blood cell count  $\geq 17$ , and abdominal tenderness) were used to create the BIPS, with a score of 2 or greater associated with a nineteen-fold increase in the odds of a bowel injury requiring surgical intervention. Since publication in 2015, several centers<sup>8-13</sup> have published retrospective studies on BBMI and referenced the BIPS.

### **Purpose**

The purpose of this study is to prospectively identify high mechanism blunt abdominal trauma patients and validate the retrospectively designed BIPS as a method of identifying patients who may require surgical intervention for bowel injury.

### **Design**

This is a prospective multicenter observational study. Data will be collected over a twelve month period starting May 1, 2018.

### **Subject Population**

All adult patients (age  $\geq 16$ ) admitted to the trauma service who sustained high mechanism blunt abdominal trauma and had a CT scan of the abdomen prior to surgical intervention with radiographic suspicion of bowel or mesenteric injury will be included in this study. For the purposes of this study, high mechanism of injury includes MVC, MCC, ATV, bicycle, and auto-pedestrian mechanisms of injury.

### **Consent Procedures**

This is a prospective observational study. No intervention will be performed and no change in patient management will occur as a result of participation in this study. All data will be stored in a secure database without patient identifiers.

### **Study Procedures**

All patients will undergo a routine workup and clinical care as is standard at the institution in which they reside. All patient care decisions will be made by the treating physicians without input from the research team. Abstraction of the data points listed in the *data collection form* will be maintained prospectively while the trauma registry may be utilized to capture demographic data and other retrospective data points as outlined below. The BIPS will be calculated retrospectively after the local PI classifies the radiographic grade of injury as grade 4 or other (Table 1) after review of final radiology report and imaging studies.

The de-identified data collected at each institution will be entered into an electronic database (REDCap). All electronic subject data will be kept on password protected computers and accessible to only personnel approved for the study.

**TABLE 1. CT Grading Scale for Mesenteric Injury**

| Grade | Description   |
|-------|---|
| 1     | Isolated mesenteric contusion* <i>without</i> associated bowel wall thickening or adjacent interloop fluid collection             |
| 2     | Mesenteric hematoma** < 5 cm <i>without</i> associated bowel wall thickening or adjacent interloop fluid collection               |
| 3     | Mesenteric hematoma > 5 cm <i>without</i> associated bowel wall thickening or adjacent interloop fluid collection                 |
| 4     | Mesenteric contusion or hematoma (any size) <i>with</i> associated bowel wall thickening† or adjacent interloop fluid collection‡ |
| 5     | Active vascular or oral contrast extravasation bowel transection or pneumoperitoneum  |

\*Ill-defined ground glass haziness or wispy or streaky opacities within the mesenteric fat.

\*\*Discrete, measurable, soft tissue density within the mesentery.

†Thickening of the wall of small bowel greater than 3 mm.

‡Small triangular collection of free fluid within the mesentery and/or between the bowel loops.

**Data Collection**

Demographics:

Gender

Race

Age

BMI

Mechanism of Injury – MVC, MCC, ATV, bicycle, and auto-pedestrian

Emergency Department Information:

Date/Time of injury

Date/Time of Arrival

Vital Signs – SBP, HR, RR, Temp

GCS score

Admission labs: WBC, bands, Hct, base deficit, lactic acid

Abdominal FAST exam – positive, negative, equivocal, not done

Physical exam – abdominal tenderness, abdominal seatbelt sign, peritonitis

Disposition of patient from ED – OR, OR, ICU, floor, observation unit, home, morgue

Operating Room Information:

Date and Time of Surgery Start/End

Abdominal operation – diagnostic laparoscopy, exploratory laparotomy, or dx lap converted to open

Reason for operation

--peritonitis

--suspicion for BBMI on CT scan

--abdominal operation for other injury (not bowel or mesentery)

--repeat CT scan findings

--Other \_\_\_\_\_

Operative findings

--Ischemic bowel

Location – small bowel or colon

--full-thickness perforation

Location – small bowel or colon

--serosal tear > 50% circumference

Location – small bowel or colon

--serosal tear < 50% circumference

Location – small bowel or colon

--mesenteric injury – full thickness

--mesenteric injury – partial thickness

--actively bleeding mesenteric vessel

Operative procedure

--repair

--resection with anastomosis

--resection with anastomosis and protective stoma

--resection with stoma

--closure of mesenteric injury

--no intervention on bowel or mesentery

Was the fascia closed at the index operation – yes or no

If no, what additional procedures were performed?

Was the skin closed – yes or no

Injury Information (trauma registry)

All injuries

Outcome data (trauma registry)

ISS

Abdominal AIS

Head AIS

ICU LOS

Hospital LOS

Death

Complications

--fascial dehiscence or enteric fistula

--unplanned return to OR

--DVT or PE

--sepsis – bacteremia, pneumonia, UTI, surgical site infection

--acute renal failure, adult respiratory distress syndrome

Radiographic - retrospective

CT scan protocol – no contrast, IV only, IV + PO

CT scan date and time

CT grade 4 - YES or NO

## References

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