Case Presentation

Kings county Hospital Center
M & M Conference
June 2006
71M presented to KCHC, s/p MVA.

Patient was a restrained driver who denied any LOC.

At the time of initial evaluation, he complained of right chest and flank pain.

He stated that he had a head on collision with a parked vehicle as he lost control.

PMHx: significant for HTN, CAD NIDDM and CRI.

PSHx: Patient had right sided neck dissection for ? Skin cancer (Hx unclear)
Physical Examination

- **HEEN:**
  - b/l equal and reactive pupils,
  - small contusion on the forehead.
  - GCS 15.

- **Chest:**
  - decreased breath sounds on the right side.
  - tenderness on palpation on the right flank and right chest.

- **Abdomen:**
  - BS +,
  - seat belt sign noted on the anterior abdominal wall.
  - No guarding.

- **Extremities:**
  - b/l equal pulses,
  - no long bone deformities

- **Back:**
  - no evidence of spinal tenderness,
  - no contusions noted.

- **Rectal:**
  - no gross blood,
  - N tone.

**Vital on presentation**

- BP: 150/87 mmHg
- Pulse: 115 sinus
- GCS 15
Work up

- Labs:
  - ABG
  - CBC
  - CHEM
  - Amylase
  - U/A

- ECHO:
- CTA:
- EKG:
- Troponins:
CT scan of Chest:
- Right sided haemothorax
- Rib fractures
CT scan of Abdomen
Patient had placement of right sided Chest tube, about 200ml of gross blood noted at the time of insertion.

Patient was transferred to the SICU for further management.

During the SICU admission, patient developed type 2 respiratory failure.

HD# 3 patient started on BiPAP

He was started on regular diet on HD # 5
On HD # 6, patient developed hypotension, abdominal distention and vague abdominal pain.  
- Intubated for airway protection,
- Patient started on pressors, followed by fluid resuscitation
- DPL done at the bed side – equivocal

Patient was emergently taken for CT scan.
CT scan of Abdomen (HD#6)
Patient was emergently taken to OR

Operative findings:
- Perforation of the cecum with gross peritonitis
- Large hematoma (transmural) involving the cecum.
- The hematoma extending to the right mesocolon with compromised blood supply to the proximal half of the ascending colon.

Procedure: right hemicolecctomy with ilieostomy
POD# 1 Patient did poorly in the SICU, in spite of maximal pressor support.

He eventually succumbed to Sepsis, On code full ACLS protocol followed.

Patient was pronounced.

Patient’s family refused autopsy.
Delayed Colonic Perforation following blunt abdominal trauma

Emmanuel Amulraj, MD
SUNY Downstate Medical Center

April 2006
Or Is the real question:

Delay in diagnosis of intestinal perforation in blunt abdominal trauma?

OR

Delayed presentation of intestinal perforation in abdominal trauma?
Introduction

- Sammuel Annan – Reported the first case of intestinal rupture following in blunt abdominal trauma in 1837.

- Counseller and McCormack gave evidence to the “fixed point” theory in 1935

- Most publications dealing with blunt abdominal trauma are based on few cases collected over many years.

- Simple reasoning dictates that different mechanisms cause different injuries.
Colon injury occurs in 2% to 15% of patients having blunt abdominal trauma.

noted that a severe direct force is usually required to produce colon injuries.

Most of these injuries are due to
- motor vehicle collisions (74%), and
- the incorrect placement of safety belts has been implicated as an additional risk factor.

Regardless of restraint usage, associated injuries are common.

Possible mechanisms of hollow organ injury from blunt trauma include

- crush injury between the vertebrae and anterior abdominal wall
- tangential tears at relatively fixed points along the bowel
- and a sudden increase in intraluminal pressure.
Although not consistent among reported series, colonic injury from blunt trauma appears evenly distributed.

- Bugis et al, in their study of 16 patients with blunt colon injury, found primarily left-sided injuries

- yet, Howell et al reviewed 19 cases and found that the transverse colon was most frequently injured


Hemorrhagic contusion is the most frequent type of injury to the colon.

followed by serosal tears, which occur most commonly in the transverse colon.

Severe injuries occur more commonly in the sigmoid, right colon, and cecum, where frank rupture or devitalization from vascular compromise may result.

Because of the force required to injure the colon, other intra- and extra-abdominal injuries often coexist.

Injury to the transverse colon appears to have more associated injuries than other sites of colon injury.
In the series reported by Dauterive et al, the most frequently encountered intra-abdominal injuries involved:
- the liver 64%,
- spleen 52%
- small bowel mesentery 48%.
- Involvement of the transverse colon also increased the likelihood of pancreaticoduodenal injuries.

The most frequently associated extra-abdominal injuries were:
- skeletal 53%
- facial 33%
- neurologic 32%
- thoracic 10%

The importance of physical examination in the diagnosis of colonic perforation cannot be overstated.

In 1984, Maull and Reath described 20 patients with hollow visceral injury.

- All patients who were conscious at the time of admission complained of abdominal pain and/or had signs of peritoneal irritation.

- The pitfall, of course, is that many injured patients are unresponsive when first encountered, may be affected by alcohol or other drugs, or have sustained a closed head injury, compromising the reliability of their clinical assessment.

In such circumstances, further investigation is warranted.
The seat belt sign

Presence of which increases the likelihood of intraabdominal injuries, however the absence does not exclude it!
Diagnostic peritoneal lavage done soon after blunt abdominal trauma may also miss a perforated hollow viscus.

Presumably, this is related to an initial absence of an inflammatory response.

The presence of excessive leukocytes (>500/mm\(^3\)) in the effluent is highly suggestive of bowel injury.

The presence of vegetable matter is also suggestive.
In a report on the utility of DPL, Fang et al described the importance of the cell count ratio.

The cell count ratio was defined as the ratio between white blood cell count and red blood cell count in the lavage fluid, divided by the ratio of the same parameters in the peripheral blood.

A cell count ratio $\geq 1$ predicted hollow organ perforation with a specificity of 97% and a sensitivity of 100%.

Ultrasonography and laparoscopy are additional diagnostic techniques available to the clinician, but both lack the sensitivity to aid in early diagnosis.
CT Vs DPL

- CT and diagnostic peritoneal lavage (DPL) may be helpful in confirming blunt intestinal injury, but both have limitations.

- The role of CT in diagnosing hollow viscus injury after blunt abdominal trauma remains controversial, with previous studies reporting both high accuracy and poor results.

- Helical CT scanning is very accurate in detecting bowel and mesenteric injuries, as well as in determining the need for surgical exploration in bowel injuries.
This study was performed to determine the diagnostic accuracy of helical computed tomography in detecting bowel and mesenteric injuries after blunt abdominal trauma in a large cohort of patients (150).

Computed tomography had an overall sensitivity of 94% in detecting bowel injury and 96% in detecting mesenteric injury.
- Surgical bowel cases were correctly differentiated in 64 of 74 cases (86%), and surgical mesenteric cases were correctly differentiated from nonsurgical in 57 of 76 cases (75%).

However, it is less accurate in predicting the need for surgical exploration in mesenteric injuries alone.
CT findings of intestinal rupture include pneumoperitoneum (without an intrathoracic source or previous peritoneal lavage)
- gas in the mesentery, bowel wall, or retroperitoneum; and extraluminal extravasation of contrast material.

Other findings suggestive of bowel rupture include
- thickening of the bowel wall,
- anterior pararenal fluid, or
- free intraperitoneal fluid without a known source.
Lung windows to r/o free air

- Free air as seen on CT scan
CT Scan finding

- Jejunal thickening
  - Suggestive of duodenal / jejunal injury (arrows)

- Ascending colon laceration.
  - CT abdominal scan demonstrates thickening of the lower ascending colon (arrows).
Correlation of US with CT scan findings

$B = \text{bladder, } FL = \text{fluid.}$

Transverse US scan of the pelvis demonstrates a small amount of free fluid in the rectouterine pouch.

CT scan of the pelvis demonstrates fluid in the rectouterine pouch (arrow), with loops of bowel anteriorly.
FAST / Ultrasound
US Vs CT

- Rothlin et al. calculated the sensitivity of US to be 98% for identifying free fluid and 41% for identifying solid organ injury.
  
  Ultrasound in blunt abdominal and thoracic trauma. J Trauma 1993; 34:488-495

- Sherbourne et al. identified a group of patients with visceral injury;
  
  26% of these patients had no hemoperitoneum detected at screening US.

Sherbourne CD, Shanmuganathan K, Mirvis SE, et al.
Visceral injury without hemoperitoneum: a limitation of screening abdominal sonography for trauma.
Emerg Radiol 1997; 4:349-354

- The finding of more than trace amounts of free fluid in the absence of solid organ injury in BAT is often associated with clinically significant visceral injury.

- Early laparotomy is recommended for these patients. 28 of 1,367 patients met inclusion criteria (2%).
21 patients underwent exploratory laparotomy (75%).

which for 16 was therapeutic (76%): bowel injuries were found in 10 patients, mesentery injuries in 6, and injuries to solid organs in 3.

In 5 patients, laparotomy was nontherapeutic.

Those with more than a trace of free fluid were significantly more likely to have a therapeutic procedure.

7 patients were observed, of whom 2 failed nonoperative management and underwent therapeutic laparotomies within 24 hours of admission for missed colon, splenic, and hepatic injuries.

The presence of abdominal seat belt bruising or a Chance-type fracture in the study patients was associated with a 90% and 100% therapeutic laparotomy rate, respectively.
During the study period, 399 of 1,074 patients admitted for blunt torso injuries were enrolled in this study.

11 patients underwent emergency celiotomy and 11 underwent LP immediately after admission to the emergency department.

1 nontherapeutic laparotomy was performed among the patients who underwent celiotomy.

The LPs revealed 7 bowel perforations and 1 mesenteric laceration. After a repeat CT scan,

3 and 7 of the patients underwent laparotomy and LP, respectively.

4 bowel perforations were found by LP.

The remaining 198 patients were treated conservatively, and no complications related to a delayed BBI diagnosis occurred.
Background: Despite the predominance of superficial injuries after explosive blast exposure, major morbidity or mortality among immediate survivors is caused by delayed perforation of intestinal mural contusions.

Previous studies have suggested that small bowel and colonic contusions larger than 10 mm in diameter are at high risk.

This experimental study aimed to identify contusions at high risk of late perforation.

Methods: Histological features of injury were classified in 188 blast-induced intestinal contusions in 16 anaesthetized Large White pigs.
Results

- Some 16 per cent of small bowel and 12 per cent of colonic contusions were at high risk of late perforation.
- Small bowel contusions larger than 15 mm in diameter had a worse histological grading than those smaller than 15 mm.
- Contusions that extended over more than half the bowel circumference and those affecting the mesenteric border were more severe injuries.
- Colonic contusions larger than 20 mm in diameter had a worse histological grading than smaller ones.
- Confluent, rather than diffuse, colonic contusions were more severe injuries.
- Conclusion Once identified at laparotomy, the number of small bowel contusions requiring excision may be reduced from 86 to 60 per cent; similarly, excision of colonic contusions can be reduced from 73 to 27 per cent if small bowel contusions smaller than 15 mm in diameter and colonic contusions of less than 20 mm are managed conservatively.
The authors report 4 patients who suffered delayed intestinal perforation 6 or more days after sustaining nonpenetrating abdominal trauma in motor vehicle accidents while wearing passive seat-belt restraints.

All patients had low severity of injury (scores ranging from 4 to 13) but had persistent vague abdominal pain before perforation occurred.

3 of the 4 patients suffered spinal trauma as their major initial injury. Such patients appear to be at higher risk for delayed perforation and should be monitored carefully.
The authors describe three patients with similar clinical features and patterns of colonic injury following blunt abdominal trauma. Perforation was discovered 7 to 10 days after injury and was indicated by the clinical signs of systemic sepsis.

A prominent sign of occult sepsis was post-traumatic pulmonary insufficiency.

Blunt trauma to the colon was initially present but was not very impressive, consequently diagnosis was delayed.

The large number of concomitant injuries and the subsequent sepsis led to a higher morbidity and mortality than in cases of penetrating injuries to the colon.

The key to successful management of blunt colonic injuries is early diagnosis. Awareness of the type of injury and the magnitude of the deceleration force combined with the presence of persistent ileus may lead to earlier laparotomy.
Delayed perforation of the sigmoid colon following closed abdominal trauma. Apropos of a case report

[Article in French]


Services de Chirurgie digestive et thoracique, Centre Hospitalier Saint Philibert, Lomme, France.

A case of delayed perforation of sigmoid colon, three days after a blunt abdominal trauma in a male adult. It was caused by disinsertion of sigmoid colon mesentery for about ten centimeters.
Conclusion

- Delay between injury and operation, extensive contamination, associated intra-abdominal injuries, and the presence of hemodynamic instability favor placement of a protective colostomy.

- Mortality rates from blunt intestinal trauma range from 10% to 30%.

- The mortality is most closely related to the number and severity of other injuries, not to the specific intestinal injury or its surgical management.

- However, delay in diagnosis of a perforated colon increases the mortality rate by 25% to 33%.
Conclusion

- CT scanning and selective Laparoscopy can prevent nontherapeutic laparotomy and delayed diagnosis in patients with suspected BBI.

- A cell count ratio $\geq 1$ predicted hollow organ perforation with a specificity of 97% and a sensitivity of 100%.

- Ultrasonography and laparoscopy are additional diagnostic techniques available to the clinician, but both lack the sensitivity to aid in early diagnosis.
Questions
References


Bensard DD, Beaver BL, Besner GE, Cooney DR. Small bowel injury in children after blunt abdominal trauma: is diagnostic delay important?. J Trauma 1996; 41:476-483. [Medline]


