

Colonic Injuries in Blunt Abdominal Trauma

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Abstract

Aim: To retrospectively evaluate the preoperative diagnostic approaches and management of colonic injuries following blunt abdominal trauma.

Methods: A total of 14 patients with colonic injuries caused by blunt trauma between June 2003 and June 2006 were enrolled. Data were collected on clinical presentation, investigations, diagnostic methods, associated injuries, and operative management. Colonic injury-related mortality and abdominal complications were analyzed.

Results: Colonic injuries were caused mainly by motor vehicle accidents 9 patients (64.4%). Of the 14 patients, 11 (78.5%) had other associated injuries. Laparotomy was performed within 6 h after injury in 7 cases (50%). The most commonly injured site was located in the transverse colon. The mean colon injury scale score was 2.8. Six patients (43%) were treated with diversion of faecal stream by colostomy or exteriorization of injured segment. Eight cases were treated by primary suturing and early resection and anastomosis. The overall mortality rate was 7%.

Conclusion: Colonic injuries following blunt trauma are especially important because of the severity and complexity of associated injuries. A thorough physical examination and a combination of tests can be used to evaluate the indications for laparotomy. One stage management at the time of initial exploration is most often used for colonic injuries.

الخلاصة

دراسة منظورة لأربعة عشر حالة لإصابات القولون للتمزق نتيجة حدوث صدمه خارجية على البطن .

أكثر الإصابات %64,4

كانت إصابات حودث الطرق أجريت هذه الدراسة في مستشفى الديوانية التعليمي للفترة من حزيران 2003 لغاية حزيران 2006 .

كانت إصابات القولون مرتبطة مع أصابه أعضاء مختلفة في 11 حاله مرضيه (%87,5) . عولجت إصابات القولون بالخياطة الابتدائية في 8 حالات (%75) وعولجت 6 حالات (%43) بعملية تقويه أو استخراج القولون كانت النتائج جيده في حاله الخياطة الابتدائية وخاصة الحالات التي أجريت خلال 6 ساعات من تاريخ بدا الاصابه

Introduction

Hollow viscus injury after blunt abdominal trauma, though uncommon can have serious consequences if the diagnosis is missed or delayed. Although the colon is often injured in case of penetrating abdominal trauma, a significant proportion of colonic injuries caused by road traffic accident is a grossly destructive in type associated with damage to multiple organs. The diagnosis and

management of blunt colon injuries are still debatable, The aim of this study was to evaluate the preoperative diagnostic methods and management of colonic injuries following blunt abdominal trauma.

Colon injury occur in 2% to 15% of patients having blunt abdominal trauma. Carrillo et al noted that a sever 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 mechanism of hollow organ injury from blunt trauma include crush injury between the vertebrae and anterior abdominal wall. And sudden increase in intraluminal pressure.

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 most frequently involve liver, spleen, and small bowel mesentery. Involvement of the colon increase the likelihood of pancreatico – duodenal injuries. The most frequently associated extra-abdominal injuries were skeletal (53%) facial (33%), neurological(32%), and thoracic (10%)

Patients and Methods

Patients

14 patients with colonic injuries caused by blunt trauma presented to the emergency department of the Diwanyiah teaching hospital between June 2003 and June 2006 were enrolled. The criterion for inclusion in the study was full thickness perforation of colon injuries requiring surgical repair. Data were collected on clinical presentation, investigations, diagnostic methods,

associated injuries, operative management, morbidity and mortality.

Haemodynamic status was determined based on their heart rate and systolic blood pressure (BP) on admission. A systolic BP equal to or < 90 mmHg on admission was interpreted as haemodynamic instability or presence of shock. The time from injury to operation was recorded. The site of colon injury (right colon defined as the right of the middle colic vessels, left colon the left of the vessels) and major associated injuries of the head, thorax, pelvis, axial skeleton, major blood vessels and long bones were recorded.

The severity of colon injury was graded according to the colon injury scale (CIS) score. CIS score was defined as follows: grade 1: contusion and serosal tear without devascularization, grade 2: laceration of less than 50% of the wall, grade 3: laceration of 50% or greater of the wall, grade 4: 100% transection of the wall, and grade 5: complete transection with tissue loss and devascularization, an advanced grade for multiple injuries to the colon. The degree of faecal spillage (the gross extent of intra-abdominal faecal contamination) was categorized as mild: stool contamination on local or one quadrant, moderate: stool contamination on 2 to 3 quadrants, and severe: stool contamination on all four quadrants.

COLON INJURY SCALE

	Grade	Description
1	Hematoma Laceration	contusion or hematoma without devascularization partial thickness, no perforation
11	Laceration	laceration < 50% of circumference.
111	Laceration	laceration > 50% of circumference without transection
1V	Laceration	transection of colon
V	Laceration	transaction of colon with segmental tissue loss

Methods

All patients were resuscitated and received intravenous antibiotics in the emergency room. The discretion of operative options was based on Stone's exclusion factors for primary repair and surgeons' experience. The outcome variables of the study included colonic injury-related mortality and abdominal complications (anastomotic leak, intra-abdominal abscess or peritonitis, and colon obstruction or necrosis, if it was judged to be directly related to the colonic trauma).

Diagnostic peritoneal lavage

- when there is haemodynamic instability with Indicated unreliable clinical findings (eg due to head injury, intoxication or paraplegia) or if abdominal examination is equivocal (eg lower rib, lumbar spine or pelvic fractures causing abdominal tenderness and tensing) or if abdominal examination of a repeated nature is impractical because of anticipated lengthy x-ray studies or GA for extra-abdominal injuries

- detects free blood in abdominal cavity with 97% accuracy
- insert NG tube and urinary catheter prior to DPL
- open or closed methods both satisfactory although open preferred
- only absolute contraindication is an existing indication for laparotomy
- relatively contra-indicated in pregnancy, significant obesity and previous abdominal surgery. In these situations (or with pelvic fractures) supra-umbilical open method should be used
- early DPL is reliable in presence of pelvic fractures

Criteria for positive DPL:

Clinical criteria

- Initial aspiration of >10 ml frank blood
 - Egress of lavage fluid through chest drain or urinary catheter
 - Bile or vegetable material in lavage fluid
- Laboratory criteria (lab criteria, especially for penetrating injury remain debatable)

Test	Blunt trauma	Penetrating
RBC (definite injury)	>100 000/ml	>20 000/ml
RBC (indeterminate)	50-100 000	5-20 000
WCC	>500/ml	>500/ml
Amylase	>20 IU/L	>20 IU/L
Alkaline phosphatase	>10 IU/L	>10 IU/L

If laboratory analysis is not available a rough alternative for a positive DPL is inability to read newsprint through the tubing leading from the PD catheter because of the presence of blood.

- note that a negative laparotomy does not exclude retroperitoneal injury and that false negatives do occur. These are usually due to isolated injury to pancreas, duodenum,

diaphragm, small bowel or bladder

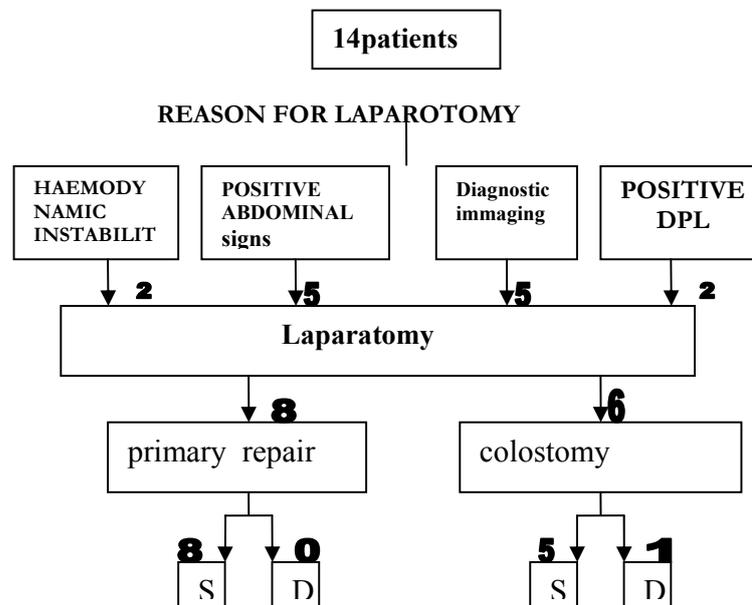
- if non-operative management for organ injury may be best, DPL may not be indicated and a CT scan may be preferable
- DPL will generally leave some fluid in the peritoneal cavity which will adversely affect the interpretation of any subsequent CT scans

Results

A total of 14 patients were included in this study. There were 10 males (71.4%) and 4 females (28.6%). Their age ranged 16-68 years with a mean of 37.6 years. Colonic injury was found in 9 patients (64.4%) due to motor vehicle accidents, in 3 (21.4%) due to building accidents, in 1 (7.2%) due to criminal assault, and in 1 (7.2%) due to burst injury.

Of the 82 patients, 11 (78.5%) had other associated injuries. Laparotomy was performed within 6 h after injury in 11 cases (78.5%). The most commonly injured site was located in the transverse colon. The

mean colon injury scale score was 2.8. The degree of faecal contamination was classified as mild in 3 (22.0%), moderate in 7 (50%), severe in 3 (22%), and unknown in 1 (6%) cases. Six patients (43%) were treated with diversion of faecal stream by colostomy or exteriorization of injured segment. Faecal .Eight cases (57%) were treated by primary suturing and early resection and anastomosis. The overall mortality rate was 7%. The incidence of colonic injury-related abdominal complications was 20.7%. The only independent predictor of complications was the degree of peritoneal faecal contamination ($P = 0.02$)



The most common complications were, intra-abdominal abscess (2 cases), wound infection (2 cases) and colostomy obstruction or necrosis (1 case). The only independent predictor of complications was the degree of peritoneal faecal contamination ($P = 0.02$). There was no significant correlation between age, mechanism of injury, shock on admission, location of colon injury, therapeutic options and outcome in terms of morbidity and mortality.

Discussion

Injuries of the hollow viscera are far less common in blunt abdominal trauma than in penetrating abdominal trauma. Blunt abdominal trauma accounts for approximately 5% to 15% of all operative abdominal injuries. The majority of colonic injuries caused by penetrating trauma are dominant. Nevertheless, about 6.5% of patients with blunt trauma at admission had injuries to the colon and rectum, which is slightly higher than the reported 5%[. Despite their infrequency, traumatic blunt injuries to

the colon are extremely destructive and generally associated with damage to multiple organ systems, making diagnosis and treatment difficult. It was reported that delayed management of colonic results in a high incidence of morbidity. Therefore, further researches on guidelines for the diagnosis and surgical management of colonic injuries following blunt trauma are especially important.

No clinical investigations are available to compare with gastrointestinal tract injuries. Moreover, clinical assessment can be unreliable in patients following blunt trauma due to distracting injuries, head and spinal cord injuries, and shock. Less than 50% of gastrointestinal tract injuries resulting from blunt trauma are reported to have sufficient clinical findings to indicate the need for laparotomy. In this study, 2 patients with unstable haemodynamics undergoing immediate laparotomy (< 2 h) showed marked evidence for abdominal injury.

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. Computed tomography and diagnostic peritoneal lavage (DPL) may be helpful in confirming blunt intestinal injury, but both have limitations. Computed tomographic 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. Notwithstanding the value of these findings when they are detected, CT is considerably less reliable in detecting hollow organ injury than solid organ injury.

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) in the effluent is highly suggestive of bowel injury. The presence of vegetable matter is also suggestive. In a recent 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 ≥ 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. Current therapeutic approaches to colon injury are primary repair, primary resection with anastomoses, and repair or resection with diverting colostomy. Exteriorized repair had a period of favor but is no longer in common use. Operative management of colon injury has shifted more toward primary repair. Carillo et al noted no difference in the incidence of abdominal complications after primary anastomoses with or without ostomy formation. Although much has been written on the subject, it is not yet known which risk factors predict suture line failure. However, 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

A large number of colorectal injuries can be managed without proximal diversion. Primary repair is safe in selected patients - those without high risk factors. A quick colostomy is life saving in unstable patient

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