

Colon and Rectal Injuries: Contemporary Management

Review Article

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Abstract

Colon and rectal injuries pose major challenges for the operating surgeon. Modern management takes into account the time elapsed from injury, the site and extent of the injury and the overall status of the patient. Colostomy in every case has evolved to become a more selective approach. Primary anastomosis is now considered feasible in most cases. The long-standing different approach to right and left colon injuries is debated. Intraperitoneal rectal injuries can be managed similar to left colon injuries by primary repair, whereas the mainstay of management of extraperitoneal injuries remains proximal colostomy. The extent of injury, associated abdominal injuries, presence of shock, number of blood transfusions and the time from injury to operation determine the decision-making process and the prognosis for these patients.

Key words

Colon injuries, Rectal injuries, Primary anastomosis, Faecal diversion

Introduction

During the first World War, the overall mortality rate from colonic injury was around 60% [1,2]. Colostomy was the treatment of choice during World War II with a reported decrease in mortality from 60% to 30%. Like colonic injuries, faecal diversion for penetrating rectal injuries was popularized during World War II. Mortality from rectal injuries decreased from 90% before World War I, when non-operative management was customary, to 67% during World War I when primary suture was employed, and to 30% during World War II when faecal diversion and presacral drainage was established [1,2]. Colon and rectal injuries occur in both penetrating and blunt abdominal trauma. Colon injury is rare in blunt abdominal trauma and accounts for

only 5% of all cases [3]. On the other hand, colon and rectal injuries following penetrating abdominal trauma are far more common and account for 17% of abdominal injuries [3]. Colon injuries are more common in urban centres and firearms are by far the most common cause of injury. In anterior stab wounds, the colon is the 3rd most commonly injured organ whereas in posterior stab wounds it is the most frequently injured organ. The left colon is more frequently injured in stab wounds, possibly owing to the predominance of right-handed assailants.

Rectal injuries are rare and usually the result of penetrating trauma. In most series, shotgun wounds account for 80% of rectal injuries and stab wounds 5% [1]. Rectal injuries are common among patients with associated pelvic injuries. The treatment of these injuries is controversial. The aim of this review is to present the current management of colon and rectal injuries.

Colon Injuries

Diagnosis

The diagnosis of colon injuries may be difficult - especially in the unconscious or obtunded patient. Missed injuries are common and maintaining a high degree of suspicion during evaluation is vital. Peritonitis results from colon and rectal injury but is not specific. Plain radiographs may show free air in the peritoneal cavity but this finding is relatively uncommon. DPL can be diagnostic in the presence of intraperitoneal colonic injury yielding lavage fluid with blood, bacteria or faecal material. There is Level I evidence that exploratory laparotomy is indicated in patients with a positive DPL. False negative DPL occurs when the injury is confined to the extraperitoneal colon (descending, ascending and rectum).

Computed Tomography is rapidly becoming the investigation of choice for evaluating blunt abdominal trauma in the haemodynamically normal patient [1]. The presence of blood during digital rectal examination suggests rectal injury.

In conclusion, colon injuries are difficult to diagnose and the key to identification is proper evaluation of the mechanism of injury, the free use of ab-

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dominal CT scanning and the clinical re-evaluation of the patient due to the commonly delayed presentation of these injuries.

Classification systems and risk factors

These injuries may vary from a contusion or haematoma in the bowel wall to destructive injuries such as transected colon with segmental tissue loss and faecal contamination of all abdominal compartments. Several grading systems for organ injuries have been developed that serve to provide objective criteria for the classification of the severity of the injury. Maxwell and Fabian suggest the separation of injuries into destructive and non-destructive. Non-destructive wounds included serosal, single wall or <25% wall injury in patients with minimal delay to operation, without associated injuries and in the absence of shock [4]. Destructive wounds included injuries with >25% of wall involvement or circumferential wall involvement with or without vascular injury in a patient with severe tissue loss or heavy contamination and in deep shock.

The type of injury (destructive or non-destructive) is not the only determining factor for the prognosis of these injuries. There is evidentiary support that mortality is significantly increased in the presence of sustained hypotension pre- and intraoperatively [3]. Delayed diagnosis and treatment not only influence the treatment plan but also increase postoperative morbidity. Faecal contamination is a risk factor that is difficult to quantify. Several studies noted an increase in the rate of abscesses and septic deaths in patients with major faecal contamination [1].

Retrospective series emphasized multiple organ injuries as a contraindication for primary repair of the colon injury [1,2]. More recent class I series, though conceding that mortality and septic morbidity is higher in patients with a greater number of associated organ injuries, do not consider them a contraindication for primary repair of non-destructive wounds [1,2].

The number of blood transfusions is an independent risk factor for postoperative morbidity [1,2]. Blood transfusions are usually indicators of concomitant injury of abdominal organs (liver or spleen) that influence the overall prognosis of the patient.

Operative management

The main question for the operating surgeon is how to surgically proceed with a colon injury. Stone and Fabian published the first prospective, randomized study of 139 patients showing that primary repair of selected colonic injuries was safe and preferable

to faecal diversion [5]. This was found to be true for patients without profound preoperative shock, displaying blood loss <20% of estimated blood volume, no more than two intra-abdominal organ systems injured, minimal faecal contamination, undergoing surgery within 8 hours of the injury and bearing wounds that were not so destructive as to require a resection. Other studies confirmed these findings [6]. Faecal diversion is recommended for destructive injuries when surgery is delayed for more than 6 hours and there is significant faecal peritonitis. For non-destructive wounds, colostomy is recommended for delay >12 hours or in the presence of severe concomitant faecal peritonitis or hypotension [7].

Studies have suggested that significant preexisting comorbidities along with the requirement for >6 units of intraoperative blood transfusions are risk factors for suture line leak and anastomotic dehiscence [8,9]. These authors recommend faecal diversion for this high-risk group.

Several studies compare primary repair to faecal diversion for colon injuries. These studies conclude that the incidence of intra-abdominal abscess was lower in the primary repair group whereas the complication rate was the same for both groups. Chapius et al [6], Sasaki et al [10], Gonzales et al [11], studying a total of 208 patients, found that the data favoured primary repair of non-destructive colon injuries.

Demetriades et al [12] evaluated 297 patients with destructive colon injuries, of which 197 had resection and primary anastomosis and 100 had faecal diversion. There were four deaths, all within the colostomy group. These authors suggested that destructive colon injuries should be managed by resection and primary anastomosis without colostomy, regardless of risk factors.

East Practice Summarize Workgroup reviewed the literature concerning the management of colon injuries following abdominal trauma [13]. Primary repair was performed in 42% of the patients included in their reports. Among those studies there were 1,272 reported cases of primary repair with 15 suture line failures (1.1%) and two deaths associated with these failures. The data support primary repair of non-destructive penetrating colonic wounds (Level I evidence). Studies of resection and primary anastomosis for destructive colon injuries showed anastomotic leak of 2.5% [14-17]. Mortality in this group was 0%. The study of 303 cases of resection and anastomosis for destructive colon wounds showed 16 failures (5.2%). These large studies suggest that resection and primary anastomosis, even

for destructive colon injuries, is safe in the absence of shock and associated injuries (Level II evidence). In the presence of these factors, colostomy is a safer option (Level II evidence)[13].

In conclusion, primary repair is considered a safe option for non-destructive injuries irrespective of risk factors. Conservative surgeons may choose colostomy for non-destructive injuries for patients in shock, if >12h have elapsed from time of injury, in the presence of severe faecal peritonitis or when multiple concomitant diseases are present. As concerns destructive injuries, primary repair is safe in cases of minimal associated injuries, no significant comorbidities and haemodynamic stability. In the presence of risk factors, a colostomy is preferred for destructive injuries.

Colonic injuries may be repaired by simple suture techniques when the damage is minimal. Resection and primary anastomosis is performed for lacerations involving significant circumference of the bowel wall. The method of anastomosis, hand-sewn or stapled, does not influence the incidence of abdominal complications or leak rate [1,2].

In cases where colostomy is being considered, bear in mind that the laceration itself can be used as a loop stoma if technically feasible. Alternatively, the injured colon is resected with the proximal end brought out as an end stoma and the distal end sutured to the abdominal wall as a mucous fistula [2]. This can be matured in the same aperture as the end stoma, offering the possibility of one circumstomal incision for colostomy closure. Alternatively, primary anastomosis can be combined with a proximal loop colostomy or ileostomy for anastomotic protection.

When comparing primary treatment to colostomy, we must take into account that colostomy closure is a second necessary operation that adds to the morbidity and mortality of these patients [9,18-22]. Uncomplicated primary repair of colonic injuries needs no re-operation, avoiding the associated morbidity which may significantly affect the quality of life and cost of treatment [23,24]. Loop stoma closure is usually done without the need of a formal laparotomy. Colostomy closure can be performed within two weeks of injury if contrast enema or sigmoidoscopic examination shows no sign of leakage. This treatment presumes that no major complications occurred after the initial operation, there was no persistent wound sepsis, and there was no significant perineal wound that required continued diversion. Late closures can be more complicated than early closures due to dense adhesions. In conclusion, the comparison between primary repair and colostomy formation must consider the complications and cost

of colostomy closure associated with the latter.

In the presence of the lethal triad of acidosis, hypothermia, and coagulopathy, damage control is the safest approach. Damage-control surgery comprises three separate stages. The first is an abbreviated laparotomy performed to rapidly control haemorrhage and contamination. Only necessary bowel resections are performed and the ends are left stapled. No attempt is made to mature a colostomy. Should coagulopathic bleeding persist, control can be gained by packing laparotomy pads directly over the bleeding areas. The next stage involves aggressive resuscitation in the intensive care unit. Finally, once normal physiology is restored (usually within 24 to 48 hours), the patient is taken back to the operating room for re-exploration, definitive repair, and attempted abdominal closure. Damage control surgery seems to provide better chances of survival to the severely injured patient with acidosis, hypothermia and coagulopathy.

Colon injuries after blunt abdominal trauma

Blunt colonic injuries are rare and often associated with other potentially life-threatening injuries to the liver, spleen, small bowel, head, chest, and extremities. This renders diagnosis and treatment more complex. Carrillo et al. [25] showed no difference in complications between patients who had resection and primary anastomosis and resection with stoma formation after colonic injury due to blunt abdominal trauma. In conclusion, due to the fact that blunt colon injuries are often associated with other organ injuries, colostomy may be more frequently indicated and is more easily practiced [26].

Rectal Injuries

Diagnosis

Rectal injuries may be missed if digital rectal examination is omitted from the physical examination of the trauma patient or the threshold for performing a CT scan is high. Associated pelvic injuries must increase the suspicion for associated rectal injuries. Injury of the extraperitoneal rectum is difficult to recognize because physical examination is negative. Again, the mechanism of injury can guide us to the clinical suspicion of a rectal injury. The grading system for rectal injuries is similar to that for colonic injuries, although it is very important to determine whether the injury is intra- or extraperitoneal.

Operative management

In general, intraperitoneal rectal injuries are treated like colonic injuries with primary repair for non-de-

structive and destructive injuries in the absence of shock, significant comorbidities and associated injuries. For destructive intraperitoneal rectal injuries in the presence of the risk factors mentioned above, faecal diversion represents a safe choice.

In a review of 30 patients with extraperitoneal rectal injuries (below the peritoneal reflection), Levine et al [27] suggest that primary repair without faecal diversion can be considered in patients without major associated injuries when treated within 8 hours of injury. They propose colostomy without repair if the injury cannot be adequately visualized. Other authors recommend repair of the extraperitoneal rectal injury only if it is easily visualized and accessible through a transanal or laparotomy approach without extensive dissection or when the repair of other genitourinary structures is required [28,29]. If the injury cannot be visualized or there is doubt as to its presence or extent, attempts at repair while risking the exposure of uncontaminated pararectal planes should be discouraged. In these cases, faecal diversion without repair seems to be the best

choice [14]. Faecal diversion and presacral drainage for extraperitoneal rectal injuries are considered to reduce septic complications [14,30]. Presacral drainage is performed by dividing the anococcygeal ligament and placing two suction drains. Those who advocate presacral drainage believe it prevents stool soilage and infection of pararectal and retroperitoneal tissues [31-33]. The study by Burch et al.[31] is the only study to show a statistically significant decrease in complications associated with presacral drainage. However, other studies question the dogma of this practice [34-36]. To conclude, the current practice is to perform presacral drainage for injuries that cannot be identified and repaired primarily. The patients whose injuries are identified and repaired probably do not benefit from presacral drainage [7].

Distal rectal washout can be performed via the efferent limb of a diverting stoma combined with washout per anum [37], reducing septic complications especially in patients with destructive rectal wounds [37]. However, many authors found no

Table 1 Management of Colon Injuries

Colon Injuries	Destructive	Non Destructive
Absence of sustained hypotension, minimal associated injuries (PATI<25), absence of peritonitis	Primary repair (Resection plus anastomosis Resection plus anastomosis plus proximal loop stoma)	Primary repair (simple suture, Resection plus anastomosis Resection plus anastomosis plus proximal loop stoma)
Sustained hypotension, associated injuries (PATI>25), peritonitis	Faecal diversion (Resection plus stoma and mucous fistula)	Primary repair (resection plus anastomosis, Resection plus anastomosis plus proximal loop stoma) Conservative approach: Resection plus stoma and mucous fistula

Table 2 Management of Rectal Injuries

Rectal injuries	Intraperitoneal	Extraperitoneal
Injury visualized	Treat as colon injuries	Primary repair (resection plus anastomosis Resection plus anastomosis plus proximal loop stoma)
Injury not visualized	-	Faecal diversion Presacral drainage Rectal washout

benefit [27,28,31,32,34,35]. Data are not yet conclusive. However, since distal rectal washout has no complications and it is easy to perform, we suggest it for extraperitoneal rectal injuries.

Blunt rectal injuries present high morbidity and mortality rates because they are associated with injuries to the pelvic vasculature, bladder, and urethra. Complex pelvic, perineal, and gluteal injuries often result in shock from massive haemorrhage which makes primary repair difficult. As in colon injuries, a colostomy is a safe option after destructive blunt rectal injuries.

Conclusions

The diagnosis of colorectal injuries is based on digital rectal examination, the liberal use of an abdominal CT scan and serial clinical re-examination. The current practice for non-destructive colon injuries is primary repair. For destructive injuries, primary anastomosis is considered safe in the absence of severe associated injuries or comorbidities. In the presence of these risk factors, resection and colostomy is indicated. Intraperitoneal rectal injuries are managed in much the same way as colon injuries.

Providing they are visualized and accessible through a transanal or laparotomy approach without extensive dissection, extraperitoneal rectal injuries can be repaired primarily. If the injury cannot be visualized or there is doubt as to its presence or extent, faecal diversion without repair emerges as the optimal choice. Presacral drainage and distal rectal washout are being used along with faecal diversion in selected patients with destructive rectal injuries. Tables 1 and 2 summarize the proposed management of colon and rectal injuries.

Conflict of interest

The authors declare that they have no conflict of interest.

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Κακώσεις Κόλου και Ορθού: Σύγχρονη Αντιμετώπιση

Άρθρο Ανασκόπησης

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Περίληψη

Η αντιμετώπιση των τραυματισμών του παχέος εντέρου και του ορθού θεωρείται πρόκληση για το χειρουργό τόσο προεγχειρητικά όσο και διεγχειρητικά. Η σύγχρονη προσέγγιση τέτοιων τραυματισμών λαμβάνει υπ'όψιν την ώρα που έχει μεσολαβήσει από τον τραυματισμό, την θέση και την έκταση της βλάβης καθώς και τη γενική κατάσταση του τραυματία. Στο παρελθόν η δημιουργία κολοστομίας θεωρούνταν η λύση εκλογής σε κάθε τραυματισμό του κόλου και ορθού. Η δημιουργία κολοστομίας σε κάθε περίπτωση έχει δώσει την θέση της σε μια πιο εκλεκτική προσέγγιση των ασθενών αυτών. Η πρωτογενής αναστόμωση θεωρείται πλέον εφικτή στην πλειοψηφία των περιπτώσεων. Η επί μακρόν ισχύουσα διαφορετική προσέγγιση των τραυματισμών δεξιού και αριστερού κόλου πλέον αμφισβητείται. Συστήματα που με αντικειμενικά κριτήρια επιχειρούν να προσδιορίσουν την έκταση της βλάβης ώστε να καθορίσουν τη θεραπευτική στρατηγική κατά την αντιμετώπιση των τραυματικών κακώσεων του παχέος εντέρου έχουν περιγραφεί. Εκτός από την έκταση της βλάβης, οι συνυπάρχουσες ενδοκοιλιακές κακώσεις, η παρουσία καταπληξίας, ο αριθμός των μεταγγίσεων και η ώρα που μεσολαβεί από τον τραυματισμό έως την αντιμετώπιση είναι οι παράγοντες που θα καθορίσουν τις θεραπευτικές επιλογές για την αντιμετώπιση τέτοιων ασθενών. Για μη καταστρεπτικές κακώσεις του κόλου η πρωτογενής αντιμετώπιση της βλάβης θεωρείται ότι δίνει τα καλύτερα αποτελέσματα. Σε περιπτώσεις καταστρεπτικών τραυματικών κακώσεων η πρωτογενής αντιμετώπιση φαίνεται να παρουσιάζει ικανοποιητικά αποτελέσματα όταν δε συνυπάρχουν άλλες σύγχρονες κακώσεις, σοβαρές συνοδές παθήσεις, ανάγκη για μεγάλο αριθμό μεταγγίσεων ή καταπληξία. Όταν υπάρχουν τέτοιοι ποαράγοντες η κολοστομία και η αποκατάσταση της συνέχειας του εντέρου σε δεύτερο χρόνο φαίνεται ότι είναι η πιο ασφαλής λύση. Τραυματικές βλάβες που αφορούν

το ενδοπεριτοναϊκό τμήμα του ορθού μπορούν να αντιμετωπιστούν όμοια με τις βλάβες στο αριστερό κόλον με πρωτογενή αναστόμωση, ενώ για τις βλάβες που αφορούν στο εξωπεριτοναϊκό τμήμα του ορθού η κολοστομία είναι ασφαλής.

Λέξεις κλειδιά

Τραυματικές κακώσεις κόλου, Τραυματικές κακώσεις ορθού, Πρωτογενής αναστόμωση, Τελική κολοστομία