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Farouck N. Obeid

Victor Sorensen

Gilford Vincent

Deepak Vij

H. Mathilda Horst

See next page for additional authors

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Management of Colonic Trauma: Six-Year Experience at Henry Ford Hospital

Authors

Farouck N. Obeid, Victor Sorensen, Gilford Vincent, Deepak Vij, H. Mathilda Horst, and D. Paul Horan

Management of Colonic Trauma: Six-Year Experience at Henry Ford Hospital

Farouck N. Obeid, MD,* Victor Sorensen, MD,* Gilford Vincent, MD,*
Deepak Vij, MD,* H. Mathilda Horst, MD,* and D. Paul Horan, MD*†

Surgical management of 114 patients with colonic injuries related to trauma who were treated over a six-year period is reviewed. Eighty-three (73%) injuries were secondary to gunshot wounds. Twenty-six patients (24%) had isolated colonic injuries. The majority of patients (60%) were treated with colostomies: exteriorization of the injury, repair with proximal colostomy, or resection with colostomy and mucous fistula. Exteriorization of repaired colon, primary repair, and resection with pri-

mary anastomosis were performed in 40% of the patients. Six patients (5.3%) in our series died, and 24% had complications directly related to the colon injury. Based on this study, no standard method for treatment of colonic trauma is advised. Colostomy is recommended for patients with massive multiple intra-abdominal injuries and gross fecal contamination. In selected patients, primary repair may be performed.

Most deaths that occur immediately after trauma are secondary to cardiorespiratory problems or hemorrhage, while delayed morbidity and mortality are usually secondary to sepsis. Sepsis develops from peritoneal soilage with the high bacterial count of 10^{11} organisms per gram of colonic contents. Many methods are proposed to treat penetrating and blunt colonic trauma.

We present our experience with colonic trauma from January 1975 to December 1980. Henry Ford Hospital is a major trauma center with approximately 70,000 patient visits in the Emergency Room annually. The Division of Trauma Surgery is consulted for 2-3% of these patients.

Materials and Methods

A retrospective review of patients from 1975 through 1980 identified 114 patients who were treated for colonic trauma at Henry Ford Hospital within the Division of Trauma Surgery. Of these patients, 102 (89%) were men and 13 (11%) were women. The patients ranged in age from 3 to 80 years, and most patients were between 21 and 40 years (Fig. 1). The mechanism of injury included: gunshot wounds in 83 patients (73%), stab wounds in 25 (22%), shotgun wounds in four, and blunt trauma in one patient.

All patients were resuscitated with crystalloids and, if necessary, transfused with cross-matched or type-specific blood. At the time of initial evaluation, 27 of 114 patients

(24%) had evidence of shock (blood pressure of less than 100 mm Hg systolic). Most patients received intravenous antibiotics before operation. Sixty-six percent of patients were operated on within three hours after they arrived in the Emergency Room, and the remaining 34% were operated on from three to six hours after arrival.

Laparotomy in this group of 114 patients identified isolated colonic trauma in only 26 patients (24%). In 17 patients the injury was secondary to gunshot wounds, and in nine patients secondary to stab wounds. Most patients had multiple intra-abdominal injuries. There were 147 associated intra-abdominal injuries in 88 patients (Table I). The most commonly injured segment of colon was the right colon in 47 patients (37%), followed closely by the rectosigmoid in 37 patients (26%). The transverse colon was the site of injury for 30 patients (21%), and the left colon for 27 patients (19%).

After intraperitoneal bleeding was controlled, the colonic injury was treated. During the review period, no single standard operation was performed to treat colonic

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*Department of Surgery, Division of Trauma Surgery, Henry Ford Hospital
Address reprint requests to Dr. Obeid, Department of Surgery, Henry Ford Hospital, 2799 W Grand Blvd, Detroit, MI 48202

†Dr. Horan died unexpectedly in 1982.

TABLE I

Associated Injuries in 88 Patients with Colonic Trauma

Small Bowel	61
Liver	14
Retroperitoneal Hematoma	14
Diaphragm	13
Genitourinary Tract	13
Stomach	12
Spleen	10
Gallbladder	4
Pancreas	3
Major Abdominal Wall Defect	3
Total Injuries*	147

*Some patients had more than one site of injury.

trauma. The surgeon chose the technique of treatment according to the severity and anatomic location of the injury (Table II).

Results

In 114 patients with colonic trauma, 27 patients had complications related directly to the colon injury. One third of these complications occurred in those who underwent resection with colostomy and mucous fistula. Wound infection or dehiscence, anastomotic leak, or intraperitoneal abscesses occurred in eight of 25 patients (32%) in this group. These 25 patients also had the highest mortality rate: five patients died (20%). In 46 patients who underwent exteriorization of the colonic injury or repair with proximal colostomy (Table II), six patients (13%) had similar complications, but none of the 46 patients died.

Primary repair of colonic injury with exteriorization was performed in 26 patients. A suture line leak developed in nine (35%), and one patient died. The complications in this group accounted for one third of the total complications.

Primary repair of the colon without proximal colostomy was performed on 12 patients, and two patients developed complications. One patient developed a retroperitoneal abscess at the site of repair, and the other patient developed a wound infection and subsequent dehiscence.

Resection and primary anastomosis was performed without complications or mortality in four patients, all of whom had right-sided colonic injuries.

In our series of 114 patients, six patients died, for a 5.3% mortality rate. Causes of death included hemorrhagic shock, complications of sepsis, and renal failure. Deaths from isolated colon injury occurred in 3.7% of patients,

while the mortality rate rose to 29% when four or more organs were involved.

Discussion

During the First World War, the colonic injuries of those wounded in battle were routinely treated by primary repair, and the mortality rate was prohibitively high at 58%. During the Second World War, the policy of the U.S. Army mandated colostomy or exteriorization of the colonic injury for those injured in battle, and the mortality rate dropped to 37% (1). The rate was further reduced during the Korean and Vietnam conflicts to 13% and 11%, respectively, by the use of aggressive preoperative volume replacement, antibiotics, and rapid evacuation of the wounded from the battlefield so that they could be treated quickly.

Since the late 1950s, two distinct schools of thought about management of colonic trauma have evolved. The first approach employs mandatory exteriorization of colonic injury or colostomy with mucous fistula rather than primary repair (2). According to proponents of this view, the magnitude of fecal contamination is difficult to determine because mixing of blood and liquid feces cannot be separated volumetrically (2). Abcarian, et al also suggest that the exact time of injury cannot be accurately determined because of the patient's sensorial impairment and because most patients are not operated on within six hours of injury (2). These authors feel that their low rate of morbidity and mortality of 3.2% argues effectively for their policy, which involves either exteriorization of injury or resection with colostomy and mucous fistula (2).

Advocates of the second approach believe there is a role for primary repair of some colonic injuries. Because civilian gunshot wounds are usually due to low velocity missiles which do not cause extensive tissue destruction, these colonic injuries can be safely repaired primarily (3,4). If gross fecal contamination, extensive devascularization, or extensive destruction of the colon is present, resection with colostomy and mucous fistula is required (3). Recent prospective studies by Stone and Flint delineate the exact circumstances under which primary repair of colonic injuries is performed (5,6): blood loss of less than 20% of estimated normal volumes, minimal fecal contamination, two or fewer associated injuries, absence of shock (blood pressure below 80/50), no significant delay between injury and operation, or colonic injury not significant enough to require resection (5,6). If patients do not meet these criteria, exteriorization of injury or colostomy and mucous fistula are performed. Patients who had primary repair for their colon injury

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had the lowest complication rate, mortality rate, and the shortest hospital stay (3,5,6).

Exteriorization of a repaired colon or resection with primary anastomosis are other approaches to colonic trauma. These techniques have the advantages of avoiding a colostomy and the associated significant morbidity of colostomy closure (7,10). The utilization of these two operations depends on criteria similar to those required for primary repair of colonic injuries. Primary repair with exteriorization is a safe alternative, as any leak following repair can easily be transformed into a colostomy. Kirkpatrick feels that primary repair with exteriorization is a safe adjunct for treating colonic injuries above 18 cms (from the anal verge). In his series, the need for colostomy was reduced 50% by this alternative (7).

Resection with primary anastomosis, which is used most commonly for right colon injuries, causes a significant complication rate (8-10), many of which are due to anastomotic leaks into the abdominal cavity. For this reason most authors feel that resection and primary anastomosis should be used only for those patients who have simple stab wounds or low velocity gunshot wounds of the right colon with minimal spillage and no significant associated injuries (10). In general, surgeons have been reluctant to perform resection and primary anastomosis for injuries to the left colon, which are usually managed by colostomy and mucous fistula or exteriorization (12). Hawley and Hunt's study (13) showed increased collagenase activity in the left colon and rectum reinforcing the opinion that left-sided colonic injuries should be exteriorized or resected with colostomy and mucous fistula. However, some authors take exception to this practice and have repaired injuries to the left colon by primary means in recent years (14,15).

When proximal colostomy is indicated, a completely divided colostomy with either a mucous fistula or a Hartman's procedure should be done as close to the site of injury as possible. A loop colostomy does not divert the fecal stream from the area of injury (11). Without complete fecal diversion, a higher complication rate related to the repair can be expected.

In our series, more than 60% of the operative procedures involved some form of colostomy: exteriorization of injury and proximal colostomy with repair or resection of injury with colostomy and mucous fistula. These techniques were chosen because most of the patients (76%) had associated intra-abdominal injuries, and many

TABLE II
Operative Techniques for Treatment of Colonic Trauma

	Number	Percent	Mortality %
Exteriorization or Repair with Proximal Colostomy*	46	40	0
Primary Repair with Exteriorization	26	23	4
Resection with Colostomy and Mucous Fistula	25	22	20
Primary Repair	12	10	0
Resection with Primary Anastomosis	4	40	0
No Surgery**	1	1.0	0

*The medical records did not distinguish between these two methods.

**Rectal injury below the peritoneal reflection (GSW)

patients had several sites of colonic injury as well. In addition, 45% of the injuries were in the left colon or rectosigmoid. Although the highest morbidity and mortality rates were found in this group of patients, the added, potentially disastrous consequences of intra-abdominal leaks were avoided. Different types of primary repair were performed on the remaining 40% of patients. These procedures had the advantage of not requiring a second hospitalization for colostomy closure. Few colonic injuries met the literature criteria for primary anastomosis: only four of 47 patients with right colon injuries underwent resection and primary anastomosis. Complications occurred with primary repair, particularly leak of the repair. Exteriorization of the repair allows suture line leaks to be identified and conversion to a colostomy to be performed. This occurred in nine of 26 patients in our series.

Based on our retrospective review, we cannot recommend one standard method of treatment for colonic injury. However, based on our experience and a review of the literature, we can recommend colostomy and mucous fistula or exteriorization of the injury in patients who have suffered extensive colonic trauma, multiple intra-abdominal injuries, massive fecal contamination, and shock. In these patients, the potential hazard of intra-abdominal suture line leaks must be avoided. In the absence of peritoneal contamination, we recommend primary repair for simple lacerations and exteriorization of colonic repair in properly selected patients.

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