

Management of Large Bowel Injuries in Civilian Practice *

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THE ROUTINE use of exteriorization or proximal colostomy in the management of wounds of the colon in World War II resulted in such a striking reduction in mortality that this form of therapy was subsequently applied to the treatment of perforating injuries of the colon in civilian practice (Table I).^{1-6, 8-11, 13, 14} Within the past decade, however, it has become apparent that these procedures may not be necessary in the majority of civilian injuries of the colon, and in fact may be associated with prolonged convalescence and additional complications.

This report is concerned with an analysis of 122 consecutive cases of perforating injuries of the large bowel seen between January 1949 and April 1956. The majority of these cases were treated with primary repair.

INCIDENCE

A boy of nine and a man of 84 marked the extremes of age in this series of cases. As anticipated, the majority (77%) of these wounds of violence occurred in the period of greatest vigor, namely the third, fourth, and fifth decades. Male patients outnumbered female 102 to 20, while 81 patients were Negro and 41 were white. In 68 (56%) the injuries were due to bullets, in 36 (29%) to knife wounds, and in 11 (9%)

to shotgun blasts. Among the remaining seven cases, two each were injured by ingested foreign bodies, impalement and blunt abdominal trauma respectively. A single patient had a sigmoidal perforation due to self-instrumentation (Table II).

INTERVAL BETWEEN INJURY AND DEFINITIVE THERAPY

The time elapsing between injury and the institution of conclusive treatment has been shown to profoundly affect the results of therapy for perforating injuries of the colon. Thus, Woodhall and Ochsner¹⁷ noted a mortality rate of 15 per cent when this interval was less than six hours compared with 31 per cent for cases with a greater time lag. Similar results were reported by Tucker and Fey.¹⁵ In the 122 cases comprising this series 118 (97%) were operated upon within six hours following injury. In fact the major portion of the time lag in these cases occurred in the hospital and was devoted to resuscitative measures.

PREOPERATIVE MANAGEMENT

Upon reaching the hospital, patients were promptly started on definitive therapy. In general, those with knife wounds were not in shock or required only intravenous administration of crystalloids to restore a normal blood pressure. On the other hand patients with gunshot wounds almost invariably required blood transfusion to combat shock. This was particularly true when there were concomitant injuries. In this series 23 patients required more than 1500

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TABLE I. *Mortality of Perforating Injuries of Large Bowel*

MILITARY			
Author	Number of Patients	Mortality, Per Cent	Year
Ogilvie	192	53	1944
Gordon-Taylor	231	53	1944
Hurt	39	33	1945
Imes	119	26	1945
Jarvis, <i>et al.</i>	57	44	1946
Jones, <i>et al.</i>	217	22	1946
Taylor and Thompson	70	27	1948
Beebe and DeBakey	1261	36	1952
Sako <i>et al.</i> (Korean Conflict)	162	15	1955
CIVILIAN			
Rippey	32	62	1941
Elkin and Ward	69	53	1943
Wilkinson, Hill and Wright	37	79	1946
Woodhall and Ochsner	55	20	1951
Tucker and Fey	42	14	1954
Pontius <i>et al.</i>	122	16	1957

ml. of blood preoperatively for resuscitation.

The routine of placing a plastic tube in the saphenous vein at the ankle for infusions was modified only when inferior vena caval injury was suspected. In such cases cut-downs were done on the arm veins. A large nasogastric tube was introduced and the stomach completely emptied prior to induction of anesthesia. A Foley catheter was passed into the bladder as an aid in the diagnosis of urinary tract injury and for accurate measurement of postoperative urinary output. Anterior-posterior roentgenograms of the abdomen were made to determine the location of retained missiles. In cases of suspected rectal injury proctoscopy was done.

OPERATIVE MANAGEMENT

Endotracheal anesthesia was used almost exclusively. In the treatment of knife wounds the surgical incision was frequently made through the site of injury. In gunshot and shotgun injuries, however, a long vertical, usually midline, incision was em-

ployed because of the speed and excellence of exposure.

When injuries to large vessels were present the resulting hemorrhage was immediately controlled. Once hemostasis was complete, obvious intestinal injuries were repaired and then a systematic examination of the abdominal contents was undertaken. When necessary the retro-peritoneal portions of the duodenum and colon were mobilized for inspection. To facilitate detection of wounds of the duodenum, the stomach and upper intestinal tract were inflated with air via the nasogastric tube.

Wounds of the colon were closed primarily except for the following circumstances: 1) extensive fecal contamination, 2) complete destruction of a segment of bowel and 3) injuries to the rectum. These conditions usually required exteriorization, proximal colostomy, or both.

Wound drainage was instituted frequently and drainage of the area of colonic closure occasionally employed. Retention sutures were used in severely wounded cases, and debridement of the traumatic wound was seldom done.

Among the 122 cases there were 166 perforating injuries of the large bowel. These were distributed as follows: right colon, 43 (26%), transverse colon, 63 (38%), left colon 49 (30%), and rectum 11 (6%). Injuries of the right, transverse and left segments of the colon were involved about equally in missile injuries, whereas the transverse colon was the most frequent site of knife wounds. As might be expected, gunshot (pistol) and shotgun wounds fre-

TABLE II. *Mechanism of Injury in 122 Cases*

Bullet	68
Knife	36
Shotgun	11
Ingested foreign body	2
Impalement	2
Blunt trauma	2
Instrumentation	1
Total	122

TABLE III. *Associated Injuries in 122 Cases*

	No.	Per Cent
Small bowel	51	42
Liver	27	22
Stomach	21	17
Kidney	13	11
Extremity	13	11
Chest	12	10
Spleen	11	9
Gall bladder	10	8
Duodenum	8	7
Inferior vena cava	5	4
Pancreas	4	3
Urinary bladder	2	2
Aorta	2	2
Ureter	1	1
Iliac artery and vein	1	1

quently resulted in multiple colonic injuries while stab wounds were usually a single perforation. Thus in 79 cases of firearm injury there were 119 large bowel injuries, and in only four of 36 stab wound cases were there multiple colonic injuries.

ASSOCIATED INJURIES

Among 122 cases of large bowel injury 86 (70%) had additional injury of other structures (Table III). Most commonly involved were the small intestine, liver and stomach. There were seven associated major vascular injuries, five of the inferior vena cava and two of the aorta. In some instances, because of their serious nature, the associated injury demanded immediate attention relegating the colonic wound to a place of secondary import.

RESULTS

There were 119 cases available for analysis as three patients died at operation from associated injuries of major vascular structures. The operative treatment may be divided into two categories on the basis of therapy employed: primary repair and those in which some type of two-staged procedure was used.

Primary Repair. There were 83 patients treated by primary repair of the large bowel

injury. In 77 suture of the perforation was performed, and in six cases the injured segment was resected and a primary end-to-end anastomosis performed. Twenty nine of these 83 cases (35%) had no other visceral involvement.

Firearms were the cause of injury in 45 of the 83 cases. Six of these 45 patients died and in a single case early in the series fecal fistula was associated with demise. The average hospital stay for these 45 patients was 17 days.

Knife wounds were the cause of injury in 32 of the 83 cases treated by primary repair. There were no deaths, or fecal fistulae in this subdivision and the average hospital stay was nine days.

In the remaining six cases treated by primary repair, injury was due to ingested foreign body in two, impalement with tear of the extra-peritoneal rectum in two, while there were single cases of instrumentation and blunt abdominal trauma. There was a single death, no fistulae and the average hospital stay was ten days.

Thus of 83 patients with colonic injury treated by primary repair 76 survived. Two of the seven deaths were directly related to the large bowel injury. Four instances of non-fatal fecal fistulae occurred in the cases due to firearm injury. The average period

TABLE IV. *Operative Management and Mortality in 119 Cases*

PRIMARY REPAIR			
	Deaths	No.	Mortality
Suture	5	77	
Resection and anastomosis	2	6	
Total	7	83	8%
TWO-STAGED PROCEDURE			
Exteriorization	7	20	
Proximal colostomy	2	13	
Cecostomy	0	3	
Total	9	36	25%

TABLE V. *Postoperative Complications*

Wound infection	10
Wound dehiscence	6
Fecal fistula	5
Acute renal failure	5
Intestinal obstruction	5
Intra-abdominal abscess	3
Jaundice	2
Duodenal fistula	2
Urinary fistula	2
Biliary fistula	1
Pneumonia and atelectasis	1
Pulmonary embolism	1
Osteomyelitis of sacrum	1

of hospitalization for the entire group treated by primary repair was 13 days.

Two-staged Procedure. There were 36 cases in which exteriorization or some type of decompression was employed. In 20 cases exteriorization was used. Closure of the perforation with proximal colostomy was done in 13 and proximal cecostomy was used three times. Eight of these 36 cases had injuries of the rectum, whereas seven had isolated injuries to the large bowel. There were no fecal fistulae and the average hospital stay was 36 days.

Firearms caused the injury in 31 of these 36 cases. There were nine deaths, seven of which were due primarily to extensive trauma and peritonitis. Four cases of knife wound were treated in this group, two by suture and proximal cecostomy, and two by exteriorization. An isolated case of blunt abdominal trauma which was originally only placed under observation returned six months later with a large subphrenic abscess and responded satisfactorily to a two-staged colonic repair. All the colostomies have been closed and the average period of hospitalization for completion of the two-staged procedure was 37 days.

COMPLICATIONS

Eighty-six of the 103 surviving patients had an uncomplicated postoperative course. Wound infection and dehiscence were the most frequent complication and were re-

lated to contamination of the operative field. Intra-abdominal abscess requiring drainage occurred only three times. Other complications were not directly related to surgery of the large bowel. Penicillin and streptomycin were used routinely in every case and appropriate broad spectrum antibiotics were added as the need became evident. However in this series no significant correlation between specific antibiotics and mortality, complications or duration of hospital stay could be made.

COMMENT

The mortality rate for the total series is 15.6 per cent. Three of the 19 deaths occurred in the operating room. Age is a factor in prognosis as six of 11 patients over the age of 50 years expired, a mortality of 55 per cent. Thus in patients below the age of 50 who leave the operating room the mortality was 9.3 per cent (10 deaths in 108 cases). While the comparison of length of hospital stay of patients treated by primary repair would appear to favor that method over a two-staged procedure such a conclusion may not be valid as more of the cases of complex injuries are included in the latter group. However, the analysis does imply that in the majority of cases seen, primary repair was a more desirable procedure. In the last 60 cases a two-staged procedure was done in only five instances as compared to 31 of the preceding 59 cases.

TABLE VI. *Cause of Death*

Hemorrhage at operation	3
Shock within 48 hours postoperative	4
Peritonitis	5
Renal failure	2
Fecal and urinary fistulae	1
Duodenal fistula	1
Pneumonia	1
Pulmonary embolism	1
No evident cause	1

SUMMARY

While the use of exteriorization and proximal colostomy may be necessary in the management of war wounds of the large bowel, it appears that the majority of colonic injuries encountered in civilian practice may be treated by primary repair.

The experience with 122 consecutive cases at the Jefferson Davis Hospital has been analyzed. Of 119 patients surviving operation 83 were treated by primary repair and 36 by a two-staged procedure. The average hospital stay in the former group was 13 days as compared to 37 days in the latter. The mortality in the entire series was 15.6 per cent.

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