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A STUDY OF THE PATTERN, MANAGEMENT AND OUTCOME OF PENETRATING COLON INJURIES IN SAGAMU

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ABSTRACT

Background: Colon injuries are increasingly being treated safely by primary repair in spite of the high risk of septic complications.

Objective: This is a retrospective study of the pattern, management and outcome in patients treated for penetrating colon injuries at Olabisi Onabanjo University Teaching Hospital, Sagamu over a 7 year period (January 1995- December 2001).

Patients and methods: Records of thirty-two patients were studied.

Results: Gunshots (75 percent) and knife stabs (18.75 percent) accounted for ninety-four percent of penetrating colon injuries. Associated intra-abdominal injuries were present in 22 patients (68.8 percent). Eight (twenty-five percent) patients presented in shock. Moderate to major faecal contamination was present in 30 (93.8%) patients.Severe colon injury occurred in nine patients. The eighteen patients with right colon wounds were managed by primary repair. All the fourteen patients with left colon wounds had a diverting colostomy alongside repair or resection. Complications included wound infection (56.7 percent) and septicaemia (31.7 percent). Eleven patients died, giving an overall mortality rate of 34.4 percent. Mortality was significantly associated with shock on admission ($p<0.02$), degree of faecal contamination ($p<0.05$) and severity of colon injury ($p<0.01$). Colostomy did not affect mortality. ($P<0.1$)

Conclusion: In this study primary repair was employed in 56% of patients with penetrating colon injuries. The routine use of diverting colostomy for all left colon injuries can no longer be justified in current surgical practice as colostomy did not affect mortality.

Key Words: colon injury; penetrating; colostomy; primary repair; mortality *(Accepted 16 May 2008)*

INTRODUCTION

The management of colon trauma seems to have swung from the "diversion dogma" to a more liberal use of primary repair. There is strong evidence from prospective randomised trials that the vast majority of colonic injuries can be safely managed by primary repair [1, 2,3,4,5]. It also seems, however, that there is a limited role for colostomy, particularly in high-risk patients with destructive injuries of the left colon. Most authors advocate diverting colostomy in patients with destructive colon injuries, especially those patients in shock, with associated multiple organ injuries, peritonitis and concomitant medical illness [6, 7, 8.] In West Africa, surgeons face peculiar challenges of inadequate facilities, late presentation, delay to surgery and faecal loading of the colon.[9] Inefficient ambulance services, inadequate supply of blood for transfusions, delayed presentation cause prolonged injury to surgery interval thus contributing to a relatively high incidence of infectious complications and mortality.[10] There are no official locally generated practice management guidelines for penetrating colon injuries. Published reports on civilian penetrating injuries of the colon in our region are few .[9, 11, 12, 13,14,15,16.] Liberal use of primary repair of colon injuries advocated elsewhere[4] is yet to be popularly accepted, probably because of the uniformly prolonged time from injury to surgery. This is a retrospective study of the pattern, management and outcome in patients treated for penetrating colon injuries at Olabisi Onabanjo University Teaching Hospital, Sagamu, over a 7 year period (January 1995-December 2001).

MATERIALS AND METHOD

The records of the patients with abdominal injuries were retrieved and those with penetrating colon injuries were carefully selected for the study. Patients with rectal injuries were excluded. Relevant data was extracted from the case notes, ward and theatre registers. These were, age, sex, occupation, address, cause of injury, vital signs on admission, extra-

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abdominal injuries, admission time, time of injury, investigations, operative findings, procedure carried out, number of intra-abdominal organs injured, duration of operation, site of colon injury, postoperative complications, number of units of blood transfused and outcome. Faecal contamination and extent of colon injuries were graded on the basis of the description in the operation notes. Faecal contamination was classified as minimal if there was spillage confined to the immediate area around the injury, moderate when spillage was confined to one quadrant of the abdomen, and major if faecal contamination was found in more than one quadrant.[13] The colon injury was graded by means of the intraoperative classification system devised by Flint et al [2]; Grade 1: isolated colon injury, minimal contamination, no shock, minimal delay; Grade 2: through-and-through perforation, lacerations, moderate, contamination; Grade 3: severe tissue loss, devascularization, heavy contamination. The right colon was defined as being to the right of the junction between the proximal two-thirds and distal one-third of the transverse colon, and left colon was defined as being to the left of this junction. Primary repair included direct suture of the perforation or bowel resection and primary anastomosis. Only mortality and complications that occurred within 30 days of laparotomy were considered. Outcome variables of the study were overall mortality, and complications.

Statistical Analysis

Data were entered and analyzed on a personal computer using Epi-info version 6.02 (Centres for Disease Control, Atlanta, GA). Univariate analysis was performed with the chi-squared and Yates correction as appropriate. Relationship and differences were considered statistically significant when the associated *p* values were =0.05.

RESULTS

Complete records of 32 patients were available for the study. Twenty-eight (87.5 percent) were males and four (12.5 percent) were females. The average age was 38 years with a range of 18 to 69years; 14 (45 percent) patients were between the ages of 20 and 40 years. Colon injuries were caused by gunshots in 24 (75 percent) patients, knife stabs in six (18.75 percent) patients, penetrating injuries following road traffic accident in one (3.4 percent) patient, and iatrogenic injury in one (3.4percent) patient. The iatrogenic injury occurred in a woman with retained placenta after a vaginal delivery of a full term baby. The sigmoid colon was pulled into the uterus and damaged during the process of removing the placenta. Eight patients (25%) had hemorrhagic shock (systolic BP < 90 mmHg) on hospital admission. Average admission to surgery interval was 14 hours. Admission to surgery interval was in excess of 12 hours in 17 (53.1%) cases. Major and moderate faecal contamination was present in 23 (71.9%) and 7 (22%) patients respectively. Site of colon injured is shown in Table 1. Eighteen (56.2%) patients had right colon injuries. Associated intra-abdominal injuries were present in the small bowel in 21 patients, liver in seven patients and stomach in eight patients. Table 2 Colon wound grading, according to the intraoperative classification system devised by Flint et al [2], was: Grade 1, three patients, Grade 2, twenty patients. Grade 3 (severe colon injury) occurred in nine patients, seven of whom died. Extra-abdominal injuries included haemothorax (2 patients), and superficial soft tissue wounds (9patients). Seven patients with right colon wounds had suture repair, while the remaining eleven patients had bowel resection with primary anastomosis.Table 3. Four out of these patients died. Management of left colon wounds (14 patients) included a diverting colostomy in all 14 patients. It was by suture repair in three patients, one of who died, and resection and primary anastomosis in ten patients. Six out of the ten patients who had resection and anastomosis died. One patient had the injured segment brought out as colostomy. Table 4 Complications included wound infection (56.7 percent), septicaemia (31.7 percent), enterocutaneous fistula (16.7 percent) and intra-abdominal abscess (12.5%). Eleven patients died overall, giving a mortality rate of 34.4 percent. Ten patients with gunshots and the patient who had road traffic accident died. Deaths were due to sepsis and multiple organ injuries. Mortality was significantly associated with shock on admission ($p<0.02$), degree of faecal contamination ($p<0.05$) and severity of colon injury ($p<0.01$). Colostomy did not affect mortality. ($p<0.1$) Table 5.

Table1: **Region of Colon Injured (n = 32).**

Site of Injury	N	(%)
Caecum and Ascending colon	9	(28.1)
Transverse colon	11	(34.4)
Splenic flexure	3	(9.4)
Descending colon	5	(15.6)
Sigmoid colon	7	(21.9)

Three patients sustained injuries at two sites.

Table 2:**Associated Intra-Abdominal Injuries (N = 32)**

Organs	N	(%)
Small bowel	21	(65.6)
Liver	7	(21.9)
Stomach	8	(25.0)
Mesentery	5	(15.6)
Gallbladder	3	(9.4)
Spleen	2	(6.25)
Kidneys	1	(3.1)
Urinary bladder	2	(6.25)

Table 3: **Operative Treatment of Left Colon Injuries (N = 14).**

Operative Procedure	No of cases	Mortality (Rate %)
Diverting colostomy + Suture repair	3	1 (33)
Resection +anastomosis	10	6 (60)
Colostomy at site	1	0 (0)
Total	**14**	**7 (50)**

Table 4: **Operative Treatment of Right Colon Injuries (N = 18).**

Operative Procedure	No of cases	Mortality (Rate %)
Suture repair	7	1 (14.3)
Resection +anastomosis	11	3 (27.2)
Total	**18**	**4 (22.2)**

Table 5: **Univariate analysis for mortality rate.**

Risk factor	Class	Mortality rate (%)		chi-squared Yates	P Value
Shock	**present**	**6/8**	**(75)**		
	Absent	5/24	(20.8)	5.58	<0.02
Peritoneal	moderate	5/23	(21.7)		
Contamination	major	6/9	(66)	3.97	<0.05
Flint score	**< 2**	**4/23**	**(17.4)**		
(Injury severity)	>2	7/9	(77.8)	7.95	<0.01
Treatment	**repair**	**2/10**	**(20)**		
	Resection + anastomosis	9/22	(40.9)	0.46	<0.5
Cause of injury	**gunshot**	**10/24**	**(41.7)**		
	Others	1/8	(12.5)	1.15	<0.5
Duration of surgery	**<4hours**	**3/14**	**(21.4)**		
	> 4 hours	8/18	(44.4)	0.97	<0.5
No. of organs injured	**<2**	**4/15**	**(26.7)**		
Injured	>2	7/17	(41.2)	0.3	> 0.5
Admission-surgery	**<12 hours**	**4/15**	**(26.7)**		
interval	> 12 hours	7/17	(41.2)	0.3	< 0.5
Colon site injury	**Right colon**	**4/18**	**(22.2)**		
	Left colon	7/14	(50)	1.6	<0.5

DISCUSSION

Colonic injuries have always presented a challenge. The challenge is to control the high incidence of septic complications and mortality by the correct surgical decision. Recent trend in surgical decision is directed away from colostomy, which was considered mandatory in the past. There have been numerous reports of successful management of colonic injuries with primary repair without the colostomy.[1-5.] Today, with better supportive care, mortality from colonic injuries in civilian practice ranges from 3-5 %.[17] In this study, the age and sex incidence followed the usual pattern of trauma i.e. predominantly affecting men (85%) in the third and the fourth decades of life.[10]. Seventy-five percent of colonic injuries in this study were due to firearms, usually victims of armed robbery attacks, while 18.8% were due to stab wounds with sharp edged weapons. In Lagos Nigeria 91.7% of colonic injuries were due to firearms.[10.] This may be related to the relative ease with which firearms can be acquired in Nigeria. In civilian practice in India, 78% of cases were mainly due to stab wounds with sharp-edged weapons [17], whilst in the USA, firearm injuries are predominant.[7]Iatrogenic causes include injury to the sigmoid colon during sigmoidoscopy and uterine curettage particularly for termination of pregnancy. The iatrogenic injury in this study occurred in a woman with retained placenta after a vaginal delivery of a full term baby. The sigmoid colon was pulled into the uterus and damaged during the process of removing the placenta. Oludiran and Okonofua also reported three cases of injury to the sigmoid colon following induced abortion.[15] The main findings of this study were; (a) that mortality was significantly associated with shock on admission, degree of fecal contamination and severity of colon injury and (b) that diverting colostomy was employed in all left colon injuries. Nine patients died after resection and primary anastomosis. These resections were carried out usually by registrars and senior registrars in the middle of the night, on patients in a state of advanced peritonitis. Sepsis and shock interfere with healing and increase the incidence of anastomotic breakdown. The diverting colostomy may also not totally divert feces if it is not properly constructed. Breakdown of the anastomosis and leakage of feces may lead to septicemia and death. The recommended practice guidelines 6 are as follows;

1.Primary or suture repair for patients with non-destructive (involvement of < 50% of the bowel wall without devascularization) colon wounds in the absence of peritonitis.

2.Resection and anastomosis, no colostomy, for patients with destructive (involvement of > 50% of the bowel wall with devascularization) colon wounds in the absence of peritonitis, shock and associated organ injuries.

3.Resection and anastomosis with colostomy or exteriorized repair in patients with destructive (involvement of > 50% of the bowel wall with devascularization) colon wounds in the presence of peritonitis, shock and associated organ injuries.

Twenty-three (71.9%) patients had non-destructive colon injuries which should have been repaired by primary suture rather than resection and anastomosis. Resection and anastomosis add to operation time and the mobilization required may expose the retroperitoneal surface to sepsis. Only nine patients with destructive colon injuries required bowel resection. However in this study 21 patients had resection and anastomosis, nine of whom died. Sepsis is the main cause of morbidity and mortality following penetrating colon injury. Shock state leads to diversion of blood from the gastrointestinal tract, this increases the incidence of anastomotic breakdown. In this study 25% of the cases had systolic blood pressure < 90mm

Hg on admission. This group recorded a significantly higher mortality. This may due to the effect of shock on all organs, leading to multiple organ failure. Reversal of the shock state might also be delayed due to unavailability of adequate units of blood. Patients had to procure their own blood and other materials necessary for the surgery because there is no effective health insurance scheme in place. Type-specific blood was usually not obtained until two to three hours after request. Delay before surgery may be detrimental in patients with nonfatal abdominal injuries because blood loss and fecal contamination of the peritoneal cavity becomes prolonged. The inoculation of feces with high bacteria concentration into the peritoneal cavity from the injured unprepared colon is expected to result in a high infection rate. Ninety-four percent of our patients suffered moderate or major fecal contamination. The postoperative wound infection rate was 56.7 percent, and overall mortality was 34 percent. These rates are higher than the 3% - 5% observed in patients elsewhere with penetrating colon injuries. [2, 3, 17], but comparable to the mortality rate of 33.3% from Lagos.[10]. Destructive colon injury was found in nine patients, seven of whom died. This may be a reflection of the severity of injury, and the associated high risk of sepsis consequent upon delay in surgical intervention recorded in this study. The use of diverting colostomy for all left colon injuries can no longer be justified in current surgical practice [18, 19.] In this study, patients with non-destructive colon injuries survived as well with or without a colostomy. Practice guidelines derived from randomized, controlled trials for the optimum treatment of this condition should be followed. It is not necessary to always protect repaired nondestructive left colon wounds with diverting colostomy. A large number of colonic injuries can be managed without proximal diversion. Primary repair is safe in selected patients - those without high risk factors. A quick colostomy however, is life saving in unstable patients.

CONCLUSION

In this study gunshots accounted for 75% of cases of penetrating colon injuries. Primary repair was employed in 18(56%) patients. The high mortality was significantly associated with shock on admission, degree of faecal contamination and severity of colon injury. The routine use of diverting colostomy for all left colon injuries can no longer be justified in current surgical practice. A liberal use of primary repair, without colostomy, should be encouraged in patients with non-destructive injuries of the colon.

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