

Original Research Article

Management of Colonic and Rectal Injuries: A multicenter study

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Abstract: Colorectal injuries are associated with septic complications in a high percentage of abdominal injuries. Proper initial management of colorectal injuries will significantly reduce septic complications and consequently mortality. The management of colorectal trauma has evolved considerably over the past several decades. The objective is to study the current surgical management of colonic and rectal injuries and to compare the morbidity and mortality of primary repair with faecal diversion. This is a prospective descriptive hospital based multicenter study conducted at Omdurman Military Hospital, El Obeid Military Hospital and Omdurman Teaching Hospital in the period from March 2014 to February 2015. Fifty two patients fulfilled the criteria for inclusion and analysis. More than half of colorectal injuries were managed with diversion. When comparing left with right-sided injuries, there was a trend toward increased stoma placement in patients with left-sided injuries (87.5% vs. 4.3%) P value 0.000. The morbidity of the right colonic injury was 26.1% and the mortality was 8.7% compared with 41.7% morbidity and 12.5% mortality in left colonic injury (P value 0.752). The complication rate for patients with colonic injury requiring a colostomy was 50% (11/22) versus 20% for the primary repair group (P value 0.382). Six out of seven patients (85.7%) with rectal injuries were managed with colostomy (P value 0.269). In conclusion; the current practice of most surgeons for management of colorectal injuries is to divert left colonic and rectal injuries and repair or resection and primary anastomosis for right colonic injuries. Patients whom were managed with colostomy were found to have higher morbidity and mortality than those managed with primary repair.

Keywords: Colon injuries, rectal injuries, primary anastomosis, faecal diversion.

INTRODUCTION

During the First World War, the overall mortality rate from colonic injury was around 60%. Colostomy was the treatment of choice during World War II with a reported decrease in mortality from 60% to 30%. Like colonic injuries, fecal 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 fecal diversion and presacral drainage was established [1].

Over the past 20 years, several studies have demonstrated the safety of primary repair for many penetrating colon injuries and as a result clinical practice patterns have changed, resulting in fewer colostomies in this setting.

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 fecal diversion in patients as follows: a) without profound preoperative shock, b) blood loss < 20 percent of estimated normal volume, c) no more than two intraabdominal organ systems injured, d) with minimal fecal contamination, e) whose operation was started within eight hours of injury, and f) whose wounds of the colon and abdominal wall were not destructive enough to require resection. Primary repair resulted in fewer wound infections, fewer intra-abdominal infections (15 % in primary repair group vs. 29 % in colostomy group), and shorter hospital stays. However, this was a selected patient population without hypotension or associated injuries [2]. Other studies have confirmed this concept [3-5].

Flint scale prepared by Flint *et al.*; [6] and the colon injury scale (CIS) of the American Association for the Surgery of Trauma (AAST) [7] are frequently

applied. Based on them, the level of colon injury can be objectified by classifying colon injuries as destructive colon injuries or non-destructive colon injuries.

Maxwell and Fabian separated colon wounds into destructive and nondestructive injuries. Nondestructive wounds included Flint Grades 1 and 2 and CIS Grades I, II, and III injuries. Maxwell and Fabian recommend fecal diversion in patients with destructive injuries when the delay to operation is more than 6 hours and there is significant faecal peritonitis or in patients with delays more than 12 hours with nondestructive wounds and concomitant faecal peritonitis or hypotension. The numbers of associated injuries and PATI have been linked with infectious and noninfectious complications but not suture line dehiscence [8].

Stone and Fabian [2] provided evidence for the first time that the primary repair was superior to the colon diversion through a prospective randomized study conducted on selective patients, excluding risk factors. Maxwell and Fabian reported that the primary repair group presented better results compared to the proximal diversion group not only for complications (14% vs. 31%) but also for intra-abdominal sepsis (5% vs. 12%) and mortality rate (0.11% vs. 0.14%) [8].

Trauma to the intraperitoneal rectum is likely best managed as a colonic injury. Extraperitoneal rectal injuries occur below the peritoneal reflection within the fixed pelvis, which presents many challenges. The literature on the use of fecal diversion with or without direct injury repair is all over the map. While some studies support diversion without direct repair [9], others support selective nonoperative management of extraperitoneal rectal injuries [10] using only dietary restriction and limited intravenous antibiotics with follow-up contrast radiographs [11]. 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 [12].

PATIENTS AND METHODS

This is prospective, descriptive and hospital-based multicenter study, conducted at Omdurman Teaching Hospital, Omdurman Military Hospital and El Obeid Military Hospital. The study population was composed of patients with colorectal injuries in the period from Mar. 2014 to Feb. 2015. A total of 52 patients were included with the use of constructed structured questionnaire. Non-probability sampling was used, including all patients with colorectal injuries during the period of study. Data were processed and analyzed statistically using computer program statistical package for social sciences (SPSS). Qualitative data

were analyzed using percentage and the statistical significance was accepted if P value <0.05. Ethical clearance and approval for conducting this study was obtained from the ethical committee of Sudan Medical Specialization Board. Informed verbal consent was obtained from the patients participating in this study after full explanation of the study objectives. Data variables includes; mode of colonic trauma, site of colonic trauma, severity of injured colon using the Flint scale and the colon injury scale (CIS) of the American Association for the Surgery of Trauma (AAST) in 1990, the degree of faecal contamination, the presence of shock, the need for blood transfusion, time from trauma to surgery, surgical treatment done and the outcome. Faecal contamination was defined 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.

RESULTS

The study involved 52 patients with colorectal injury. Forty-eight (92.3%) were males and four females, with male to female ratio of 12:1.

The mechanism and site of colorectal injuries

Penetrating wounds were the commonest cause of injuries in the study (82.7%), (Gunshot wounds in 25 (48.1%), stab wounds in 18 (34.6%)). Road traffic accident was seen in five (9.6%) of the patients and four (7.7%) inflicted injuries of other causes.

The colon was injured in 45(86.5%) patients, the rectum in five (9.6%) patients and two (3.8%) patients with combined colonic and rectal injuries. The common injured sites were the transverse and descending colon in 29 (%55.8) patients. The least injured parts were; the sigmoid and the ascending colon in 18 (34.6%) cases. Regarding the cases of rectal injury they were five (9.6%), of them three (5.8%) with intraperitoneal, while two (3.8%) with extraperitoneal rectal injury.

Treatment of colorectal injuries

All colonic anastomosis were done using hand-sewn technique. In colonic injury; simple suture was used in 16 (30.8%), resection and primary anastomosis nine (17.3%), repair and protective colostomy six (11.5%), resection and Hartmann procedure three (5.8%). Resection and stoma formation of the proximal segment with exteriorized distal part as mucus fistula in ten (19.3%) and exteriorized injured colon as loop colostomy in one (1.9%) patient.

In rectal injury; repair was done in single patient (1.9%), repair and proximal colostomy in three (5.8%), colostomy without repair in one patient (1.9%) (Table 1). In combined colonic and rectal injuries; two

(3.8%) patients with combined colonic and rectal injury were managed with repair and diversion colostomy.

Presacral drainage was not applied for any patient with rectal injury.

Table 1: Management in comparison between colonic and rectal injuries (n=52).

Site of injury	Type of management		P value
	Repair	Colostomy	
Colonic	24 (96%)	21 (77.8%)	0.000
Rectal	01 (04%)	04 (14.8%)	0.269
Combined	00 (00%)	02 (07.4%)	—
Total	25 (100%)	27(100%)	—

Outcome of colorectal injuries:

Regarding the outcome, 30(57.7%) of the patients were discharged uneventfully, 17 (32.7%) had developed complications and five (9.6%) patients were

died. Most of the complications were surgical site infection occurred in 13(25%) patients, intra-abdominal abscess in one (1.9%) patient, leak in one (1.9%) patient and fistulae in two (3.8%) of the patients(**Table 2**).

Table 2: Outcome of colorectal injuries (n=52).

Outcome	Colonic injury	Rectal	Combined
Uneventful	26 (57.8%)	4 (80%)	0 (00%)
Complications	15 (33.3%)	1 (20%)	1 (50%)
Deaths	04 (08.9%)	0 (00%)	1 (50%)
Total	45 (100%)	5 (100%)	2 (100%)
P value	0.752	0.350	—

The outcome in relation to the site of colonic injury: the morbidity of the right colonic injury was 26.1% and the mortality was 8.7% compared with 41.7% morbidity and 12.5% mortality in left colonic injury (P value 0.752). The outcome of colonic injury in relation to the management: The total complication rate for patients with colonic injury requiring a colostomy was 50% (11/22) versus 20% (5/25) for the primary repair group (P value 0.382).

died patients (n=5) were transfused, one received five units and four received six units, P value 0.004.

The outcome of rectal injury in relation to the management: Considering rectal injury the patient who underwent primary repair was discharged in a good condition, and for the patients with colostomy the morbidity was 33.3% (2/6), and the mortality was 16.6 (1/6) (P value 0.827). The degree of faecal contamination in relation to outcome: Twelve out of 17 patients with complications were found to have moderate to severe faecal contamination, all deaths (five patients) were found to have moderate to severe faecal contamination (P value 0.001).

The severity of colorectal injuries in relation to the outcome: The severity of colorectal injuries were significantly related to the outcome, as 80% of patients were died presented with Flint grade 3 (P value 0.000) and 60% of the patients were died presented with CIS of the AAST Grade 5 (P value 0.001).

DISCUSSION

In this study most of the colorectal injuries were caused by penetrating abdominal trauma (82.7%) either gunshot or stab abdomen, this in support to what had been reported by many authors. Georgoff, *et al.*; [13] reported an incidence of 91.8%.

The site of colonic injury

The current study suggests relatively high rates of morbidity and mortality with injury to the left colon (41.7% and 12.5% respectively) who most of the patients (87.5%) were managed with diversion colostomy. However to compared with 26.1% morbidity and 8.7% mortality from right colonic injury that most of the (95.7%) patient were managed with repair, although they were not statistically different (P. value 0.752). This in support of a study done by Tade *et al.*; [14] which demonstrated that the mortality from right colonic injuries which where all managed either with repair or with resection and primary anastomosis was 22.2%, compared with 50% mortality from left colonic injuries which were all managed with diverting colostomy.

Primary repair versus diversion colostomy

In the current study more than half of the patients with colorectal injury were managed with diversion and the remainder was managed with repair or resection and primary anastomosis. There were no specific indications for diversion rather than most of the surgeons have a propensity toward diverting left colonic and rectal injuries. When comparing the outcome with the type of management, although it was not statistically significant but both of morbidity and mortality in patients with colonic injury were higher in diverted patients (50% vs. 20%) and (13.6% vs. 8%) respectively (P value 0.328). The same thing for patients with rectal injury as morbidity was 33.3% and the mortality was 16.7% in diverted patients while no morbidity or mortality were found in the patients whom were managed with repair (P. value 0.827). This in support to that reported by Miler *et al.*; as the mortality for patients who underwent diversion colostomy was 27% compared 5% mortality rate for patients whom were managed with primary repair [15].

Risk factors affecting the outcome of colorectal injuries

Shock and blood transfusion: In our study shock and blood transfusion were significantly related to the outcome as all deaths were shocked at time of presentation, while 42.9% of shocked patients had developed complications (P value 0.000). Cleary *et al.*; reported 80% of deaths were shocked in the first 24 hours [16], Chppuis *et al.*; concluded that shock is not a risk factor for postoperative mortality [17].

Intra-abdominal faecal contamination: In our study the degree of faecal contamination was significantly related to the outcome, as moderate to severe faecal contamination was present in 70.6% of patients with complications and in all patients who were died (P. value 0.001). Tade *et al.*; [14] reported that 66% of patients died had severe faecal contamination, while Fealk *et al.*; [18] reported that there was no relationship between the outcome and the degree of faecal contamination.

The severity of colonic injury: According to the guideline of the Eastern Association for the Surgery of Trauma (EAST guidelines, 1998) [19], even in destructive colon injury cases, if patients are haemodynamically stable during surgery, have fewer associated injuries, do not have severe peritonitis, and those who have with no prior underlying medical diseases, the end-to-end anastomosis after the colon resection is recommended without the proximal diversion.

In our study the severity of colorectal injuries were significantly related to outcome, as 80% of deaths were Flint grade 3 (P value 0.000) and 60% were CIS of AAST grade 5 (p 0.001). This in support to which had

been reported by Adesanya *et al.*; [20] who concluded that, destructive colon injury was the most important risk factor for mortality and it was associated with a greater than fourfold increased incidence of death [20].

The associated injuries

The number of associated organ injuries is known to increase infectious complications, as well as non-infectious complications (8,17,21). In this study the injured organs and or systems were significantly related to the outcome as the five patients whom were died had 4-5 injured organs (P value <0.001).

Management of colorectal injuries

Management of colonic and intraperitoneal rectal injuries: In our study, surgeons tend to divert patients with left colonic and rectal injuries (extra and intraperitoneal) as 87.5% of cases with left colonic injury were managed with diversion colostomy and only one (4.3%) patient with right sided colonic injury was managed with colostomy.

Regarding cases of intra-peritoneal rectal injury only one out of five patients was managed with repair. So the site of injury was the only indication for faecal diversion in most cases regardless other risk factors as severity of injury, degree of faecal contamination, shock and blood transfusion and associated injured organs or systems. Much of the literature considered primary repair is safe for non-destructive colorectal injuries while the mentioned risk factors should be considered only in the management of destructive colorectal injury [14, 19].

Management of extra-peritoneal rectal injury: In this study there were two cases of extraperitoneal rectal injury; one was managed with transanal repair and diversion colostomy while the other was managed with only diversion colostomy. Unlike injuries located above the peritoneal reflection, these patients are more often treated with faecal diversion. In a study of 100 consecutive patients with injuries to the extra-peritoneal rectum, 100 % were treated with colostomy, with a resultant pelvic sepsis rate of 11 % and overall mortality rate of 4 % [22].

Outcome of colorectal injuries

In this study both of the morbidity and mortality for colonic injury were higher as 4 of the 5 patients who were died had colonic injury while the fifth had combined colonic and rectal injuries. Brady, *et al.* reported 2.1% mortality from rectal injury compared with 32.9% mortality from colonic injury [23]. However in a study conducted for 23 patients with colorectal injuries no mortality from rectal injury and only one death from colonic [24].

CONCLUSION

The current practice of most surgeons for management of colorectal injuries is to divert left colonic and rectal injuries and to do repair or resection and primary anastomosis for right colonic injuries regardless of other risk factors. The morbidity and mortality of left colonic injuries were higher than right although most of the patients of left colonic injury were managed with colostomy. Patients whom were managed with colostomy were found to have higher morbidity and mortality than those whom were managed with primary repair, so colostomies did not reduce the morbidity and mortality. Shock, the degree of faecal contamination, the severity of colorectal injury and the associated injured organs or systems were all statistically significantly associated with adverse outcome.

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