

## Original Article

# Management of Penetrating Colon Injuries in Zabol Province in Afghanistan

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## ABSTRACT

**Objective:** To present the pattern, management and outcome of penetrating colon injuries in peace keeping mission in Afghanistan.

**Methods:** This prospective study was conducted in Zabol Hospital in Afghanistan during a period of three months, from December 2007 to March 2008. All patients with penetrating colon injury were included in the study. All underwent laparotomy.

**Results:** Out of twelve patients with penetrating colon injuries, nine (75%) were males, with a mean age of 33.9 years. Six (50%) patients had colonic injury due to shrapnel penetration, 4 (33%) due to gunshot and two (17%) due to stabbing. Associated intra-abdominal injuries occurred in the small bowel (75 %), liver (33.3 %), stomach (25 %) and mesentery (25 %). All right colon injuries (5) were managed by primary repair or resection and anastomosis, whereas left colon injuries (7) were managed by either primary repair or resection and anastomosis. A total of 26 complication occurred. The most common was wound infection in 8 (66.7%) patients, followed by septicemia in 5 (41.7%). The mortality rate was 50%.

**Conclusion:** Primary repair or resection and anastomosis of the colon should be considered for treatment of all patients with penetrating bowel injuries. These patients should be managed immediately and monitored intensively in postoperative period.

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**Key Words:** Colon injury, primary repair, colostomy.

## **INTRODUCTION**

Despite the dramatic reduction of colon-related mortality from about 60% during World War I to about 40% during World War II to about 10% during the Vietnam War and to lower than 3% in the last decade, the colon-related morbidity remains unacceptably high.<sup>1</sup> After World War II, Ogilvie declared that “the exteriorization of colon injuries is perhaps the greatest single factor in the improved results we are able to record”.<sup>2</sup> Ogilvie’s proclamation and the subsequent mandate by the American Surgeon General<sup>3</sup> established fecal diversion for penetrating colon injuries as the standard of care in the United States for decades. The perception was that intra-abdominal abscess and other septic complications could be prevented by diverting the fecal stream and avoiding an anastomosis. However, in recent years, this relationship was challenged as many studies have now shown that most penetrating colon injuries can be safely managed by primary repair irrespective of associated risk factors.<sup>4-7</sup> However, the management of destructive colon injuries by resection and primary anastomosis remains controversial.<sup>8,9</sup> Despite this, most authors still advocate diverting colostomy (DC) for destructive colon injuries, especially in patients who have had multiple injuries, massive blood transfusions, and concomitant medical illness.<sup>8-10</sup> The aim of our study was to present the pattern of colonic injuries sustained in a war zone, their presentation and management.

## **METHODS**

This prospective study was conducted at Zabol Hospital in Afghanistan during a Peace Keeping Mission (Eagle 24) between December 2007 and March 2008. All patients with injuries of the colon and rectum that penetrated into the lumen were included in the study. After vigorous resuscitation, all underwent exploratory laparotomy. Administration of

intravenous antibiotics (ceftriaxone and metronidazole) was at the induction of anaesthesia, and continued after the operation.

Data collected included patients' age, gender; cause and type of injury, extra-abdominal injuries, injury-to-surgery time, operation findings, and number of intra-abdominal organs injured (NOI), type of colon wound management and postoperative complications. Extent of visceral organ injuries and fecal contamination were graded on the basis of the description of the operating surgeon. Fecal contamination was classified as minimal if there was a small amount of bowel content spillage confined to the immediate area around the injury, moderate when spillage was confined to one quadrant of the abdomen, and major if fecal contamination was found in more than one quadrant.<sup>11</sup>

**Table 1. AAST Colon Injury Scale <sup>1</sup>**

| <b>Grade Injury</b> | <b>Description</b>  |
|---------------------|---|
| I                   | a) Contusion or hematoma without devascularization<br>b) Partial thickness laceration |
| II                  | Laceration $\leq 50\%$ of circumference   |
| III                 | Laceration $> 50\%$ of circumference  |
| IV                  | Transection of the colon  |
| V                   | Transection of the colon with segmental tissue loss                                   |

The AAST Colon Injury Scale<sup>1</sup> was used (table 1). The segment of colon injured was resected if perforations were numerous and close or when injury was destructive. If perforations were small and isolated closure was performed also in one layer after minimal debridement. Skin was closed primarily. Only complications that occurred within 30 days of emergency laparotomy were considered.

## **RESULTS**

Out of twelve patients, nine (75 %) were males and 3 (25 %) females. The mean age was 33.9 years (range 15 to 61). The injuries were caused by bomb explosion with shrapnel penetration in six (50%), low velocity and high velocity gunshots in 4 (33%) and knife stab in 2 (17%). Seven (58.3%) patients also sustained extra-abdominal injuries to the upper limbs (5), lower limbs (3), face (4) and chest (4). The average injury-to-surgery time was 7.9 hours (range 5-17). During laparotomy, minimal contamination was found in 2 (16.7 %) patients, moderate in 6 (50 %) patients and major contamination in 4 (33.3%) patients. Left colon was injured in 7 (58.3 %) patients, right colon in 5 (41.7 %), while multiple colon injuries were present in six (50%) patients (table 2).

**Table 2. Region of colon injured.**

| <b>Site of colon injury</b> | <b>Number (%)</b> |
|-----------------------------|-------------------|
| Caecum                      | 2 (16.7)          |
| Ascending                   | 3 (25)            |
| Hepatic flexure             | 1 (8.3)           |
| Transverse                  | 6 (50)            |
| Splenic flexure             | 1 (8.3)           |
| Descending                  | 2 (16.7)          |
| Sigmoid                     | 4 (33.3)          |
| Rectum                      | 1 (8.3)           |

Four patients sustained injuries at 2 sites and 2 at 3 sites

Concomitant small bowel injury was commonest (table 3). All right colon (5) injuries were managed by primary repair in three (60%) patients and resection and anastomosis in two (40%) patients, none had a DC. Left colon (7) injuries were treated by DC in three (42.9%) patients and either primary repair or resection and anastomosis in four (57.1%) patients, (table 4). None of the patients who had repair or resection and anastomosis had protective proximal colostomy or ileostomy.

Using AAST Colon Injury Scale, majority of patients (58.3%) had grade I and II injury, 16.7% had grade III, and 8.3% had grade IV and 16.7% grade V. A total of 26 complication occurred, the commonest being wound infection in 8 (66.7%) patients. Septicemia occurred in 5 (41.7%) patients, enterocutaneous fistula, and chest infection and burst abdomen in 2 patients' each and intra-abdominal abscesses in 1 patient. Other complications were acute renal failure, aspiration on induction of anaesthesia, myocardial infarction, acute heart failure and pulmonary embolism.

**Table 3. Associated intra-abdominal injuries.**

| <b>Organ</b>    | <b>Number (%)</b> |
|-----------------|-------------------|
| Small Bowel     | 9 (75)            |
| Liver           | 4 (33.3)          |
| Stomach         | 3 (25)            |
| Mesentery       | 3 (25)            |
| Pancreas        | 2 (16.7)          |
| Spleen          | 1 (8.3)           |
| Duodenum        | 1 (8.3)           |
| Urinary Bladder | 1 (8.3)           |
| Kidney          | 1 (8.3)           |
| Diaphragm       | 1 (8.3)           |

The mortality was 50% (six patients). Out of four patients with colon-injury related mortality, three died of septicemia and one with intra-abdominal abscess. In non colon-related mortality, one died of acute renal failure and the other of postoperative extensive myocardial infarction. The mean hospital stay for non survivors was 5.7 days (range 2-9 days). Mean hospital stay for survivors was 18.8 days (range 10-28 days). The enterocutaneous fistulae closed spontaneously in 26 and 41 days.

## **DISCUSSION**

Large number of retrospective reviews and editorials published in the last 20 years regarding this topic reflects the favorable attitude of surgeons toward primary repair.<sup>12</sup> Majority of patients in this study presented at Zabol Hospital more than four hours after sustaining penetrating colon injuries. Inefficient ambulance and general transportation services and delay in transferring wounded patients from location of injury, all contributed to the delay in injury-to-surgery time. There was minimal delay from

admission-to-surgery time. Mean admission-to-surgery time was one hour (range 45 minutes-2 hours).

**Table 4. Operative treatment.**

| <b>Operative procedure</b>     | <b>Right colon</b> | <b>Left colon</b> | <b>Total (%)</b> |
|--------------------------------|--------------------|-------------------|------------------|
| Repair                         | 3                  | 2                 | 5 (41.7)         |
| Resection+ anastomosis         | 2                  | 2                 | 4 (33.3)         |
| End colostomy + rectal fistula | 0                  | 1                 | 1 (8.3)          |
| Hartman's                      | 0                  | 2                 | 2 (16.7)         |
| Total                          | 5                  | 7                 | 12 (100)         |

The length of delay of surgical repair over which the septic complication rate increases is not well defined. Some studies suggest >6 hours whereas others suggest >12 hours as critical delays associated with an increased risk of infections.<sup>9,10</sup> It seems that the degree of contamination is much more important than the delay in surgical management and the time delay in itself should not be used as a criterion for primary repair or diversion. In a prospective study of 297 destructive colon injuries, the incidence of abdominal complication was 11.4% in patients with preoperative time >6 hours and 26.1% in patients with times <6 hours and multivariate analysis failed to identify time delay as an independent risk factor.<sup>11</sup> Eighty three percent of our patients had moderate to severe contamination and this partly explains high postoperative wound infection rate (66.7%), overall mortality rate (50%) and colon-related mortality rate of 33.3%. These rates are relatively higher than those observed in patients elsewhere with penetrating colon injuries.<sup>6,13</sup>

Although destructive colon injuries, severe contamination, multiple injuries, and delays in treatment affect outcome,<sup>4,14</sup> main advantage of primary repair is the avoidance of the high morbidity associated with colostomy and its closure. We offered primary repair and DC to 9 (75%) patients and 3 (25%) patients, respectively. No clinical or experimental



study has demonstrated any healing differences between the two sides of the colon or any evidence that the two anatomic sides should be treated differently.<sup>1</sup> The only conditions for which there is agreement for colostomy are the presence of severe colon edema or a questionable blood supply of the colon.<sup>1</sup> In these situations, at least theoretically, a diversion procedure might be a safe option. Colon leaks remain the most serious complication in repaired or anastomosed colons. In a collective review of 35 prospective or retrospective studies with 2964 primary repairs, Curran reported 66 (2.2%) leaks.<sup>15</sup> Colon injury is the most important risk factor for the development of septic complications in patients with penetrating abdominal trauma.<sup>16</sup> In conclusion; colon injuries should be managed by repair or resection and anastomosis, whenever possible. Defunctioning of the bowel must be carried after considering patient's general condition, presence or absence of shock on admission, major fecal contamination and destructive colon injuries. These patients should be operated as soon as possible and should be managed intensively in the postoperative period.

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