

Changing Patterns in the Management of Colonic Trauma

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Recent prospective studies have recommended primary repair for all colonic trauma. We evaluate the changing patterns given these recommendations and assess our results of primary repair. This prospective study was conducted on 63 patients with colonic trauma received over a year from July 2000 to June 2001. Morbidity was defined as failure of a primary repair, abscess, fistula, wound dehiscence, sepsis, and organ failure. Primary repairs were performed in 28 patients and colostomy was done in 35 patients. Prolonged mean hospital stay and more incidences of postoperative complications occurred in colostomy group. It was therefore, concluded that primary repair of colon should be adapted as a standard procedure. Colostomy should be reserved for patients with a prolonged delay to surgery, severe blood loss, and gross faecal contamination or associated with multiple organ injuries.

Key Words: Primary repair, colostomy.

The management of colonic trauma continues to arouse lively debate. Day by day, surgery is going through revolutionary changes, especially, in cases of management of colonic injuries. Age-old traditional procedures like colonic repair with exteriorization and covering colostomy are being replaced by one time primary repair. Among the modern diagnostic aids, ultrasound and abdominal CT scan are doing a great job. All such factors have decreased the time interval between injury and surgery. Both morbidity and mortality following colonic injuries depend upon the extent of associated injuries, in addition, to other factors. The pattern and amount of trauma has changed rapidly. The line of management of colonic injuries has been altered, so as to decrease hospital stay of patients, without affecting the overall well being of the recipient of treatment.

Material and method

A prospective study was performed over a year from July 2000 to June 2001 at Mayo hospital, Lahore, Pakistan. After excluding patients who died within 24 hours and those with extra peritoneal rectal injuries, 63 patients remained for analysis. Resuscitation was performed following Advanced Trauma Life Support guidelines.¹ Colon injuries were addressed by either primary repair, including suture repair and resection with anastomosis, or diverting colostomy. The attending surgeon chose the method of repair. Both suture repair and resection and anastomosis were generally performed using a double-layered technique.

Demographic information, including age, gender, and mechanism of injury was recorded. Colon injury was characterized by location of the injury, colon injury (CIS Table No 1)² and the degree of contamination. All associated injuries were reviewed. Major morbidity related to the colonic injury, was defined as an anastomotic leak, abscess, fistula, wound dehiscence, sepsis and organ failures. Statistical analysis was performed using χ^2 -test to

assess statistical significance between sample proportions. Significance was defined as $p < 0.05$.

Table 1. Colon injury score (CIS)

Grade	Injury Type	Description
1	Haematoma	Contusion or Haematoma without devascularization
	Laceration	Partial thickness
2	Laceration	< 50% circumference
3	Laceration	> 50% circumference without transection
4	Laceration	Transection
5	Laceration	Transection with segmental tissue loss

Results

From July 2000 to June 2001; sixty-three patients with colonic injuries were enrolled in Emergency department of Mayo hospital, Lahore, Pakistan. There were forty-nine (77.78%) male and fourteen (22.22%) female patients. The mean hospital stay was 11.7 days ranging from 4 to 48 days. Thirty-four, (53.97%), patients were wounded by firearm, twenty-two, (34.92%), were injured by stab to abdomen and seven (11.11%) had blunt trauma to abdomen. Forty-five patients were brought within a distance of 20 kilometers from the hospital. The mean interval between injury and reporting to the hospital was 4.3 hours. At the time of initial examination mean pulse rate was 96/min and average systolic blood pressure was 112 mm Hg, fifteen patients were obviously pale.

Free gas under the diaphragm was observed in 42 patients (66.67%), guarding was present in 35 patients (55.56%), rebound tenderness was present in 47 (74.60%) patients. Only 19 patients had abnormal findings in their routine blood investigations. All patients were explored under general anesthesia. All patients abdomen was opened by standard umbilicus saving midline incision. Haemoperitoneum was a uniform finding. Faecal contamination was minimal in 13 (20.63%) patients,

moderate in 38 (60.32%) patients and gross in 9 (14.29%) patients. The anatomic location of injury to colon is depicted and compared with a study by Nelkin and Lewis³ 1989 in Table 2.

Table 2. Anatomical location compared to a study

Anatomic location	Author (2000-2001)	Nelkin & Lewis (1989)
Caecum	6 (9.52%)	20%
Right colon & Hepatic flexure	9 (14.29%)	20%
Transverse colon	29 (46.03%)	45%
Left colon & splenic flexure	14 (22.22%)	13%
Sigmoid colon	5 (7.94%)	11%

There was single colonic perforation in 45(71.43%) patients while 18(28.57%) patients had multiple colonic perforations, 15(23.81%) patients had pure colonic injury while 48(76.19) patients had associated injuries to other colonic abdominal viscera. The operative procedures performed for repair of colonic injuries are depicted in Table 3.

Of 63 patients 28 patients were included in Group A (Primary repair/resection and anastomosis) and rest of 35 were included in Group B (Colostomy/exteriozation). Data was collected concurrently and complications and outcome recorded. The majority of patients in each group were young men. The average age for Group A was 24.5 years (range from 13 to 49 years) and for Group B was 31.9 years (range 15 to 67 years).

The average time interval between injury and arrival to hospital was 3.7 hours (range half an hour to 8 hours) in Group A while it was 5.9 hours (range one hour to 36 hours) in the other group. Group A had preponderance of stab wounds as the causative agent. It is compared with Chappius et al⁴ in Table 4

Table 3. Various procedures done

Group	Method of repair	n=	%age
Primary Group "A" (n=28)	Simple Suture repair	14	22.22
	Resection with end to end anastomosis	14	22.22
	1. Ileo-colic anastomosis	8	12.70
	2. Colo-colic anastomosis	6	9.52
	Exteriorization of injured part as loop colostomy	16	25.40
Group Colostomy "B" (n=35)	Exteriorization of proximal part as loop with repair of injured site	6	9.52
	End colostomy with Hartman's procedure	4	6.35
	End-colostomy with mucous fistula (including double barrel)	9	14.29

Table 4. Mechanism of injury (comparison)

Type of injury	Primary repair		Colostomy Group	
	Author (2000-2001)	Chappius (1990)	Author (2000-2001)	Chappius (1990)
Fire arm	10	24	24	28
Stab	16	4	6	-
Blunt trauma	2	-	5	-

The average hospital stay was 8 days (3-48days) in primary repair group, while it was 15 days (3 to 34 days) in colostomy group. The average time for colostomy closure was 5 days, so that hospital stay in Group B was 20 days. Exploratory laparotomy in both groups was done through a proper midline incision. The amount of faecal contamination in both groups is depicted in Table No: 5. Chi-Square test was used to assess the statistical significance of effect of faecal contamination on type of surgical intervention, in two groups. Observed and estimated frequencies were calculated. χ^2 was 3.95 for which $p < 0.05$ in the distribution table with a degree of freedom of 1 which show its significance.

Of 28 patients in Group A, simple repair was done in 22.2% and resection and anastomosis was done in 22.2%. Ileo-colic anastomosis was preferred for caecal, right colonic including hepatic flexure injuries in 12.70% of cases. In 9.52% colo-colic anastomosis was done. As far as anatomical location of injuries of colon is concerned Table No: 6, elaborates the comparative incidence between the two groups. Associated intra abdominal injuries in both groups are shown in Table 7.

Table 5. Degree of faecal contamination

Faecal contamination	Group A n=28	Group B n=35	Total
Absent	3	-	3 (4.76%)
Minimal	9	4	13 (20.63%)
Moderate	16	22	38 (60.32%)
Gross	-	9	9 (14.29%)

Table 6. Site of colon injuries

Regions	Primary Group	Colostomy group	n=
Caecum	6	-	6
Right colon & Hepatic flexure	7	2	9
Transverse colon	13	16	29
Left colon & Splenic flexure	6	8	14
Sigmoid colon	1	4	5

The potential risk factors were evaluated for their contribution to the development of complications. The

major complications in two groups are shown in Table 8. There was one failure of a primary repair during the entire study period. The patient underwent re-exploration with diverting colostomy and was discharged later in good condition.

Table 7. Associated intra-abdominal injuries

Injury	Group A	Group B	Combined
Small bowel	8	11	19
Stomach	2	4	6
Duodenum	-	4	4
Pancreas	-	2	2
Liver	6	9	15
Gall bladder	1	1	2
Diaphragm	5	5	10
Spleen	1	5	6
Kidneys	1	6	7
Urinary bladder	-	3	3

Table 8. Complications

Complication	Group A (n=28)	Group B (n=35)	n=63
Abscess	1	1	2
Suture repair leak	1	-	1
Multi organ failure	-	1	1
Renal failure	-	-	-
ARDS	-	1	1
Sepsis	2	3	5
Soft tissue infection	2	4	6
Dchiscence	1	1	2
Total	7 (25%)	11 (31.43%)	18 (28.57 %)

Discussion

Colonic injuries management is the most controversial and lively debate of modern day surgery. Ogilvie who changed the treatment standards with exteriorization or diverting colostomy^{5,6}.

With the introduction of colostomy, and improved evaluation techniques, decrease in mortality was seen in World War II, with further reduction in the Korean War. Given the dramatic results, colostomy was adopted more frequently in civilian practice. Soon enough, there was a dissent pointing to differences between most civilian and wartime injuries^{7,8}. They argued the necessity of routine colostomy, which was more effective in battle conditions. Sporadic heretical reports of successful results with primary repair in low risk patients persisted^{9,10,11,12}. A landmark in this was the prospective randomized study, which compared primary repair with diverting colostomy¹³. Thereby primary repair for colon injuries gained favour^{4,9,14,15}. So much so, that in 1995 Nance & Nance stated "Diversion of the faecal stream has no role in the routine

management of colon injuries"¹⁶. Recent, overall mortality for colon injuries, treated with primary repair has fallen to less than 5%^{3,14}.

The incidence of septic complication from colon injuries was 26% in our study. Most of these septic complications were wound infection and intra-abdominal abscess formation, both being high in colostomy group (14% vs. 43%). The incidence of colon related complications were almost the same in both groups.

The degree of faecal spillage has been correlated with complication rate and a need for colostomy in many studies³. One study has however, eliminated faecal spillage as an independent determinant for colostomy formation if associated injuries are not extensive¹⁷. Only those patients underwent colostomy that required major colon resections, repair of associated injuries and prolonged operations. Our results do not support this study and continue to show a complication rate proportionate with greater fecal spillage. Therefore, we performed colostomy in grossly contaminated cases.

There has been much controversy regarding management of right and left sided colon injuries. Right-sided colonic injuries were thought to be suitable for primary repair while left sided injury for colostomy. In our study, both left sided and right-sided injuries were treated by primary repair either by simple suture repair or by resection and anastomosis. In a study of more than nine hundred cases they pointed to no difference in the behavior of right and left colon¹⁸. So there seems to be no arbitration of right and left colon, both behave in the same way and are suitable for primary repair if no other contraindication exists. This technique is now considered quite safe and is an accepted method of treatment provided necessary precautions are taken.

Although there are high apprehensions regarding colostomies but colostomy is still a safe, acceptable and conservative method of treating colon injuries. Although, there is a strong move towards primary repair, there are still clinical situations in which the performance of a colostomy is in the best interest of the patient. Despite, recent evidence indicating that associated risks factors play a more important role than the type of repair; colostomy is still used extensively in many centers including our own institution. Depending upon the part injured, the bowel may be exteriorized as loop colostomy or closed and proximal site is chosen for colostomy. Our study shows that the distal transverse colon or splenic flexure should be avoided for exteriorization, as subsequent closure was difficult. All the colostomies were opened up at time of operation. There is much talk regarding psychological trauma associated with construction of colostomy but the management of colostomy is now easier than in the past because of improved colostomy devices.

Much of the concern, about treating the patients with a colostomy, centers around the extra morbidity and extra hospitalization associated with its use. Our study also

favors this finding because complication rate associated with colostomy closure was about 17% and there was significant longer hospital stay. But some authors present the opposite side of the picture¹⁹. They reported their experience with 139 patients who had colostomy closure after trauma. The overall morbidity rate was about 10%. They concluded that colostomy should not be abandoned based upon the fear of complications resulting from its closure.

The patients in Group A i.e. primary repair group showed more favorable results than patient of Group B, i.e. colostomy group. Primary repair of selected colon injuries is becoming increasingly popular. More and more series are now advocating its adoption, although there still remains a lack of consensus regarding selection criteria. A bias that favors colostomy for more serious patients and primary repair for the more favorable lesion cannot be excluded from these reports.

Work by Stone and Fabian¹³ and Burch et al¹⁸ shows that primary repair is safe in selected cases and can be performed with minimal morbidity and mortality. Our own study has shown more favorable results with primary repair group. Therefore primary repair should be performed in carefully selected patients of colon injuries.

Thus, we can say, that, there is definitely a changing pattern in the evaluation and management of colonic trauma. The time-honored philosophy of conservative management by repair and diversion is giving way to a more bold approach, which includes primary repair of many injuries. The role of colostomy has been challenged by the need for additional operative procedure, patient disability and rising hospital and medical costs. But, role of colostomy should not be abandoned only because of fear of its complications, when dealing with the patients with colonic injuries.

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