

## A Comparative Study of Primary Colonic Repair versus Stoma in Emergency Cases

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### ABSTRACT

**Background:** In emergency surgery, management of an enterotomy, either spontaneous or following resection of a bowel segment can be by approximation of cut edges, referred to as primary repair or by exteriorization of the involved segment, referred to as ostomy. Indication of this operation can be a perforated bowel segment (produced as a result of trauma or secondary to an inflammatory process of gut) or a devitalized/redundant segment of bowel requiring resection. Penetrating colon injury or blunt abdominal trauma carries a high risk of a high-risk rate of infectious morbidity. The development of infectious complications is related to the injury severity and haemodynamic status of the patient, not the type of operation performed. **Aim of the Work:** Comparing the outcome of primary repair versus colon diversion in emergency cases regarding efficacy, safety and usefulness.

**Patients and Methods:** A prospective study on 40 patient undergoing either primary repair of bowel or intestinal stoma formation following emergency laparotomies in the Department of Surgery in El-Hussien and El-Haram Hospitals, which is a big emergency and trauma center and cover large geographic area. All persons will give their informed consent. The people who have the decision in performing and choosing the type of the operation are specialists and consultants (they have the license as decision makers). All patients presented in ER department with colorectal emergencies, included trauma (penetrating, gunshot & blunt), obstruction (malignant & non-malignant) and acute abdomen due to perforation, and need emergent laparotomy confirmed by history, clinical examination and investigations. **Results:** It included 40 patients divided into three age groups with main age of  $31.2 \pm 20.1$  years old. There were 26 males and 14 females. Etiological causes were trauma 30 patients (75%), benign obstruction 2 patients (5%), malignant obstruction 4 patients (10%) and the acute abdomen 4 patients (10%). Time between injury and admission was less than 8 hours in 28 patients and it was between 9 to 24 hours in 12 patients (30%) and more than 24 hours in 4 patients (10%). Shock defined by systolic blood pressure less than 90 mmHg was present in 7 (17.5 %) patients and non-shocked patients were 33 patients (82.5%). **Conclusion:** After reviewing many literatures and studies, after this work. We recommend primary repair of the colon in colorectal emergent conditions. Especially injuries and benign obstruction and care must be taken when performing primary repair in cases of malignant obstruction and peritonitis due to non-traumatic colonic perforation (PNTCP). First of all the main indicator for the primary repair is the patient's general condition. Over all the main determine to do primarily repair or to divert is the general condition of the patient.

**Keywords:** Primary Colonic Repair, Stoma IN Emergency Cases

### INTRODUCTION

In emergency surgery, management of an enterotomy, either spontaneous or following resection of a bowel segment can be by approximation of cut edges, referred to as primary repair or by exteriorization of the involved segment, referred to as ostomy.

Indication of this operation can be a perforated bowel segment (produced as a result of trauma or secondary to an inflammatory process of gut) or a devitalized/redundant segment of bowel requiring resection<sup>(1)</sup>.

Penetrating colon injury or blunt abdominal trauma carries a high risk of a high-risk rate of infectious morbidity. The development of infectious complications is related to the injury severity and haemodynamic status of the patient, not the type of operation performed<sup>(2)</sup>.

Latrogenic abdominal colonic perforation is a rare but very dangerous complication of colonoscopy<sup>(3)</sup>.

During the world war II, diversion was the dictum, current trends favor the primary repair. Colostomy is no longer a standard option because of

its own complications and the need for subsequent surgery<sup>(4)</sup>. It seems, however that there is a limited role for colostomy, particularly in high-risk patient with destructive injuries of the left colon<sup>(5)</sup>.

The decision regarding the type of surgery needs to balance the risks of anastomotic dehiscence to the of bowel exteriorization. Although numerous studies have concluded a trauma primary advantage of repair over stoma formation in emergency trauma surgeries<sup>(6)</sup>.

There are different strategies to avoid colostomy and its associated problems with improved facilities in patient care and proper use of antibiotics, the surgeons today are more included to primary repair of colon<sup>(7)</sup>.

### AIM OF THE WORK

Comparing the outcome of primary repair versus colon diversion in emergency cases regarding efficacy, safety and usefulness.

### PATIENTS AND METHODS

A prospective study on 40 patient undergoing either primary repair of bowel or intestinal stoma formation following emergency

laparotomies in the Department of Surgery in El-Hussien and El-Haram Hospitals, which is a big emergency and trauma center and cover large geographic area. **The study was approved by the Ethics Board of Al-Azhar University.**

All persons gave their informed consent. The people who had the decision in performing and choosing the type of the operation were specialists and consultants (they had the license as decision makers).

All patients presented in ER department with colorectal emergencies, included Trauma (penetrating, gunshot & blunt), obstruction (malignant & non-malignant) and acute abdomen due to perforation, and need emergent laparotomy confirmed by history, clinical examination, investigations.

**All patients were subjected to the following: In Emergency Room:** The patients were assessed clinically and resuscitated with intravenous fluids and blood transfusions to improve haemodynamic status.

Haemodynamic status determined based on their heart rate and systolic blood pressure on admission, a systolic blood pressure equal to or < 90 mmHg on admission interpreted as haemodynamic instability or presence of shock).

Nasogastric and urethral catheter were positioned in all cases.

**Baseline investigations included:** Complete blood count (CBC), renal and liver functions tests, blood gases, electrolytes, X-ray chest, ECG, abdominal ultrasonography, plain x-ray of the abdomen often reveal multiple air fluid levels. In doubtful cases CT scan was performed. Proper preoperative antibiotic coverage usually with a combination of cephalosporins and metronidazole through I.V. line

**Operatively:** In all cases, laparotomy were done through midline incision under general anesthesia.

Operative data were studied including the operative diagnosis, the procedures done. The condition of gut wall, the adequacy of blood supply and faecal contamination (minimal: when contamination limited to the site of colonic pathology, moderate: when contamination limited to the affected quadrant of the abdomen or, severe: when contamination was affecting more than one quadrant), associated injuries, operative duration and intraoperative complications were recorded.

**There were multiple techniques used according to the need:**

**(A) Primary Repair:**

**Primary repair without resection-anastomosis:** The repair was done in double-layer repair with inner layer all layers continuous suturing and the outer interrupted sero-muscular Lembert sutures

**Primary resection-anastomosis:** That included many forms of colonic resection according to the situation: A) Segmental resection B) Formal and limited right hemicolectomy with ilio-colic anastomosis C) Formal and limited left hemicolectomy with colo-colic or colo-rectal anastomosis.

Most cases, the anastomosis was end to end double-layer anastomosis by hand sewing with an inner layer of continuous sutures encompassing all layers followed by an outer seromuscular layer of interrupted Lembert sutures using vicryl (0.3) Except few cases where staplers side to side anastomosis was used.

**(B) Stoma Formation:**

Through a standard technique of circular skin opening incision of anterior and posterior rectus sheath, muscle splitting, placing of supporting rod /feeding tube bowel exteriorization and placing of sutures from bowel full thickness to the deep dermal layer of skin.

**Types of colostomy:**

**A) Loop colostomy:** A loop of the bowel was pulled out onto the abdomen and held in place with an external device. The bowel was then sutured to the abdomen and two openings were created in the one stoma: one for stool and the other for mucus.

**B) End colostomy:** A stoma was created from one end of the bowel. The other portion of the bowel was either removed or sewn shut (Hartmann's procedure).

**C) Double barrel colostomy:** The bowel was severed and both ends were brought out onto the abdomen. Only the proximal stoma was functioning. After all colon injuries were repaired, the peritoneal cavity would be flooded with a copious amount of warmed sterile saline (about 6 liters) before fascial closure. Peritoneal toilet. Wide drain enough to detect any early colon leakage was inserted. An additional application of saline irrigation was used on subcutaneous tissue and skin before wound closure. Skin was primarily closed in all cases.

**Post-operatively:** Assessment of possible postoperative complications such as wound (sepsis & dehiscence), anastomotic leak (low output fistula: when the output was less than 200cc/day or high output: when the output was more than 200cc/day), peritoneal sepsis, intra-abdominal abscess, septic shock and development of multi organ failure were investigated.

**Stoma specific complications:** Skin excoriation, stoma prolapsed and retraction, parastomal hernia, stomal necrosis, local abscess and obstruction were assessed.

**Primary repair specific complications:** Anastomatic leak, fistula formation and obstruction were assessed.

**Early Detection of Colon Leakage by:** 1- Clinically: - General examination showed abnormal vital signs as increased heart rate, increased temperature, decrease BP, abdominal tenderness, rebound tenderness and decreased or even absent intestinal sounds. - Local abdominal examination showed signs of acute abdomen as tenderness, rebound tenderness, abdominal rigidity and absent intestinal sounds. Feaculant discharge in collection bags connected to intraperitoneal or subcutaneous drains. 2- Laboratory: Rising leucocytic count. 3- Radiological: abdominal ultrasound showing fluid collection with trial ultrasound guided aspiration from this collection, C.T. scan of the abdomen and pelvis with oral, I.V. and rectal contrast may show site of leak.

**Discharge and Follow up:** The patients were discharged from the hospital when they tolerated oral feeding, became freely mobile, afebrile and the post operative period remained uneventful for few days. Follow up in group (A) was done twice after two weeks and after one month. Follow up in group (B) was done multiple times. Initially the visit was after every two weeks until the patient called back advised for colostomy closure. After colostomy closure, the patient was advised to follow up twice a month for one month.

**Statistical analysis:** Statistical analyses were performed using PRISM 5 (GraphPad Software Inc., San Diego, CA). Fisher exact and Chi-square tests to determine the significance of any differences between patients regarding the different variables. Significance was determined with P-value <0.05.

## RESULTS

**Table (1):** Types of patients according to age, sex, time passed and shock.

Feature	Number	% of total
<b>Age in years</b>		
<18 years	10	25 %
18-59	25	62.5 %
≥60 years	5	12.5 %
<b>Sex</b>		
Male	26	65%
Female	14	35 %
<b>Etiological causes</b>		
Trauma	30	75 %
Benign obstruction	2	5 %
Malignant obstruction	4	10 %
Acute abdomen	4	10 %
<b>Time lag</b>		
Early(0-8hrs)	24	60%
Average(9-24hrs)	12	30%
Late(>24hrs)	4	10%
<b>Presence of shock</b>		
Shocked	7	17.5 %
Not shocked	33	82.5 %

Shock defined by systolic blood pressure less than 90 mmHg was present in 7(17.5 %) patients and non-shocked patients were 33 patients (82.5%).

**Table (2):** Types of patients according to fecal contamination, grade of colonic injury and pathology side.

Feature	Number	% of total
<b>Fecal contamination</b>		
Mild	30	75%
Moderate	7	17.5%
Severe	3	7.5 %
<b>Grade of colon injury</b>		
Grade II	20	50 %
Grade III	6	15%
Grade IV	5	12.5 %
Grade V	9	22.5 %
<b>Side of pathology</b>		
Rt colon	10	25 %
Lt colon	11	27.5 %
Rectosigmoid	12	30 %
Transverse colon	7	17.5 %

Fecal contamination was mild in 30 patients, it was moderate in 7 patients and it was severe in 3 patients. Grading of colonic injury was grade II in 20 patients, grade III in 6 patients, grade IV in 5 patients and grade V in 9 patients. Patients Side of pathology was right colon in 10 patients, left in 11 patients, rectosigmoid in 12 patients and transverse colon in 7 patients.

**Table (3):** Complications according to type of patients.

Feature	Complications		P-value	Total
	Non-complicated	Complicated		
<b>Etiological causes</b>			<0.05	
Trauma	20 (66.66 %)	10 (33.33%)		30 (100%)
Benign obstruction	2 (100 %)	0		2 (100 %)
Malignant obstruction	2 (50%)	2 (50%)		4 (100%)
Acute abdomen	3 (75%)	1 (25%)		4 (100 %)
<b>Time lag</b>				
Early (0-8hrs)	19 (79.16 %)	5 (20.83 %)		24 (100%)
Average (9-24hrs)	7 (58.33 %)	5 (41.66 %)		12 (100%)
Late (>24hrs)	1 (25 %)	3 (75 %)		4 (100%)
<b>Presence of shock</b>				
Shocked	2 (28.57 %)	5 (71.42 %)		7 (100%)
Non-shocked	25 (75.75 %)	8 (24.24 %)		33 (100%)
<b>Fecal contamination</b>				
Mild	23 (76.66%)	7 (23.33%)		30 (100%)
Moderate	3 (42.85 %)	4 (57.14 %)		7 (100%)
Severe	1 (33.33)	2 (66.66 %)		3 (100%)
<b>Grade of colon injury</b>				
Grade II	18 (90 %)	2 (10%)		20 (100%)
Grade III	4 (66.66%)	2 (33.33%)		6 (100%)
Grade IV	2 (40%)	3 (60%)		5 (100%)
Grade V	3 (33.33%)	6 (66.66%)		9 (100%)
<b>Side of pathology</b>				
Rt colon	8 (80%)	2 (20%)		10 (100%)
Lt colon	7 (63.63%)	4 (36.36%)		11 (100%)
Rectosigmoid	7 (58.33%)	5 (41.55%)		12 (100%)
Transverse colon	5 (71.42%)	2 (28.57%)		7 (100%)
Total	27 (67.5%)	13 (32.5%)		40 (100%)

Complication rate increased with the increase in the grade of injury. Colon injury score was found to be significant in predicting complication rate. Regarding to the side of pathology, complication rate was higher in injuries of the left side compared to those of the right side.

**Table (4):** Post-operative complication in relation to colon repair.

Type of colon repair	Complication		Total
	Non complicated	Complicated	
Primary repair	16 (80 %)	4 (20 %)	20
Diversion	11 (55%)	9 (45 %)	20
P-value	<0.05		40

Complication rate was higher in those patients who were treated by any type of diversion compared to those who were treated by primary repair.

## DISCUSSION

This study was done to compare the outcome of primary colonic repair versus colon diversion in different colorectal emergencies and find the factors, which encourage the surgeon and the factors, which restrict him when facing such situations.

The mean age in our study was 31.2 ± 20.1 years old and the males represented 70% of the patients which not far from the same age group and gender distribution in the study of *Ajay et al.*<sup>(8)</sup>. The most of our cases were due to trauma and the middle-aged males almost were the most affected group.

The main etiology was the traumatic perforation of the colon (60%) then colonic obstruction

either benign or malignant (25%) then the non-traumatic perforation (15%), which was different from *Ajay's* study where non-traumatic perforation was the most common indication for exploratory laparotomy (61%) in the study group, followed by sub-acute intestinal obstruction (19%), traumatic perforation (15%) and sigmoid volvulus (5%). Ileum, especially in its distal part, was the most common site of insult (73%)<sup>(8)</sup>.

This different distribution of etiological causes may be due to the wide spread of typhoid and other infectious diseases which caused ulceration and perforation of intestine in India.

In our study, we reached to the conclusion that whether the time elapsed from the injury to admission was more or less than 12 hours, complications resulting from primary repair were much less than of diversion. The same results were concluded by *Burch et al.*<sup>(9)</sup> who found that the morbidity and mortality rates were consistently lower in those patients treated by primary repair regardless of the elapsed time between wounding and operation.

Our findings that the shorter the lag period the better the outcomes goes with the result of *Ajay et al.*<sup>(8)</sup> and *Ahmad et al.*<sup>(10)</sup> studies.

Shock in some studies was considered to be a non-significant factor in predicting the frequency of complications<sup>(11)</sup>, however *Shannon and Moore*<sup>(12)</sup> considered shock as contraindication to primary repair of colon as it increased the complication rate.

Colon Injury Score (CIS) was a factor in predicting the complication. In our trial complication rate was higher in those patients with multiple colon injuries compared to those with single colon injury. It was also higher in injuries of the left side compared to those of the right side. The left colon injury had been considered an indication for diversion due to poor healing, differences of collagenase activity and a higher concentration of bacterial flora that may be a factor in complications involving a left colon if managed by primary repair<sup>(13)</sup>.

In our study, severe fecal contamination was considered to be a contra-indication to primary repair or resection and anastomosis. On the other hand, *Adkins et al.*<sup>(14)</sup> concluded that gross contamination alone should not be a contraindication to primary repair or resection and anastomosis. *George et al.*<sup>(15)</sup> considered fecal contamination as a risk factor for development of septic complications and might precipitate anastomotic leaks. These result supported our results in which severe contamination was associated with more septic complications than that with mild and moderate contamination and there was a highly statistical

significant relation between fecal contamination and complications rate. The use of copious amount of intraperitoneal and subcutaneous saline irrigation had probably decreased the fecal contamination to be insignificant concentration and this irrigation method might affect the outcome of colon injury in relation to the site of injury.

In our study, leak occurred in 3 cases, one of them was low output fistula and managed conservatively, while the other 2 cases were high output fistula, one of them was re-explored and diversion done, the other case deteriorated and died.

Complication rate was higher in those patients who were treated by any type of diversion compared to those who were treated by primary repair. In our study, the overall complication was about 32.5 % of total patients and the most common complication was the wound infection 76.9 % of total complications. This was due to delayed time lag in these cases, presence of severe fecal contamination, presence of shock and presence of other associated intra-abdominal injuries. The colostomy didn't protect those patients from septic complications. Mortality rate in our study was 3 patients (7.5%) from shock and multiorgan failure compared to (6%) in other study by *Ajay et al.*<sup>(8)</sup> and (5%) by *Ricciardi et al.*<sup>(16)</sup>.

## CONCLUSION

After reviewing many literatures and studies, after this work, we recommend primary repair of the colon in colorectal emergent conditions. Especially injuries and benign obstruction. Care must be taken when performing primary repair in cases of malignant obstruction and peritonitis due to non-traumatic colonic perforation (PNTCP). First of all, the main indicator for the primary repair is the patient's general condition. Over all the main determinant to do primarily repair or to divert is the general condition of the patient.

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