

Safety of Primary Repair in Colonic Injury Cases

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Funding information

Self-funded

Conflict of interest

None declared by author

Received : January, 2024

Published: March, 2024

ABSTRACT

Background: Various criteria are crucial in determining whether diversion or primary repair should be chosen for surgical treatment of colorectal injuries. This study aims to determine the safety and timing of primary repair for individuals with colonic injuries.

Objective: To evaluate the safety of primary repair of colonic injury versus colostomy and parameters of exclusion.

Patients and Methods: prospective analytical longitudinal study of 2 years duration from October 2011 to December 2013. There were 35 cases of colonic injuries, with 25 being isolated colonic injuries. Twenty of the isolated cases were treated with primary repair. The remaining 10 cases were colonic injuries with associated additional visceral injuries, with five of them being treated by primary repair.

Results: out of 25 patients with isolated colonic injury, 20 patient treated by primary repair, 15 patients did well and the repair succeeded. and out of 10 patients with associated colonic injuries (with other visceral injuries) ,5 patients treated by primary repair ,3 patients did well and repair succeeded, we depended on American Association grading for classification of colonic injuries.

Conclusion: This study supports a more lenient approach to using primary repair in the initial treatment of colon injuries.

Keywords: Primary repair, colonic injuries, colostomy

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1. INTRODUCTION

The colon is frequently injured in penetrating abdominal trauma, ranking second behind the small bowel. Colonic injuries caused by physical trauma are uncommon, affecting approximately 2–5% of patients in most cases (1). If we go back to second world wartime, at those points in history, large numbers of casualties must be managed in a concentrated time frame. Standard management protocols are developed based on experience gained from the sudden large trauma volume and due to insufficient numbers of surgical personnel skilled in managing injuries. Exteriorization of the wounded colon as a colostomy became the established method of management of colon injuries in World War II and remains the most frequently used approach. Two major considerations are operative in altering this standard. First, civilian wounds are generally less destructive than those resulting from high-velocity missiles and shrapnel encountered during war. Second, important advances have been made in resuscitation, antibiotic therapy, and development of trauma systems that allow for rapid, definitive surgical care. With these considerations, a trend toward primary repair of carefully selected patients with a low degree of injury has emerged (2,3). Colonic injury management has been developing during the past thirty years. Before that period, the majority of colonic injuries were treated by either exteriorizing the wound or creating a proximal colostomy because to concerns about a high risk of anastomosis failure. The fundamental reason for the high failure rates in primary closure repair was the delay in proper resuscitation and limited progress in antibiotic development. Enhancements in trauma care led to reduced mortality and morbidity associated with these injuries (4,5). Over the last two decades, there has been a growing inclination towards primary repair (6). The benefits of primary repair include avoiding the need for a colostomy, which reduces the morbidity and costs associated with colostomy care and hospitalisation for closure. The possible disadvantages of primary closure include the morbidity and mortality linked to repair failure (7). Recent research supports primary repair versus colostomy, but there is still debate regarding the ideal conditions for primary repair (3, 5, 8).

During our two-year prospective study at the hospital, we primarily performed colonic damage closure in most cases and opted for colostomy in selected patients to reduce morbidity and death.

2. METHODOLOGY

This is a prospective analytical longitudinal study of 2 years duration from October 2011 to December 2013. total number of colonic injury cases in this study were 35, isolated colonic injuries were 25 and associated colonic injury (with other visceral injuries) were 10 cases, the patients classified into 2 groups.

Primary repair group include 25 patients and colostomy group which include 10 patients.

The ages of the patients were between (5-67) year old with mean age 41 year old.

The genders of the patients were 26 male and 9 patients were female.

All patients were received in Emergency room of AL-Imamein AL- Kadhmein medical city and operated upon by one team composed of 4 seniors surgeons and 5 seniors house officer surgeons.

Most colon injuries are identified before surgery (during laparotomy). Each patient received a comprehensive clinical evaluation and appropriate diagnostic tests (abdominal radiography, CT scans) if they were stable. All patients were given intravenous antibiotics before surgery (1 gramme of 3rd generation cephalosporin and 0.5 grammes of metronidazole) and continued to receive them for 5 days after surgery, we exclude rectal injuries, multiple site injuries more than 3, multiple injured patient, extra abdominal injuries (chest, limbs, head).

Primary repair was possible in 25 patients, which was performed by either closure of the perforation, by a local trimming or resection and reanastomosis by single interrupted sub mucosal, 2/0 vicryl suture. the other 10 patients treated by colostomy.

We adopted American Association grading of colonic trauma as a guide line during operative assessment of colonic injuries.

We excluded rectal injuries & those patients with colonic injuries associated with extra abdominal injuries (orthopedic, thoracic, head injuries & spine) from this study.

The American Association for the Surgery of colonic Trauma	
Grade 1	Contusion or hematoma without devascularization
Grade 2	Partial thickness laceration, no perforation
Grade 3	Laceration <50% of circumference
Grade 4	Laceration >50% of circumference without transection of the colon
Grade 5	Transection of colon with segmental tissue loss, devascularized segment

The grounds for excluding primary repair were

- Grade 4, 5 colonic injury.
- Co-morbid disease and immune compromised patients-
- Associated with generalized peritonitis > 8 hr.
- Patients with profound shock (needs >4 units of blood.

3. RESULTS

Out of 35 patients with colonic injury ,25 patients had isolated colonic injury 20 patients treated by primary repair, in 15 patients the repair was successful and patients did well post operatively, while in 5 patients developed anastomotic leak, two of them needed relaparotomy and colostomy due to peritonitis & sepsis, and 3 patients treated conservatively .and in 10 patients with associated colonic injuries (associated with other visceral injuries) primary repair done in 5 patients, in 3 patients the primary repair was successful, while in 2 patients had complications ,one of them did laparotomy and colostomy while the other had anastomotic leak (fistula formed) treated conservatively and healed within 25 days .

Table 1. Mode of injury and number of the patients in whom primary repair done and the group in whom colostomy done

Mode of injury	Primary repair group	Colostomy group
Shell injury	11	5
Gunshot injury	6	2
Stab wound	3	2
Road traffic injury	3	1
Iatrogenic (sigmoidoscopy, D&C)	2	0

Table 2. Distribution of patients who developed major complications according to the sites of colonic injury in primary repair group.

Major complication	Suture line disruption & sepsis	fistula	collection	Total
Right colon	1	1	0	2
Transverse colon	0	1	1	2
Left colon	1	1	2	4
total	2	3	3	8

Note: the patient may have more than one complication at the same time.

Table 3. Distribution of the patients in colostomy group according to the indication spectrum of patients in colostomy group

spectrum of patients in colostomy group	No.	%
Need more than 4 units of blood transfusion	5	50.0
Time of injury to admission > 8 hours	2	20.0
De-vascularization of colon	2	20.0
Uncontrolled diabetes mellitus	1	10.0
Total	10	100.0

Table 4. Number of the our patients with colonic injuries in accordance to the American Association grading for the surgery of colonic trauma.

Grade	No.	%
Grade 1	3	8.5
Grade 2	6	17.1
Grade 3	17	48.5
Grade 4	5	14.2
Grade 5	4	11.4
Total	35	100.0

Table 5. The locations of the colonic injuries among our two groups of patients.

Site	Primary repair group	Colostomy group
Rt. Colon	11	2
Transverse colon	8	3
Left colon	6	5
Total	25	10

Number of patients with major complication in primary repair group was 8/25 (complication rate=32%). Number of the patients with major complication in colostomy group was 4/10 (complication rate= 40%).

Table 6. The major complications in our patients.

Major local Complication	primary repair group (n=25)	Colostomy group n=10
Deep SSI	3	1
Collection intra-abdominal	2	2
Burst abdomen	1	1
Gangrenous stoma	0	1
Suture line disruption and sepsis	1	0
Fistula	1	0

Note: the patient may have more than one complication at the same time.

4. DISCUSSION

Three decades ago, it was standard policy to perform a colostomy in cases of colonic damage. However, this concept has since been frequently questioned and examined (9). Recent studies have shown that primary repair is a safe option for most patients, with only a small number of high-risk individuals requiring faecal diversion such as colostomy or ileostomy. There is no specific technique or evident risk factor that definitively indicates when primary repair should not be performed. An author determined that patients requiring 6 units of blood transfusion and experiencing delayed injury instances of more than 6 hours should be investigated for faecal diversion (2,4). Our study design included criteria for patients requiring more than 4 units of blood transfusion or experiencing more than an 8-hour time delay between injury and operation. and patients with high grade colonic injury or

multiple injuries should not be considered for primary repair as those patients carried a high risk for complications as supported by many evidence based studies (2, 4, 5). During our two-year study at the hospital, we mostly repaired colonic injuries in most cases and performed colostomies in high-risk patients to reduce morbidity and death. Our study did not distinguish between right or left colon injury management. Some studies suggest that colonic resection and anastomosis can be safely performed in the majority of patients, including those with left colon injuries (10, 11). However, another study indicated that left colon injuries should be treated with an end colostomy (12, 13). In a retrospective study by Murray JA14, 140 patients were analysed over a 66-month period. The study revealed that colonic injuries handled with resection had a higher complication risk, regardless of whether an anastomosis or colostomy is performed. They lowered the criterion for colostomy in subgroups with high abdominal trauma index or hypotension and recommended additional research on the topic. In our study also we did not do primary repair in extensive devascularising colon injury and hypotensive cases needing more than 4 unit of blood for transfusion to recover from shock. We believe that the presence of hypotension and faecal contamination did not affect the result of primary repair or colostomy. The complication rates in both groups were similar, at 32% and 40% respectively, which aligns well with findings from other studies conducted by different authors (15, 16). Colonic injury poses a significant risk of sepsis caused by faecal leakage due to anastomotic breakdown. It is crucial to consider this complication when determining the treatment approach for colonic damage. The incidence of colon suture line disruption varied among studies, leading to inconclusive evidence about the risk factors associated with this issue. In a prospective analysis by Cornwell E E et al, they observed a 6% complication rate of suture line disruption in 56 patients with colonic injuries repaired by primary repair. They suggested considering faecal diversion in high-risk cases with destructive colon injuries. Our study reported a higher complication rate of 12%, possibly due to a higher infection rate (17). Adesanya AA et al. conducted a 10-year analysis on 60 cases of colonic damage and concluded that there was no significant difference in outcomes between patients who underwent primary repair and those who had diverting colostomy. They have seen a higher occurrence of complications in cases including severe colon damage, shock upon arrival, significant faecal contamination,

operations lasting over four hours, and a penetrating trauma index score over (25, 18). Curran T J et al. performed a literature review of 35 papers analysing 5400 colon injuries in both retrospective and prospective studies. In most of these research, the choice to conduct primary repair was based on the surgeon's judgement or when no risk factors were identified. In a study involving 337 patients who underwent repair without any exclusion criteria, only 1.2% reported suture line failure, which was not statistically significant (p =not significant). The rate of leaking after surgical removal and reconnection is 5.5%, which is higher than the rate after a simple suture of the perforation, which is 1.4%. Repair failures were common in cases with numerous injuries or other medical problems (19). Cornard JK et al. found that the risk factors for failure of resection and anastomosis have not been determined yet. They evaluated the management patterns suggested by prior studies and analysed the outcomes of primary repair, prompting the necessity for additional research (20). In a report from August 2007 by Beitenstein S et al., it was found that primary repair with protective ileostomy is a more effective treatment than Hartmann's procedure for left colon perforation. The study revealed a higher leak rate in left colon primary repair compared to right colon cases, with 33% of left colon repair patients experiencing leaks compared to 18% in right colon cases. This difference may be attributed to greater sepsis due to extensive faecal contamination. Protective ileostomy was not performed in these cases. There was no difference in outcome between the two surgical methods for colon treatment in high-risk individuals. Abdominal problems are influenced by individual risk factors rather than the technique used for repair (21). An research conducted at multiple centres identified three specific risk factors for abdominal complications: substantial faecal contamination, receiving over 4 units of blood transfusion during the initial 24 hours, and utilising a single-agent antibiotic prophylactic. We did not choose primary repair for individuals requiring a substantial volume of blood transfusion. We set the cut-off point at >4 units of blood transfusion, which is a more conservative approach compared to prior studies that set it between >4 and >6 units (22-24). Various factors such as hypothermia, coagulopathy, and systemic inflammatory disease can influence outcomes in addition to shock. Age did not have a direct impact on the outcomes of colon repair, but the presence of co-morbid conditions may be more common among these individuals. Comorbidities, rather

than age, may be the determining factor in influencing the decision. Thus, we considered comorbidity as a risk factor instead of focusing exclusively on age. Sorting out all comorbidities in these patients is challenging due to the lack of clear past medical history. We mostly regarded major medical conditions such as severe diabetes as contraindications. Borderline diabetes, mild hypertension, and similar conditions are not considered contraindications. However, the decision to proceed with surgery in these cases is left to the surgeon's clinical judgement based on the individual patient. Nelson RL et al conducted systematic reviews to address the safety of primary repair, utilising meta-analysis of six randomised controlled studies. Both groups in the studies consisted of high-risk patients (25) Overall, problems were more favourable with primary repair compared to faecal diversion. Two types of studies were conducted: One study with specific criteria for primary repair and another study without specific criteria. Trials with exclusion criteria may not be globally applicable, but trials without exclusion criteria can be generalised. Gonzaley et al. conducted a trial with no exclusion criteria, showing a higher complication rate in the diversion group with severe faecal contamination, shock with significant blood loss, injuries to more than two organ systems, or extensive colon injuries. No substantial disparities were seen across groups in the incidence of sepsis, wound complications, or mortality in trials that did not exclude any criterion. This supports our results in two groups of patients where the complication rates were comparable. We should reduce our apprehension about primary repair in colonic injuries by minimizing the use of colostomy in situations of colonic injury (26).

5. CONCLUSIONS

Primary repair can be safely done in majority of patients with colonic injuries and the most life threatening complication that may ensue following primary repair i.e suture line disruption can be managed successfully with minimal mortality and it is nearly comparable to that with diversion operations and it have advantage of avoiding second closure procedures, patient's distress from colostomy care and bad odor and extra cost and hospitalization.

Ethical Approval:

All ethical issues were approved by the author. Data collection and patients enrollment were in accordance with Declaration of Helsinki of World Medical Association , 2013 for the ethical principles of researches involving human. Signed informed consent was obtained from each participant and data were kept confidentially.

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Citation:

Ferman M.H, Kareem A.A.H, Jaafar B.Z Safety of Primary Repair in Colonic Injury Cases. *AJMS* 2024; 10 (1): 92-103