6 Year Prospective Clinical Trial of Primary Repair Versus Diversion Colostomy in Colonic Injury Cases

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Abstract Management pathway of colonic injury has been evolving over last three decades. There has been general agreement that surgical methods dealing with colonic injury did not affect the outcome but there are certain independent risk factors for complications. These risk factors are still not clear and studies are going on to specify these risk factors. The primary objective of this study was to demonstrate that primary closure of colonic injury without colostomy in selective patient is safe. This was a prospective study of 6 year duration. All the colonic injuries operated and divided into two groups: primary repair and colostomy. The criteria for exclusion of primary repair taken were; injury time >8 hour, patient need >4 unit of blood transfusion till surgery, devascularization injury of colon, any pre existing disease of bowel, any severe co morbid disease like uncontrolled diabetes mellitus, tuberculosis, malignancy etc. Both groups are analyzed by assessing complications with special emphasis on leak rate. Patients died within 72 hours of admission were excluded from study. Total 55 colonic injury cases operated and primary repair was done in 35 cases and colostomy in 20 cases. There was 1 mortality in colostomy group and no major morbidity in both groups. The complications in primary repair group were; 1 leak (treated conservatively), 5 wound infections 1 incisional hernia and 1 intra abdominal abscess. In colostomy group 8 cases of wound infections, 2 incisional hernias and 2

intra abdominal abscesses occurred. Primary repair of colon injuries can be safely done in selected patient.

Keywords Colonic injury · Primary repair · Colostomy

Introduction

Management of colonic injuries has been evolving over last three decades. Prior to that time most of colonic injuries were managed by exteriorization of the wound or proximal colostomy; because of a fear of high rate of anastomosis failure. Due to the high failure rate with primary closure repair during world war-I, colostomy was mandated by Major General W. H. Oglivi; the consultant surgeon of the Middle East forces in the east Africa in 1943. The reasons for the failure were delay in effective resuscitation of high velocity wound, absent of blood banks and minimal antibiotics development. Improvement in trauma care resulted in decreased mortality and morbidity of these wounds. In 1950, some surgeon began to change the concept that colostomy was mandatory for management of all civilian colon injuries. The first prospective study done in 1979 laid foundation for the modern treatment of colonic injuries by confirming the safety and efficacy of primary repair in selected patients [1].

In past 20 years there has been an increasing trend toward primary repair. Advantages of primary repair are the avoidance of colostomy with reduction in morbidity of colostomy itself and cost associated with colostomy care and subsequent hospitalization for closure. Potential drawbacks of primary closure are the morbidity and mortality associated with failure of repair in recent years. There have

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been several studies that support primary repair over colostomy; however there is continued confusion as to when primary repair is appropriate. In our prospective study of 6 years at our hospital we have done primary closure of colonic injury without colostomy in selected patients; so that morbidity and mortality can be minimized.

Objective

Primary objective of this study was to demonstrate that primary closure of the colonic injury without colostomy in selective patient is safe and morbidity is less over colonic repair with colostomy.

Material & methods

This was a prospective study of 6 year duration from June 2002 to June 2008. Total no. of colonic injury cases were 55 out of which only colonic injuries were 40 and colonic injury with associated other visceral injury were 15 cases, like small bowel injury 10, spleen injury 3, stomach injury 2. Mode of injury were road traffic accident and fall from height as most common causes followed by stab injury, firearm injury, iron rod insertion to rectum, perforation during rigid sigmoidoscopy and during adhesiolysis (Table 1). Age group was 10 year to 60 year of age.

In 35 cases primary repair of colon was done and in 20 cases colostomy was done. The criteria for exclusion of primary repair taken were; time >8 hr, patient was needed >4 unit of blood transfusions, destructive or devascularization injury of colon, any pre existing disease of bowel, any co morbid disease like diabetes mellitus, tuberculosis, malignancy etc. Table 2 presents the spectrum of patients in colostomy group. We did not consider criteria of age; associated injury of other organ needed less than 4 unit of blood. Patient died within 72 hours of admission were excluded from study.

Table 1 Mode of injury

Mode of injury	Primary repair group (n=35)	Colostomy group (n=20)
Road traffic accident	16	10
Fall from height	8	2
Stab injury	8	3
Gun shot injury	3	5
Iron rod insertion	1	0
Injury during Sigmoidoscopy	1	0
Adhesiolysis	1	0
Total	35	20

Table 2 Spectrum of patients in colostomy group (n=20)

Time of injury to admission >8 hour	10
Needed >4 unit of blood transfusion	5
Devascularization of colon	2
Preexisting bowel disease	2
Uncontrolled diabetes mellitus	1

Result

Outcome of both the group was analyzed by assessing complications with special emphasis on leak rate (Table 3). One patient died after 7 days in colostomy group because of septicemia and multiple organ failure. There was no major complication in both groups. There was only one leak in primary repair group which was treated conservatively. Apart from this there were 5 wound infections, one incisional hernia and one intra abdominal abscess in this group. In colostomy group 8 cases of wound infections, 2 incisional hernias and 2 intra abdominal abscesses occurred.

Discussion

Three decade ago it was a protocol that colostomy should be done in most of colonic injury but this concept has been challenged and tested regularly. Various studies in last decade indicates that primary repair can be done safely in most of the patients and very few poor patient may need fecal diversion i.e. colostomy or ileostomy. There is no definite protocol and clear cut risk factor in which primary repair should not be done.

Some author concluded that patient needed 6 unit of blood transfusion and more than 6 hr delayed injury cases should be considered for fecal diversion [2]. In our study design we put the criteria that patient needed >4 unit of blood transfusion and >8 hr lapse between injury and surgery should not be considered for primary repair. One study say that left colon injury should be managed by end colostomy [3]. Our study do not differentiate between right or left colon injury for management Murray JA in their retrospective review study on 140 patients over 66 month

Table 3 Complications in both groups

Complications	Primary repair group (n=35)	Colostomy group (n=20)
Wound infection	5	8
Leak	1	0
Incisional hernia	1	2
Intra abdominal abscess	1	2

period analyzed and concluded that colonic injury managed with resection have more complication rate regardless of whether an anastomosis or colostomy is performed [4]. Colonic resection and anastomosis can be safely done in majority of patients including left colon injury cases also. So they further reduced the criteria for colostomy in these subgroups that have high abdominal trauma index or hypotension, and advised further such study. 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 think that merely presence of hypotension and fecal contamination did not have any bearing on outcome of primary repair or colostomy. Complication rate in both groups will be same. This view is very close to a study done by few other authors [5, 6]. They concluded that nearly all penetrating colon wounds can be repaired primarily or with resection and anastomosis, regardless of risk factor. There were complications in some cases but none of these complications were because of anastomotic leak and fistula formation [5–7]. The main danger of colonic injury is sepsis resulting from fecal spill and we should be careful for this complication while deciding the management of colonic injury. This complication of colon suture line disruption varied in different study, so there is no final conclusion about all risk factors causing this problem. Cornwell E E et al. in their prospective analysis of 56 patients of colonic injury of high risk category repaired by primary repair found 6% complication rate of suture line disruption and concluded that fecal diversion should be considered in high risk category with destructive colon injuries [2]. Adesanya AA et al. in their 10 year study of 60 colonic injury cases found no difference in outcome between patients who had primary repair and those undergoing diverting colostomy [9]. They have seen more incidence of complications with destructive colon injury, shock on admission, major fecal contamination, duration of operation more than four hours and penetrating trauma index score >25.

Curran T I et al. evaluated the literature review of 35 publications containing 5400 colon injuries in retrospective and prospective studies [10]. In most of these studies, decision of primary repair was based on surgeon discretion or absence of risk factors. However prospective series of 337 patients repaired without exclusion criteria, there were only 1.2% suture line failure (p =not significant). The leak rate after resection and anastomosis (5.5%) is greater than after simple suture of perforation (1.4%). Failed repair were high in the setting of multiple injuries or co morbid conditions. The risk factors for failure of resection and anastomosis could not be defined yet as concluded by Cornard JK et al. [11]. They compared the management trends given by these previous studies recommendations

and assessed their results of primary repair and felt the need for further investigations.

The most recent publication of Aug2007 written by Stefan Beitenstein et al. revealed that in left colon perforation; primary repair with protective ileostomy is a superior treatment than Hartmann's operation [12]. Our study did not show any difference in leak rate between left & right colon primary repair and we did not do protective ileostomy also in these left colon repair cases. In our study there was only one leak in left colon repair case perhaps because of increased sepsis of severe fecal contamination.

The two surgical method of colon management in high risk patients showed no difference in outcome. There are independent risk factors for abdominal complications rather than method of repair. A multicenter prospective study identified three independent risk factors for abdominal complications; i.e. severe fecal contamination, transfusion of >4 unit of blood transfusion within the first 24 hour and single agent antibiotic prophylaxis [13].

We did not perform primary repair in those patients requiring massive transfusion and we decided it >4 unit of blood transfusion requirement as cut off point. Though previous studies decide it between >4 and >6 unit of blood transfusion but we remain on safer side [13, 14]. There are many factors that may influence outcome apart from shock itself but also hypothermia, coagulopathy and systemic inflammatory syndrome and the like. The number of organ injured does not appear to relate with suture line leak but it is related to complications. So we did not take it as a risk factor and this has been revealed in our study also. Similarly age factor alone did not influence results of colon repair, though co morbid condition may be more prevalent in this group of patients. So it is the co morbidity rather than age; that may influence the decision. So we take the co morbidity as risk factor rather than the age solely. It is difficult to sort out all co morbidity in these types of patients because past medical history is not always evident. We considered mostly serious medical disease like severe diabetes, HIV infection, cirrhosis, renal failure and pancreatitis etc. as contraindication. The boarder line diabetes, mild hypertension etc. are not considered as contraindication but we would like to put it on surgeon's clinical judgment with respect to the patient because surgical judgments always overrule algorithms.

To resolve the uncertainty about safety of primary repair, systematic reviews done by Nelson RL et al. using meta-analysis of six randomized controlled trials [15]. These trials included high risk patients in both the groups and total complications favored primary repair over fecal diversion. There were two types of trials, one with exclusion criteria for primary repair [1] and another without exclusion criteria [7, 8, 16–18]. The results of trials which have exclusion criteria can not be applied to all patients while the results of

trials without exclusion criteria can be generalized to all patients. The trial published by Gonzaley et al. was without exclusion criteria and found higher complication rate in the diversion group having significant fecal contamination, shock with significant blood loss, more than two organ systems injured or extensive colon injuries [17]. Rest of the trials without exclusion criteria found no significant differences between groups for rate of sepsis, wound complications or mortality [7, 8, 16, 18].

Conclusion

Primary repair of colon injuries can be safely done in selected patient. The exclusion criteria are injury time >8 hours, need >4 unit of blood transfusion till surgery, devascularization injury of colon, any pre existing disease of bowel, any severe co morbid disease. It is also evident that age, associated injury of other organ, shock needing <4 unit of blood transfusion, site of colon injury did not affect the outcome of two surgical methods.

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