

# The Role of Prophylactic Diverting Loop Ileostomy in Preventing Leaks in High Risk Intraoperative Colonic Anastomosis: A Literature Review

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## ABSTRACT

**Introduction:** The anastomotic leak occurs in approximately 3-15% of patients who undergo colon and rectal surgery and can lead to significant morbidity and mortality. Prophylactic Diverting Loop Ileostomy (DLI) is done at times to prevent the anastomotic leak in high risk intraoperative colonic anastomosis. The role of DLI to prevent intraoperative colonic anastomosis leak is not well defined and we present the first review of literature to address this subject.

**Aim:** To do a literature review and study the role of prophylactic DLI for intraoperative colonic anastomosis.

**Materials and Methods:** We searched the PubMed, Google Scholar and Cochrane Library database and also searched the

reference of the relevant articles. After the extensive search, we got nine articles on this subject for review.

**Results:** For destructive colon injury with hypotension requiring more than four units of packed red blood cells or with significant co-morbidities, the high risk anastomosis becomes safer with a prophylactic DLI. For patients with pathological perforations, DLI can be added to safeguard colonic anastomosis if there are two or more risk factors for anastomotic leak. Patients not falling in above groups may not require prophylactic DLI for intraoperative colonic anastomosis.

**Conclusion:** Prophylactic DLI should be done to safeguard intraoperative colonic anastomosis only when there are multiple risk factors for the anastomotic leak.

**Keywords:** Anastomotic leak, Colonic injury, Colonic perforations, Colonic surgery

## INTRODUCTION

Anastomotic leak occurs in approximately 3-15% of patients who undergo colon and rectal surgery and can lead to significant morbidity and mortality [1,2]. Anastomotic complications are more common after colon and rectal surgery compared to gastric and small-bowel surgeries [3,4] and it is also the most common cause of death after colon and rectal surgery [5]. DLI is often done to prevent anastomotic complications in extraperitoneal rectal anastomosis when the integrity of anastomosis is in doubt. DLI is done to prevent the anastomotic leak of intraoperative colonic anastomosis also when there are risk factors for anastomotic leak, mostly in colonic trauma and colonic perforations in emergency surgeries and less often in elective surgeries. The role of DLI to prevent intraoperative colonic anastomosis leak is not well defined and there is scant literature on this. When should be DLI added to intraoperative colonic anastomosis? Does DLI prevent anastomotic leak or its septic complications or an emergency re-exploration? We studied the role of prophylactic DLI for intraoperative colonic anastomosis and present the first review of literature on this subject.

## MATERIALS AND METHODS

We searched the PubMed, Google Scholar and Cochrane Library with the words-ileostomy AND Colonic anastomosis, ileostomy AND emergency surgery, ileostomy AND anastomosis, colonic perforations, colonic injury and colonic trauma. We also searched the references of the relevant articles.

**Inclusion criteria:** Article on prophylactic DLI for intraoperative colonic anastomosis in adults (>15 years) in emergency surgery and elective surgery.

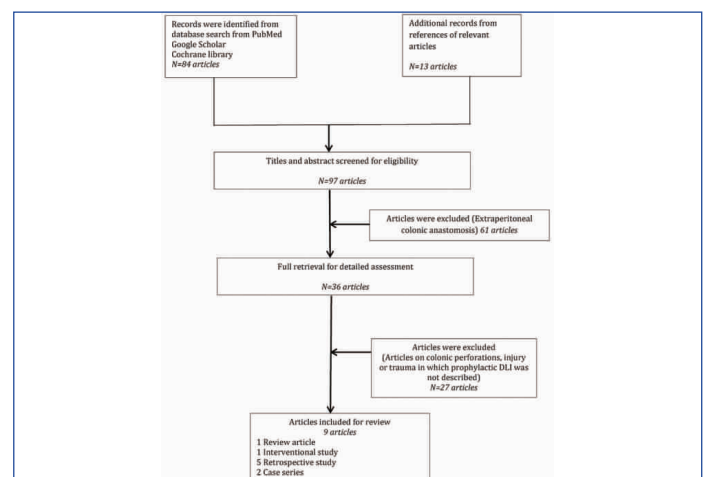
**Exclusion criteria:** Articles on prophylactic DLI for extraperitoneal colonic anastomosis or paediatric patients (<15 years).

## RESULTS

There is a large body of literature on the role of DLI for extraperitoneal colorectal anastomosis but scant literature on the role of DLI for intraoperative colonic anastomosis. After the extensive search, we got nine articles which have studied the role of prophylactic DLI for intraoperative colonic anastomosis [Table/Fig-1]. There were one review article, five retrospective studies, one interventional study and two case series [Table/Fig-2] [6-14]. These articles range from emergency to elective surgery and from traumatic to non-traumatic etiology and may seem heterogenous but they all have one common factor i.e., they have studied the role of DLI in the high risk intraoperative colonic anastomosis.

### Literature Review

Alves A et al., proposed the first study on intraoperative anastomosis for which discussion on whether to create a protective stoma was



[Table/Fig-1]: Flowchart of study selection.

S. No.	Study Name	Year of Study	Study design	Number Patients/Article
1.	Alves A et al., [6]	2002	Retrospective	707
2.	Hedrick TL et al., [7]	2006	Retrospective	15
3.	Steele SR et al., [8]	2007	Retrospective	129
4.	Bax TW et al., [9]	2007	Case series	13
5.	Rahman MS et al., [10]	2013	Case series	09
6.	Bugiantella W et al., [11]	2014	Interventional	14
7.	Midura EF et al., [12]	2015	Retrospective	13,684
8.	Hawkins AT et al., [13]	2016	Retrospective	186
9.	Steele SR et al., [14]	2011	Review	108 articles 3 abstract

**[Table/Fig-2]:** Literature review [6-14].

relevant and on whom a multivariate analysis was performed [6]. A total of 707 consecutive patients who underwent colonic or rectal resection between 1990 and 1997 were reviewed retrospectively. Multivariate analysis showed that preoperative leukocytosis ( $p=0.03$ ), intraoperative septic conditions ( $p=0.001$ ), difficulties encountered during the anastomosis ( $p=0.007$ ), colo-colic anastomosis ( $p=0.004$ ), and amount of homologous transfused blood ( $p=0.0007$ ) were independent factors associated with the anastomotic leak. They suggested that temporary stoma can be proposed for these high-risk patients, especially for those with two or more risk factors among the five independent factors for anastomotic leak.

Hedrick TL et al., did a retrospective study in which they did DLI along with drainage of the collection in 15 patients of colonic anastomotic leak and avoided dismantling the anastomosis [7]. Only one patient needed an additional drainage procedure after diversion. They suggested that DLI can even salvage an already disrupted colonic anastomosis and can take care of its septic complications.

Steele SR et al., did a retrospective study to analyse the management and clinical outcomes of patients suffering from colorectal injury at a combat hospital during Iraq war between September 2003 to December 2004 [8]. Management data of 160 patients with colorectal injury was available and 129 patients had right, left or transverse colon injury and 40 patients had rectal injury. Prophylactic DLI was made in 86 patients of which 11 patients had a leak. DLI was associated with lower leak rates (odds ratio, 0.06;  $p=0.04$ ) but did not demonstrate impact on the incidence of sepsis or mortality.

Ninety-four consecutive patients undergoing DLI were evaluated from a prospective database between 2003 and 2006 by Bax TW et al., [9]. A total of 13 patients had segmental colonic resection for diverticulitis and colon cancer while the rest had rectal resections and low anastomosis. In patients with high-risk anastomosis due to acute infection or obstruction treatment was with resection anastomosis and foecal diversion using a loop ileostomy. They achieved anastomotic failure rate of 1%, a clinically significant leak rate of 3%, and an asymptomatic, radiologically identified leak rate of 2%. They believe that there is a cost associated with the ileostomy but benefits outweigh the costs.

Rahman MS et al., reported a case series on the management traumatic bowel injury. They did primary repair or resection anastomosis with a proximal diversion in 30% of colonic injury and reported acceptable outcome [10]. Bugiantella W et al., suggested that DLI may be beneficial to protect intra-peritoneal colonic anastomosis in elderly in emergency surgeries as it may be a difficult anastomosis due to the discrepancy in bowel diameter, localized or diffuse peritonitis or doubtful bowel vascularity [11]. They reported a novel method of diverting by a percutaneous ileostomy which did not require a second surgery for closure in ten patients with intra-peritoneal colorectal anastomosis and four patients with colo-colic anastomosis. None of the patients treated had evidence of clinical or radiological leakage of anastomosis.

Midura EF et al., did a retrospective analysis of 13,684 patients who underwent segmental colectomy with anastomosis at American College of Surgeons, National Surgical Quality Improvement Program-affiliated hospitals in 2012 [12]. They concluded that DLI was protective against overall anastomotic leak and specifically major anastomotic leaks that required reoperation but not for minor leaks. Multivariate analysis of DLI associated with anastomotic leak was-OR 0.55, 95% CI 0.31-0.97 and  $p$ -value=0.04.

Hawkins AT et al., reported the first study on the role of DLI to prevent open ileocolic anastomosis leak [13]. The American College of Surgeons National Surgical Quality Improvement Program (NSQIP) data was queried from 2012-2013. A total of 186 patients underwent a DLI. They concluded that DLI was not associated with a decrease in odds of anastomotic leak. There were no serious leaks requiring reoperation in DLI group but absolute risk reduction was minor as 40 loop ileostomies were required to prevent one serious anastomotic leak. Further, a DLI was associated with the almost two-fold increase in the odds of readmissions.

Steele SR et al., did the evidence-based review of 108 articles and three abstracts to determine the ideal treatment of non-iatrogenic traumatic injuries to the colon and rectum and concluded that non-destructive colonic injury can be repaired primarily and destructive injury without hypotension and comorbidities can be managed with resection and anastomosis [14]. Patients with the destructive colonic injury with shock requiring transfusion of greater than four units of packed red blood cells or with significant comorbidities, resection anastomosis with prophylactic DLI can be done as an alternative to Hartman's procedure. Also, there was no difference between management of right and left colonic traumatic injuries.

## DISCUSSION

Management of colonic perforations has changed over time. During the era of World War One, there was the trend of primary anastomosis for emergency colonic perforations but the leak rate and mortality were high. During the second world war Ogilvie described in his 1945 article, "Surgical Lessons of War Applied to Civil Practice": "The treatment of colon injuries was based on the known insecurity of suture and the dangers of leakage." So exteriorizing the colon as stoma was the safest procedure and colonic repair or anastomosis was discouraged in emergency surgeries. This continued for decades. The loop ileostomy was first described by Turnbull RB et al., [15], using it in combination with two colostomies to decompress patients with toxic megacolon. In recent times many centres reported primary closure or anastomosis for emergency colonic perforations from penetrating injury with good results [16-20]. In pathological perforations of large bowel also the approach has changed. In perforated diverticular disease, the mandatory colonic exteriorization with Hartman's procedure was being questioned [21] and retrospective studies and metaanalysis has shown some advantage of primary anastomosis with or without diverting ileostomy, but in the absence of proper RCTs, sufficient conclusion cannot be made [22-25]. The Cochrane Systemic review demonstrated that the primary repair of penetrating colon injuries was not only as safe as the diversion but may in fact be safer. The mortality rate was similar in diversion and non-diversion groups [26]. Haemorrhagic shock with a transfusion requirement of greater than four units of packed red blood cells was the major factor that had been shown to be associated with inferior outcomes in primary repair group [27,28].

The number of published studies is not large but they give some scientific evidence on the role of DLI for intraoperative colonic anastomosis. To add or not to add DLI to a colonic anastomosis has to be decided depending on the bowel as well as the patient's condition. For destructive colonic injury with hypotension requiring more than four units of packed red blood cells or with significant co-morbidities the high risk anastomosis becomes safer with a prophylactic DLI. For

patients with pathological perforations, DLI can be added to safeguard colonic anastomosis if there are two or more risk factors for anastomotic leak. Patients not falling in the above groups may not require DLI for colonic anastomosis, as DLI has its own problems. These range from minor local care, to devastating requiring reoperation with prolonged inpatient care [29,30] and also will require a second reoperation with all the risks of a surgery. So as with extraperitoneal rectal anastomosis, DLI is to be added to intraperitoneal colonic anastomosis only when there are risk factors for anastomotic leak.

## LIMITATION

The limitation of this study is that the number of published articles available for review is not large and most of them are retrospective study.

## CONCLUSION

Prophylactic DLI should be done to safeguard intraperitoneal colonic anastomosis only when there are multiple risk factors for anastomotic leak.

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