

Enterocutaneous Fistula Following Surgical Treatment of Traumatic Gut Injury: A Single-Center Hospital-Based Study

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Submission Date : 27 March 2025
Accepted Date : 07 May 2025
Published Date : 30 September 2025
DOI: <https://doi.org/10.3329/jrPMC.v10i2.85603>

Abstract:

Background:

Enterocutaneous fistula (ECF) is a serious complication that can occur after surgery for traumatic gut injuries. It leads to significant health problems, increased death rates, and high healthcare costs.

Objective:

This study scrutinized the incidence, presentation, and factors influencing enterocutaneous fistula formation after surgical treatment of traumatic gut injuries at a tertiary care center.

Methods:

This retrospective observational study looked back at cases from the Casualty Surgical Department, Dhaka Medical College Hospital (DMCH), between July 2006 to June 2007, including patients with traumatic gut injuries, whether blunt or penetrating, who had undergone laparotomy using pre-designed case record forms. Statistical analysis was performed using SPSS version 26.

Results:

Among the 139 patients, 132(95%) were male, with an average age of 31 to 40 years. The most frequent cause of injury was road traffic accidents (32.3%), followed by stab wounds (30.2%) and gunshot injuries (24.4%). Twelve patients (8.63%) developed enterocutaneous fistula. The highest incidence of fistulas occurred in patients aged 31 to 40 years (41.6%).

Conclusion:

Timely recognition of injuries and appropriate surgical treatment may help lower the rate of this complication.

Keywords: Enterocutaneous fistula, Gut perforation, Traumatic gut injury, Surgical complications

Citation: Nur-E-Tanzim C, Rahman J, Khan MN, Hossain T. Enterocutaneous Fistula Following Surgical Treatment of Traumatic Gut Injury: A Single-Center Hospital-Based Study. J Rang Med Col. 2025 Sep;10(2):26-32. doi:<https://doi.org/10.3329/jrPMC.v10i2.85603>

Introduction:

Traumatic intestinal injuries form a significant proportion of abdominal trauma in the context of emergency surgical practice, and enterocutaneous fistula (ECF) is one of the most dreaded postoperative conditions.¹ Development of ECF as a postoperative complication following surgical intervention of traumatic intestinal injury is a great challenge for both patients and clinicians, with a usually long hospital course, additional morbidity, and high mortality rates of 15–25%.² The pathophysiology of ECF formation is multifactorial, with etiology involving infection, anastomotic breakdown, ischemia, and technical operative

reasons.³ These pathways also highlight the delicate balance between perioperative care, patient physiology, and surgical decision-making in the final determination of outcomes. The global incidence of traumatic abdominal injury has been increasing in the years, particularly in low-income countries in which road traffic and intra-personal violence are leading causative factors.⁴ Shortages in prehospital care, delays in transport, and poor operating theater facilities in some low- and middle-income countries worsen injury and enhance complication rates. In case of gut injury, the surgical practice of repairing techniques, simple primary repair versus resection with

anastomosis, further contributes to influencing patients' outcomes and complications.⁵ Studies have established that factors such as delay in time between injury and operation, hemodynamic instability upon presentation, and severity of injury of the intestine play significant roles to bear in the determination of complications following surgery.⁶ Enterocutaneous fistulas can be classified according to volume of output (high-output >500 ml/day vs. low-output <500 ml/day), anatomical location, and complexity.⁷ High-output fistulas, particularly, carry significant fluid and electrolyte imbalance, malnutrition, and sepsis risk, all contributing to a grim prognosis. Management of ECF is a multidisciplinary process involving nutritional rehabilitation, infection control, wound management, and in most cases, requires surgery for definitive closure.⁸ Enhanced survival has been achieved with advances in parenteral nutrition, critical care, and interventional radiology, but the disease is still a major surgical dilemma. The economic burden of ECF management is immense, with treatment costs ranging more than \$150,000 per patient in developed countries.⁹ In resource-limited settings, this is even more burdensome, as it not only overtaxes healthcare systems but also has devastating economic effects on families and patients. Risk factors for ECF development include delayed presentation, hemodynamic instability, multiple organ injuries, intraoperative contamination, and suboptimal initial surgical technique.^{10,11}

Methods:

This retrospective observational study took place in the Casualty Surgical Department of Dhaka Medical College Hospital (DMCH) over one year, from July 2006 to June 2007. The study aimed to look at all cases of traumatic gut injuries that needed surgical intervention. Patients were included with traumatic gut injuries, both blunt and penetrating, who also had solid organ injuries and underwent emergency laparotomy. Patients with traumatic gut injuries who had solid organ injuries but were treated conservatively or with non-surgical methods were not included in the analysis. Data was collected using pre-designed case record forms. Statistical analysis was performed using SPSS version 26.

Results:

Table-I showed the demographic characteristics of

139 study participants. Most were young adults aged 31-40 years (33%), followed by those aged 21-30 years (28%). Males made up 95% of the group, reflecting the common demographic profile of trauma patients. Urban residents accounted for 60.4% of cases, with nearly half (49.6%) coming from below-average socioeconomic backgrounds.

Table-I: Distribution of the study population by demographics (N=139)

Demographic features	no. (%)
Age (in years)	
0-10	8(5.7)
11-20	15(10.7)
21-30	39(28)
31-40	46(33)
41-50	12(8.6)
51-60	9(6.4)
61-70	4(2.8)
Sex	
Male	132(95)
Female	7(5)
Residence	
Urban	84(60.4)
Rural	22(15.8)
Suburban	33(23.7)
Socioeconomic condition	
Below average	69(49.6)
Average	47(33.8)
Above average	23(16.5)

Table-II explained the mechanisms of injury and admission trends. Road traffic accidents were the leading cause (32.3%), followed by stab wounds (30.2%) and gunshot injuries (24.4%). Notably, 76.2% of patients arrived during night time hours. Most patients (37.4%) showed up 4-6 hours after their injury, with only 9.3% arriving within 2 hours.

Table-II: Mechanism of injury and admission details (N=139)

Injury and admission details	no. (%)
Mechanism of injury	
Stab	42(30.2)
Gunshot	34(24.4)
RTA	45(32.3)
Fall on sharp object	10(7.1)
Physical assault	4(2.8)
Barotraumas	4(2.8)
Time of admission	
Day	33(23.7)
Night	106(76.2)
Delay between the time of injury and the time of admission	
0-2 hours	13(9.3)
2-4 hours	43(31)
4-6 hours	52(37.4)
6-8 hours	23(16.5)
8-24 hours	8(5.7)

Table-III categorized types and locations of injuries. Multiple perforations were the most common injuries overall (56.8%) and in fistula patients (50%). Combined injuries of the small and large bowel occurred in 50% of fistula cases, compared to 38.1% overall.

Table-III: Types and sites of intestinal injury (Overall and fecal fistula subgroup) (N=139)

Feature	no. (%)
Types of injury	
Single perforation	45(32.3)
Multiple perforation	79(56.8)
Devascularized/Gangrene	8(5.7)
Only mesenteric tear	7(5)
Types of gut injury (n=12)	
Single perforation	2(16.6)
Multiple perforation	6(50)
Devascularized/Gangrene	2(16.6)
Only mesenteric tear	2(16.6)
Site of injury	
Small intestine	65(46.7)
Large intestine	21(15.1)
Both	53(38.1)
Site of injury in fecal fistula patients (n=12)	
Small intestine	4(33.3)
Large intestine	2(16.6)
Both	6(50)

Table-IV showed that 12 patients (8.63%) developed enterocutaneous fistula, with the highest rate in the 31-40 age group (41.6%). All fistula cases occurred in patients who arrived more than 2 hours after their injury, with 66.6% arriving after 6 hours.

Table-IV: Fecal fistula development and age/ time distribution (N=139)

Features	no. (%)
Complications after traumatic gut injury	
Cured after surgery with other complications	127(91.3)
Developed fecal fistula	12(8.63)
Distribution by age who developed fecal fistula (n=12)	
0-10	0(0)
11-20	0(0)
21-30	1(8.3)
31-40	5(41.6)
41-50	4(33.3)
51-60	2(16.6)
Time from injury to admission in patients with fecal fistula (n=12)	
0-2 hours	0(0)
2-4 hours	2(16.6)
4-6 hours	2(16.6)
6-8 hours	4(33.3)
8-24 hours	4(33.3)

Table-V: Clinical features of the patients who developed fecal fistula (n=12)

Clinical features	no. (%)
Symptoms	
Abdominal pain	12(100)
Abdominal distension	08(66.6)
Discharging wound	12(100)
Fever	06(50)
Anorexia/nausea/vomiting	12(100)
Signs: General	
Anemia	10(83.3)
Dehydration	06(50)
Oedema	04(33.3)
Jaundice	00(0)
Tachycardia	06(50)
Hypotension	05(41.6)
Deep vein thrombosis	00(0)
Signs: Local	
Rigidity & tenderness of abdomen	05(41.6)
External fistula opening:	
Single	09(75)
Multiple	03(25)
Wound dehiscence	08(66.6)
Skin excoriation	10(83.3)

There were multiple responses

Table-V outlined the clinical symptoms of fistula patients. Common symptoms included abdominal pain, wounds that discharged fluid, and anorexia/nausea/vomiting (100% each). Anemia was found in 83.3% of cases, and skin irritation was seen in 83.3% of patients. Single fistula openings were more frequent (75%) than multiple openings (25%).

Figure-1 illustrated that among fistula patients, only 25% were stable, with 50% hypotensive and 25% in shock.

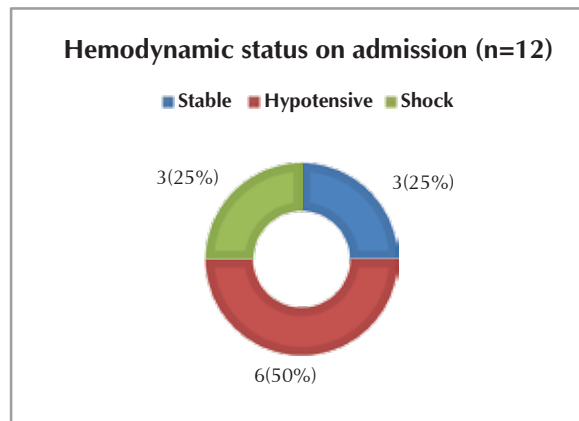


Figure-1: Hemodynamic status on admission (Overall and fecal fistula subgroup) (n=12)

Figure-2 compared complications from different surgical procedures. Patients who underwent resection and anastomosis had higher complication rates in all categories, with enterocutaneous fistula occurring in 8 cases compared to 4 in simple repair patients.

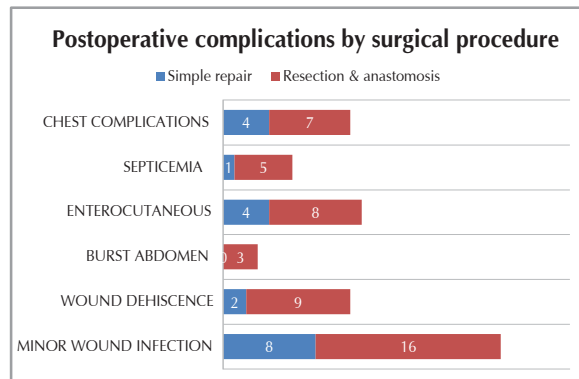


Figure-2: Postoperative complications by surgical procedure

Figure-3 showed in terms of fistula presentations; 50% of patients were operated on 4-6 hours after

admission. This suggests that surgical delays may lead to negative outcomes. The timing of surgery seems critical in preventing complications like enterocutaneous fistula formation.

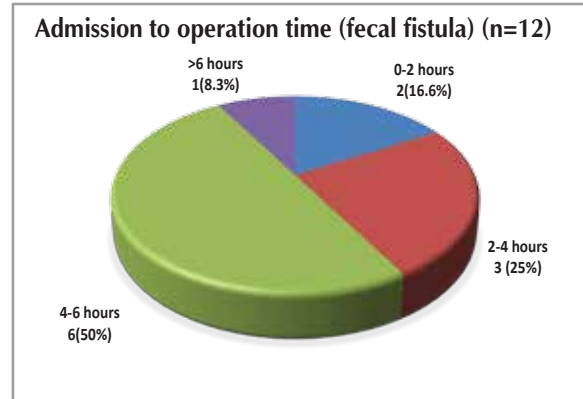


Figure-3: Time lapse between admission and surgery (Fecal fistula subgroup) (n=12)

Figure-4 represented surgical repair techniques. Resection and anastomosis were done in 70.5% of all cases and 66.6% of cases with fistula. While the proportions are similar, the actual numbers indicate that both repair techniques carry risks for developing fistulas.

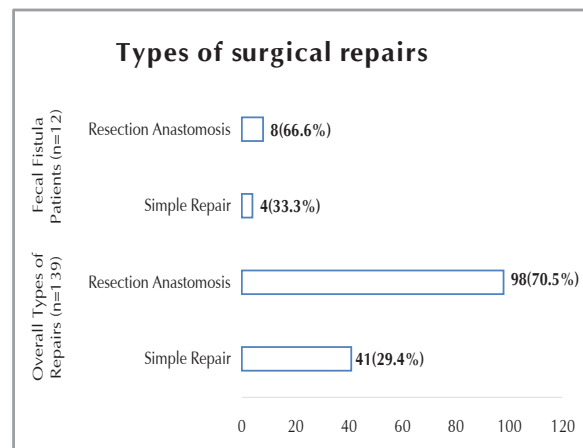


Figure-4: Types of surgical repairs (Overall and fecal fistula subgroup) (N=139)

Figure-5 described fistula characteristics and diversion methods. Fistula presentation was evenly distributed between 5 days (50%) and 6-10 days (50%) after surgery. Low-output fistulas (<500ml) were more common (58.3%) than high-output ones (41.6%). Most patients (70.5%) had proximal fecal diversion.

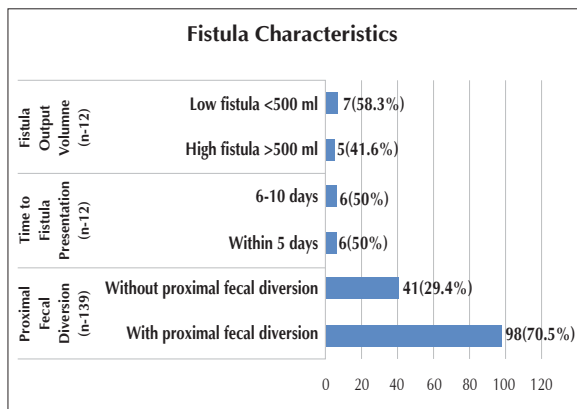


Figure-5: Fistula characteristics (N=139)

Discussion:

The present study reported an enterocutaneous fistula (ECF) incidence of 8.63% following surgical intervention for traumatic gut injury, which was in line with 5–25% in a recent study by Kaushal et al.¹² The incidence of ECF was a reflection of the persistent issue of ECF in abdominal trauma surgery, particularly in resource-poor environments where close nutritional and wound care support can be inadequate. The young men's predominance (95%) in this cohort reflected global trauma populations, in which motor vehicle crashes and interpersonal violence most heavily afflicted working-age men.¹³ Two-thirds of the patients were more than six hours from injury. This aligned with the general principle that delayed in treatment worsen outcomes by contributing to contamination, tissue ischemia, and impaired healing.¹⁴ The "golden hour" mechanism highlighted that prompt surgical intervention is critical to reducing complications and improving survival.¹⁵ Unfortunately, prehospital and transport delayed in most developing regions reduce the chances of early intervention. Hemodynamic instability also emerged as a significant risk factor. Patients with fistula were stable upon presentation in only 25%, compared to 47.4% of the overall population. Shock and hypotension reduce splanchnic perfusion and compromise tissue oxygenation, rendering tissues at risk of anastomotic failure and fistulae formation.¹⁶ Early aggressive resuscitation and stabilization before or along with definitive surgical correction became priority here. The severity of injury predominantly determined outcomes. In patients with fistula, 50% had multiple perforations and 50% had combined small- and large-bowel injuries, both markers of

high-energy trauma with maximum tissue damage.¹⁷ These are more technically challenging to fix and carry higher leakage risks. Surgical management, simple repair, resection with anastomosis, or diversion, must therefore take into consideration not only the severity of the injury but also the hemodynamic status of the patient and degree of contamination.¹⁸ Fistula output measures also provided prognostic information. In this study, 58.3% were low-output (<500 ml/day) and typically have a higher rate of spontaneous closure and less strict nutritional requirements than high-output fistulas.¹⁹ Presentation time of fistula was also distributed between early (≤5 days) and delayed (6–10 days), reflecting the heterogeneity of pathophysiologic processes, early technical failure vs delayed infection or ischemia-induced breakdown.²⁰ The findings of the study highlighted the importance of early surgical intervention, aggressive resuscitation, and careful intraoperative decision-making to prevent risks. Preventive measures and multidisciplinary management are essential to improve outcomes and reduce the substantial clinical and economic burden of ECF.

Limitations:

This single-center retrospective study design limits how broadly we can apply the findings to other healthcare settings with different patient groups and resources. The small number of fistula cases (n=12) may also restrict our ability to find more risk factors and prognostic indicators.

Conclusion:

This study demonstrated that an enterocutaneous fistula is a serious complication after surgical repair of traumatic gut injuries. It affected 8.63% of patients in our study group. Identifying high-risk patients early and providing quick surgical treatment might lower the chances of this complication. Future studies should aim to develop scoring systems that predict which patients are at high risk for enterocutaneous fistula after traumatic gut injury repair. Multi-center prospective studies with larger sample sizes are required to confirm evidence-based prevention methods.

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