



Our Experience of Emergency Colorectal Injury as a Result of Abdominal Trauma

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Abstract

Objective In the present study, we aimed to examine the treatments and their outcomes in cases with colon injuries after blunt and penetrating abdominal traumas.

Materials and Methods Twenty-six patients who underwent a laparotomy and were found to have a colon injury due to blunt abdominal trauma, penetrating stab injury, gunshot injury, and traffic accident were included. All patients were admitted into the emergency outpatient clinic of Gazi Yaşargil Training and Research Hospital General Surgery Clinic between 2016 and 2020. The records of the cases were analyzed retrospectively.

Results Colon injuries were detected in 26 cases. All 26 (100%) cases were males with an average age of 29.80 ± 11.4 (range: 17–60) years old.

Colon injuries observed during emergency operations included 18 (69.23%) patients with a GSI (gunshot injuries), 3 (11.53%) with penetrating stab injuries, 4 (15.38%) who were a part of traffic accidents and 1 (3.85%) patient with a blunt abdominal trauma. A primary colon repair was performed in 10 patients. Five patients underwent a colon resection and there were end colostomies. Four patients underwent a loop ileostomy after a colon resection and anastomosis. Colon resections with anastomoses were performed in seven patients. The mean hospitalization period was 26 ± 29.28 days.

Conclusion Patients should be classified intraoperatively with findings, such as peritoneal contamination, degree of colon injury, duration of the injury, and any accompanying injuries.

Keywords

- ▶ colon injury
- ▶ emergency
- ▶ abdominal trauma
- ▶ treatment

Introduction

When compared with other intra-abdominal injuries, colorectal injuries are the most studied injuries that undergo repair. Colorectal injuries and their treatments are important problems, mainly due to complications that include wound infections, intra-abdominal abscesses, anastomosis dehiscence, and mortality associated with these complications.

The experiences gained in the treatment of colon injuries during the First World War and ensuing wars set an example for surgical practices in civilian life. Surgical treatment methods include primary repair, resection-anastomosis, and diversion. Debate continues over the factors affecting the selection of these methods. In the 1980s, the idea that military and civilian injuries should be evaluated separately arose, and primary repair methods began to be applied more.^{1–4}

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Today, there are those who recommend the application of primary repair methods in all civilian colon injuries, as well as those who recommend other surgical methods considering the risk factors. The age of the patient, the type and location of the injury, the amount of blood loss, the degree of peritoneal fecal contamination, and the time until surgery are factors affecting mortality and morbidity in colorectal injuries.¹⁻⁴ Therefore, in our study, we examined the treatments and outcomes in cases with colon injuries after blunt and penetrating abdominal traumas.

Materials and Methods

Twenty-six patients who were admitted to the Gazi Yaşargil Training and Research Hospital emergency inpatient clinic due to blunt abdominal trauma (BAT), penetrating stab injury (PSI), gunshot injuries (GSIs) and traffic accident injury (TA) between 2016 and 2020 were evaluated. The present study was conducted following the principles of the 2008 Helsinki Declaration and was approved by a Research Ethics Committee (Gazi Yaşargil Training and Research Hospital Ethics Committee/29.05.2021/E-762). All patients were surgically treated at the General Surgery Clinic and were found to have colon injuries during laparotomy evaluations. The medical records of the patients were analyzed retrospectively. Age, sex, type of injury, time to surgery, duration of surgery, presence of additional organ injuries, surgical treatment choices, duration of the hospital stay, morbidity, and mortality were evaluated. Statistical evaluations of the data were performed using Fisher accuracy tests, Kruskal-

Wallis tests, and Mann-Whitney U tests. *P*-values < 0.05 were considered statistically significant.

Results

Colon injuries were detected in 26 cases and all patients were males. The average age was 29.80 ± 11.4 (range: 17–60) years old. There were 18 (69.23%) cases with GSIs, 3 (11.53%) with PSIs, 4 (15, 38%) with TAs, and 1 (3.85%) had a colon injury due to a BAT (– Fig. 1).

When the causes of colon injuries were examined, the most common, the longest duration operation, and the longest average hospital stay were all related to GSIs. The highest average age was with TAs and the longest preoperative waiting period was with PSIs. The cases with the longest surgical duration and mean hospitalization stay were those with GSIs. There were additional comorbidities in 3 cases, 2 (7.7%) with major depression and 1 with hypertension. The mean white blood cell (WBC) count was 15.64 WBC/μl (range: 5.95–32.33).

Whole abdominal computed tomography (CT) scans were performed in 18 (69.2%) patients. Pathological findings were observed in 11 (42.3%) cases. The CTs were normal in 7 (26.9%) cases. Whole abdominal ultrasonographies (USGs) were performed in 11 cases, of which 7 (26.9%) had pathological findings; however, 4 (15.4%) cases were reported as normal (– Table 1).

Five (19.2%) patients were taken directly to the operating room without any imaging because the hemodynamics of the patients were unstable. Preoperatively and during surgery, 1 unit of blood was transfused to 2 (7.7%) patients, 2 units to 5

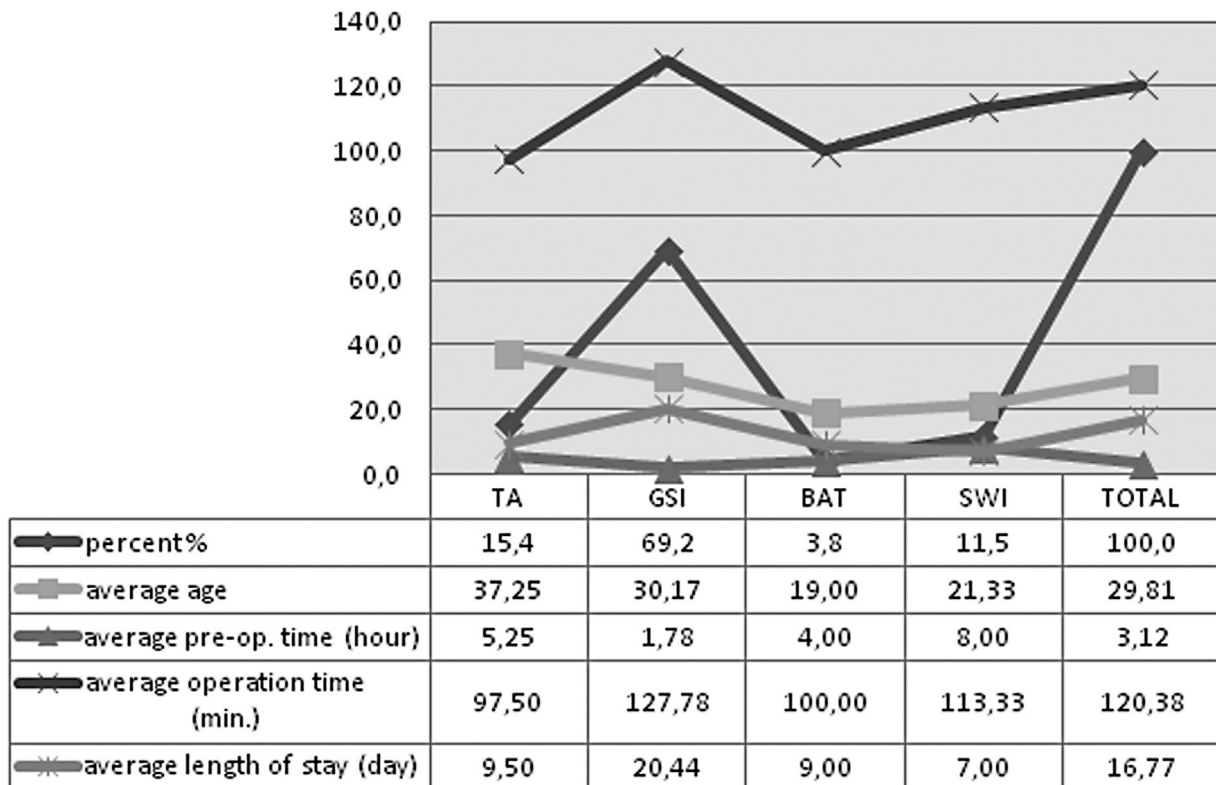


Fig. 1 Cause of colon injuries.

Table 1 Radiological findings of the cases

Radiological imaging	Pathological findings (n /%)	Normal (n/%)	Non-imaging (n/%)
CT	11 (%42.3)	7 (%26.9)	8 (%30.8)
USG	7 (%26.9)	4 (%15.4)	15 (%57.7)

(19.3%) patients, 3 units to 4 (15.4%) patients, and 6 units to 1 (3.8%) patient. There were 14 (53.8%) patients who did not require blood transfusions.

There were 6 patients (23.07%) who received an immediate operation within the 1st hour after their injury, 12 (46.15%) had surgery within two hours after their injury, 3 (11.53%) were operated on within three hours, 3 (11.53%) within 4 hours, 1 (3.84%) within 10 hours, and 1 (3.84%) within 20 hours after being injured. The mean time taken for treatment initiation was 3.1 (range: 1–20) hours.

Many parts of the colon were affected at the same time (► Fig. 2).

According to the colon injury score (CIS) of the American Association for the Surgery of Trauma (AAST),⁵ three cases had grade 1, five had grade 2, four had grade 3, four had grade 4, and nine had grade 5 injuries. Primary wound repair was applied to the colon in injuries with a CIS of 1, 2, or 3, while resection and an anastomosis were performed in those with a CIS of 4 or 5.

The Abdominal Trauma Index (ATI) was used for the severity of additional abdominal organ injury.⁶ The mean ATI value of those with a colon injury after an OVTA was 4. The mean ATI was 6.5 in patients with a colon injury due to a

TA, it was 10.5 for those with a GSI, 5.5 following a PSI, and 7 after a BAT. Colon primary repair was performed on those with ATI values of 6 to 7. A protective ileostomy or colostomy was performed in patients with an ATI of 13 and above.

Primary colon was performed in 10 patients. Five patients underwent a colon resection and end colostomy. Four underwent a colon resection with an anastomosis and a loop ileostomy. A colon resection with an anastomosis was performed in seven patients. The mean surgical time for all of them was 120.38 ± 27.2 minutes.

Along with the colon injury, 14 (53.8%) patients had a small bowel injury, 3 (11.5%) had a liver injury, 3 (11.5%) had a pelvic fracture, and 1 (3.8%) had an aortic injury (► Table 2).

Wound infections developed in 5 (19.2%) patients during the postoperative period. An anastomotic leakage occurred in 3 (11.5%) patients (► Table 3).

The mean hospital stay was 26 ± 29.28 days. There was no mortality in our cases.

Discussion

Colon injuries are more common in young male populations and occur due to sharp objects, GSIs, traffic accidents, and iatrogenic causes, in order of decreasing frequency. In addition, the more serious injuries occur with firearms.^{7,8} In our study, all the colon injuries were in males. The most common cause of colon injuries was GSI with 18 (69.23%) cases.

The presence of additional intra-abdominal or extra-abdominal organ injuries with colon injuries is an indicator of the severity of the trauma and is a determinant in the

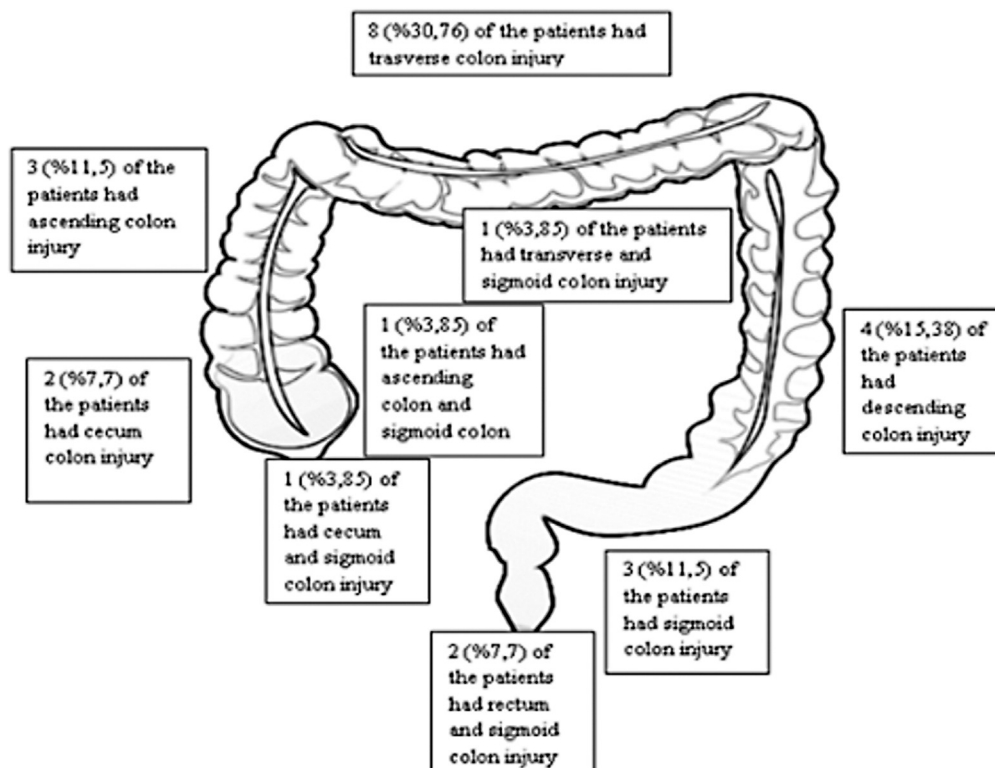
**Fig. 2** Parts of colon injury.

Table 2 Organ injuries accompanying colon injuries

Additional organ injuries	Number&%
Small intestine	14 (%53.8)
Liver	5 (%19.2)
Kidney	3 (%11.5)
Bladder	2 (%7.7)
Urethra	1 (%3.8)
Lungs	2 (%7.7)
Diaphragm	2 (%7.7)
Stomach	2 (%7.7)
Aorta	1 (%3.8)
Iliac vein	2 (%7.7)
V. cava	1 (%3.8)
Pelvic fracture	3 (%11.5)
Lumbar vertebra fracture	1 (%3.8)
Fibula fracture	1 (%3.8)
Broken scapula	1 (%3.8)
Subdural hematoma	1 (%3.8)
Accompanying colon injuries had not been seen	4 (%15.4)
Total	26 (%100)

Table 3 Postoperative complications

Postoperative complication	CIS score	number&%
Anastomotic fistula, acute renal failure, pulmonary embolism, ileus, hematoma.	4	1(%3.8)
Anastomotic fistula, evisceration	5	1(%3.8)
Anastomotic fistula, pleural effusion	5	1(%3.8)
Abscess in the inguinal region, hematoma, second look	5	1(%3.8)
Sepsis	5	1(%3.8)
Wound infections	3.4 (min: 1–max: 5)	5(%19.2)

selection of the surgical procedure to be performed. The Penetrating Abdominal Trauma Index (PATI), defined by Moore et al., and revised and published by ATI, is the preferred system for determining the severity of abdominal trauma.⁶ In our study, there were additional organ injuries in 84.6% of our patients. In the study by Kahya et al., the rate of additional organ injuries was 65%⁹

Two different studies have reported that patients were surgically treated within an average of 11 hours after the injury.^{10,11} In our study, the mean preoperative time was 3.12 (range: 1–20) hours. The BAT was treated in an average of 4 hours following the trauma. The shortest preoperative

time was with colon injuries due to a GSI at 1.78 hours. The longest preoperative period was with colon injuries due to a PSI, of 8 hours.

In the study by Taçyıldız et al., blood transfusions were administered to 35.08% of the cases.¹ In our study, blood transfusions were performed in 46% of the patients. Taçyıldız et al. also reported a mortality rate of 6.8% in patients with a primary repair and of 41.6% in the stoma group. We had no mortality. Therefore, we think there may be no relationship between blood transfusions and mortality.

In our study, the postoperative complication rate was 38.4%, with the most common of these being wound infections in 5 patients. Major complications occurred in those with a CIS grade 4 to 5 injuries. Our results are consistent with the work of Kahya et al.⁹

Traumatic column injuries are an important risk factor for the development of septic shock.¹² In our study, sepsis developed after GSI in two cases. These patients improved with early interventions and antibiotic treatments.

In many studies, general anastomotic dehiscence and fistula rates have varied between 1.2 and 12.7%. This rate has an average of 2.1% (1.6–3.4%) in colon anastomoses performed in planned surgeries and of 4.6% (0–32%) for emergency colorectal anastomoses.^{13–15} In our study, anastomotic leakages were observed in 11.5% ($n=3$) of the patients. One case received a second operation, while two cases healed with a controlled fistula.

Although the morbidity rate in blunt colon injuries has been reported as 25% in various studies, this rate has also been reported to increase to 76% in cases with surgical times exceeding 24 hours.¹⁶ In our study, there was no mortality due to BAT or other causes of colon injury.

Conclusion

It is very important for patients to receive surgical treatments within the early periods after a colon injury. Findings involving the degree of peritoneal contamination, the degree of colon injury, the time elapsed after the injury, and any accompanying injuries should be considered in the treatment choices for colon injuries.

Study Limitations

The most important factors limiting our study are the retrospective nature of our study and the limited number of patients.

Conflict of Interests

The authors have no conflict of interests to declare.

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