Early Postoperative Complications after Exploratory Laparotomy for Abdominal Trauma

Ali Mohammed Saleh,[1] MD; Mohammed Eissa,[1] MD; Yasser Abdurabo Obadiel,[1,2] MD; Arafat Alsanabani, MBBCh[3]

[1]Surgery Department, Faculty of Medicine and Health Sciences, Sana'a University

[2]General Coordinator, Scientific Council Of Surgery, Arab Board of Health Specialization Sana'a, Center, Yemen

[3]Surgery Resident, Scientific Council Of Surgery, Arab Board of Health Specialization Sana'a, Center, Yemen

Background: The mechanism of injury of abdominal trauma varies in different parts of the world and within the same country. Aim of this study was to determine the etiology of abdominal trauma, the evaluate the factors affecting morbidity and mortality in our region.

Methods: The research data included 230 patients who underwent laparotomy and for abdominal trauma at 48 Model hospital, Sana'a, Yemen from June 2019 to December 2022. Data were entered and analyzed through SPSS version 26.

Results: Regarding the general complications septicemia and pneumonia were the most common complications (23%) and (21.3%) respectively, DIC (13%), DVT (2.6%) and myocardial infarction (1.3%). Wound infection occured in 71 patients (30.9%) and wound dehiscence in 18 patients (7.8%). Paralytic ileus occurred in 38 patients (16.5%) and 4 patients (1.7%) had early intestinal obstruction. Bile leak and anastomosis leak rates were (5.2%) and (2.2%) respectively. Regarding fistulas 6 patients (2.6%) had enterocutaneous fistulas and 4 patients (1.7%) had pancreatic fistulas.

Conclusion: Laparotomy for abdominal trauma is still one of the most common surgical procedures in our practice yet it carries a significant morbidity and mortality. Many negative laparotomies also have hazardous effects for patients and that necessitates further improvement in diagnosis and evaluation of their patients.

Key words: Penetrating trauma, blunt trauma, septicemia, pneumonia, DIC, DVT, myocardial infarction, wound infection, wound dehiscence, paralytic ileus.

Introduction

The mechanism of injury of abdominal trauma varies in different parts of the world and within same country. Aim of this study was to determine the etiology of abdominal trauma, evaluate the factors affecting morbidity and mortality in our region, evaluate the organs affected in abdominal trauma and management of different parts of hollow viscus injuries and to study complications, morbidity, mortality and outcome of abdominal trauma .Blunt abdominal trauma (BAT) resulting in the intestinal injuries continues to be associated with a significant morbidity and mortality despite the advances in resuscitationand management. Intestinal disruptions are the third most frequent injuries following BAT.[1] In some cases, with missed diagnosis on the initial presentation, hollow viscus injuries including bowel should be detected during laparotomy. These patients are more vulnerable to develop postoperative complications such as sepsis.

In addition, there is a possibility of complications related to surgery like suture line dehiscence of intestinal repair, peritonitis, intra-abdominal abscess after bowel injury which can lead to prolonged hospital course, multi-organ failure, or even resulted in fatal outcomes.[1] Postoperative complications (POCs) have detrimental effects on many vital aspects of patients' health. About 7% - 15% of patients with abdominal surgeries were anticipated to have POCs with a 0.79%-5.7% expected mortality rate.[2]

The most common organs injured are the small bowel (50%), large bowel (40%), liver (30%), and intra-abdominal vascular (25%).[3] One reason is that mechanisms of injury often result in other associated injuries that may divert the physician's attention from potentially life-threatening intra-abdominal pathology.

Methods

The research data were included the patients who underwent laparotomy for abdominal trauma at 48 Model hospital, Sana'a, Yemen from June 2019 to December 2022.

The variables on which data were collected are number of patients, age, sex, mechanism of injury (blunt & penetrating injury; SW, GSW), clinical presentation of patient, time of presentation to hospital after injury, abdominal organs injured, operative procedures, postoperative complications; wound infection (Surgical site infection), wound dehiscence / burst abdomen, paralytic ileus, bile leak, anastomotic leak, DVT, Enterocutaneous fistula, DIC, septicemia, pneumonia, extra

DOI: 10.21608/ASJS.2023.325733

abdominal injuries, mortality (Blunt, penetrating) and re operative.

All the data were entered and analyzed through SPSS version 26. Results were given as percent ages, mean and standard deviations or median and ranges. Quantitative and qualitative variables were compared using Student's t-test and chi-square (Pearson's or Fischer's exact) test, respectively. A Mann–Whitney U test was preferred when there is an abnormal distribution of the samples confirmed by the Kolmogorov–Smirnov test. A p value <0.05 was accepted to be significant.

Results

Between June 2019 and December 2022, a total of 230 patients met the inclusion criteria. The median age of these patients was 27 years **(Table 1).** In 10 patients (4.3 %), blunt trauma was seen. All the patient with blunt injuries were caused by road traffic accident. Penetrating wound represent 95.7%. The majority of the penetrating injuries were caused by shooting in 120 patients (52.2%) followed by missile injury in 100 patients (43.5%) **(Table 2).** Time between the incidence of trauma and arrival to our hospital varied from 1 hour to more than 48 hours with median 13.8 hours **(Table 3).** Relevant extra-abdominal injuries showed that chest injury was prevalent in 94 patients (40.9%), extremities injury in 35 patient (15.2%), spinal injury in 23 patients (10%), pelvic fracture in 19 patients (8.3%) and head injury 14 patients (6.1%) and maxillofacial injury in 9 patients (3.9%) **(Table 4).**

Different abdominal organs were affected with large bowl injury being the most organ injured by penetrating trauma 97 patient (44.1%) and liver and spleen in blunt trauma in 4 patients (40%).

Almost all patient present with abdominal pain 226 (98.3%). Abdominal distention and vomiting represent 31.7% and 6.1% respectively. Urological symptoms as hematuria were found in 29 patients (12.6%) **(Table 5).**

In 47 patients (51%) with suspected abdominal injury who underwent a laparotomy, hemodynamic instability occurs in 77 patient (33.5%). More often patient present with free fluid collection in the abdominal cavity seen on imaging (either ultrasound and/or CT) and was the most important indication for laparotomy in 175 patients (76.1%). Positive physical examination was found in 26 patient (11.3%) and Evisceration of bowel/omentum in 13 patients (5.7%).Tow patient diagnosed as abdominal compartment syndrome **(Table 6).**

In 13 patients (5.7%), a damage control trauma laparotomy was to be performed. After stabilization of the patient, a re-laparotomy for definitive repair was performed and in 18 patients (7.8%), a negative laparotomy was conducted. Different procedures were done depending on the injuries that were found as shown in the **(Table 7).**

Regarding the general complications septicemia and pneumonia are the most common complication 23% and 21.3% respectively, disseminated intravascular coagulopathy13%, DVT 2.6% and myocardial infarction 1.3%. Wound infection occurs in 71 patient (30.9%) and wound dehisces in 18 patients (7.8%). Paralytic ileus was occurred in 38 patient (16.5%) and 4 patients (1.7%) had early intestinal obstruction. Bile leak and anastomosis leak rate was 5.2% and 2.2% respectively. Regarding fistulas 6 patients (2.6%) had enterocutaneous fistula and 4 patients (1.7%) had pancreatic fistula **(Table 8).**

50 Patients (21.7%) underwent relaparotomy, 6 patients (12%) had missed injury 5 patient missed colonic injury and 1 missed gastric injury and 4 patients (8%) had missed gauze. Intra-abdominal abscess was the indication of re-laparotomy in about (36%) which was the most common indication for relaparotomy **(Table 9).** The small and large bowel were the most affected organ in patient with post-operative complications. 10 patients out of 12 with duodenal injury suffer from post-operative complications.

Among patients how underwent negative laparotomy the complication rate was 27.8%.

In our population, patients with abdominal vascular injury showed a significant higher complication rate than patients without (100 vs 57.5% (p=0.005)). Also, pancreatic injury shows the same rate of complication (100 vs 58.5% (p=0.04)). Large bowl injury had a statistically significant rate of complication (71 vs 50.8 % (p=0.002)).

Regarding specific trauma mechanisms, amounts were too small in blunt group to do further analyses but in penetrating trauma there was a statistically significant increase in complication in GSW patients (66,9 vs 51.4% (p=0.016)). Among the procedures that were done splenectomy carried an increase in complication rate along with drainage procedure for pancreatic injury as (92.9 vs 57.4% (p=0.009)) and (100 vs 58.5% (p=0.041)).

No mortality occurred in blunt trauma patient but in the penetrating trauma the mortality rate was 11.8%. The overall mortality rate in this study was 11.3%. No patient with negative laparotomy died post-operatively. Small bowel injury associated with increase the mortality (16.9 vs 8.7% (p=0.045)). Also, the operative procedure that show a significant increase in the mortality rate was accounted for splenectomy (28.6 vs 10% (p=0.035)), damage control surgery (38.5 vs 9.7% (p=0.001)) and primary repair of colon with proximal colostomy (31 vs 9.8% (p=0.009)).

Not only the septicemia makes a major risk factor that increase the mortality significantly (41.5 vs 2% (p=0.001)) along with DIC (46.7 vs 6% (p=0.001)) but also the pneumonia also had its effect on the mortality (26 vs 7.2% (p=0.001)). Specific extra-abdominal injuries have shown to increase the mortality rate extremities injuries and chest injuries (25.7 vs 8.7% (p=0.003)) and (19 vs 5.9% (p=0.002).

Table 1: Age of patient

		Count	Column N %
Age incidence	Up to 10	2	.9%
	11-20	55	23.9%
	21-30	136	59.1%
	31-40	31	13.5%
	41-50	4	1.7%
	51-60	1	.4%
	61-70	1	.4%

Table 2: Mechanism of injury

	Mechanism	Count	Column N %
Blunt	Road traffic accident	10	4.3%
Penetrating	SW	0	0.0%
	GSW	120	52.2%
	Missile	100	43.5%

Table 3: Time of presentation to hospital

Time of presentationto hospital	Count	Column N %
1 to 8hours	68	29.6%
9 to 16hours	118	51.3%
17 to 24hours	32	13.9%
25 to 32hours	6	2.6%
33 to 40hours	1	.4%
41 to 48hours	0	0.0%
>48 Hours	5	2.2%

Table 4: Extra abdominal injuries

Extra abdominal organ	Count	Column N %
Head injury	14	6.1%
Chest injury (Haemothorax, rib fractures,pneumothorax, etc.)	94	40.9%
Extremity injury (Long bone fractures)	35	15.2%
Pelvis fracture	19	8.3%
Spine injury	23	10.0%
Maxillofacial injury	9	3.9%

Table 5: Clinical presentation

Clinical presentation of patient	Count	Column N %
Abdominal Pain	226	98.3%
Vomiting	14	6.1%
Abdominal distention	73	31.7%
Retention urine	0	0.0%
Hematuria	29	12.6%

Table 6: Indication of laparotomy

Laparotomy indication	Count	Column N %
Hemodynamic instability	77	33.5%
Free fluid inabdominal cavity	175	76.1%
Evisceration of bowel/omentum	13	5.7%
Free air inabdominalcavity	16	7.0%
Positive findings on physical examination (Peritonitis)	26	11.3%
Abdominal compartment syndrome	2	.9%

Table 7: Operative procedures performed

operative procedures performed	Count	Column N %
Splenectomy	14	6.1%
Suturing of liver laceration (Hepatorraphy)	41	17.8%
Cholecystectomy	8	3.5%
Spelenorraphy	10	4.3%
Repair of urinary bladder rupture	17	7.4%
Primary repair of stomach	29	12.6%
Primary repair of duodenum	3	1.3%
Renorraphy	17	7.4%
Nephrectomy	3	1.3%
Ureteric repair over double J	9	3.9%
Drainage procedure for pancreatic injury	6	2.6%
Repair of diaphragmatic tear	32	13.9%
Rectal injury repair with diverting loop colostomy	15	6.5%
Resection of small bowel with primary anastomosis	47	20.4%
Primary repair of small bowel	44	19.1%
Primary repair of colon injury	35	15.2%
Primary repair of colon injury with proximal colostomy	16	7.0%
Exteriorization of colon	26	11.3%
Resection and anastomosis of colon	8	3.5%
Resection and anastomosis of bowel injury with proximalileostomy	12	5.2%
Total	230	100.0%

Table 8: Post-operative complications

Post-operative complications	Count	Column N %
Wound infection (surgical siteinfection)	71	30.9%
Anastomotic leak	5	2.2%
Bile leak	12	5.2%
Wound dehiscence / Burstabdomen	18	7.8%
Early intestinal obstruction	4	1.7%
Enterocutaneous fistula	6	2.6%
Pancreatic fistula	4	1.7%
Paralytic ileus	38	16.5%
Disseminated intravascular coagulopathy	30	13.0%
Septicemia	53	23.0%
Myocardial infarction (MI)	3	1.3%
Pneumonia	49	21.3%
DVT	6	2.6%
Total	230	100.0%

Table 9: Indication of re-laparotomy

indication of re-laparotomy	Count	Column N %
Anastomosis leak	5	2.2%
Missed gauze	4	1.7%
Damage Control Surgery	13	5.7%
Intra-abdominal abscess	18	7.8%
Early intestinal obstruction	4	1.7%
Post-operative bleeding	2	.9%
Burst abdomen	12	5.2%
Urine leak	1	.4%
Missed stomach injury	1	.4%
Missed colonic injury	5	2.2%
Colonic fistula	1	.4%
Small bowel fistula	1	.4%
Lower GIT bleeding	2	.9%

Discussion

Blunt trauma was considered the in many researches is the main mechanism of trauma but in our study, it represents only 4.3% as this study was conducted in a military hospital so the overall mortality was higher than the other studies how enrolled both blunt and penetrating trauma,[10] however those studies for penetrating trauma show similar mortality rate to our study (12.8% vs 11.3%) respectively.[7]

The spleen and liver were the most organ affected by blunt trauma and bowel injuries in penetrating injury. This observation was in accordance with the other studies.[6,7] Retroperitoneal organs have involved in many patients which was 7.4% in kidney injury, 3.9% ureteric injury and 2.6% pancreatic injury. Abdominal vascular injury occurred in 4.8%.

The complication rate was observed in 60% of patient which is comparable to the study of Matthijs H. et al. that was 66% in their study.[9] The most common complication was surgical site infection that occurred in 30.9% of patients which is the same as reported in other studies.[6]

The relaparotomy was done in 21.7% of patients that was similar to the study that conducted in patients with colonic injury (20%) as most of our patient suffer from colonic injury (44.1%) but in contrast to the study that conducted in Baghdad which show about 8.6% of patients that need re-laparotomy. Relaparotomy was as a part of damage control surgery in about 26%. The most common cause of relaparotomy was intra-abdominal injury in 36% which is in contrast to the study of Baghdad which was the bleeding which could be reflected on the difference of mechanism of trauma between our population and the most effected organs.[12]

In our population, patients with abdominal vascular injury showed a significant higher complication rate than patients without (100 vs 57.5% (p=0.005)). Also pancreatic injury show the same rate of complication (100 vs 58.5% (p=0.04)). Large bowel injury had a statistically significant rate of complication (71 vs 50.8% (p=0.002)). Among the procedures that were done splenectomy carried an increase in complication rate along with drainage procedure for pancreatic injury as (92.9 vs 57.4 % (p=0.009)) and (100 vs 58.5% (p=0.041)).

Regarding the mortality different valued were investigated to assess its association with mortality. Small bowel injury associated with increase the mortality (16.9 vs 8.7% (p=0.045)). Also, the operative procedure that show a significant increase in the mortality rate was accounted for splenectomy (28.6 vs 10% (p=0.035)), damage control surgery (38.5 vs 9.7% (p=0.001)) and primary repair of colon with proximal colostomy (31 vs 9.8% (p=0.009)).

Not only the septicemia makes a major risk factor that increase the mortality significantly (41.5 vs 2% (p=0.001)) along with DIC (46.7 vs 6% (p=0.001)) but also the pneumonia also had its effect on the mortality (26 vs 7.2% (p=0.001)) so promote general management is essential to improve the outcome of traumatic patients.

Anastomotic leak contributes to increase the mortality rate as the m ortality in anastomotic leak was 40% vs 11% in non-anastomotic leak (p=0.04) as the anastomotic leak cause peritonitis and sepsis and septic shock and multiorgan failure.

Conclusion

Laparotomy for abdominal trauma still one of the most common surgical procedures in our practice yet it carries a significant morbidity and mortality. Many negative laparotomies also have its hazardous effect in patients that necessitate farther

improvement in diagnosis and evaluation of the patient. Also, improvement of general management of patients in a multidisciplinary team specialized in trauma management in different surgical and medical specialties can improve the mort ality and mortality rate.

References

1. Mahmood I, Mustafa F, Younis B, et al: Postoperative complications of intestinal anastomosis after blunt abdominal trauma. ***Eur J Trauma Emerg Surg.*** 2020; 46: 599–606.
2. Dajenah M, Ahmed F, Thabet A, et al: Early postoperative complications of gastrointestinal surgery and its associated factors in Yemeni patients treated in a Teaching Hospital: A retrospective monocentric study. ***Cureus.*** 2022; 14(5): e25215.
3. Toppo S, Kamal AK, Shekhar H, Anand C, Ali M: A retrospective study of penetrating abdominal trauma at Tertiary Care Hospital, Rims Ranchi. 2019.
4. JAIN Sanjay, MASKE, Dinkar, SONGRA, MC: Clinical study of hollow viscus injury in abdominal trauma. ***International Surgery Journal***, [S.l.]. 2017; 5(1): 39-44.
5. SOLANKI Hardik J, PATEL Himanshu R: Blunt abdomen trauma: A study of 50 cases. ***International Surgery Journal***, [S.l.]. 2018; 5(5): 1763-1769.
6. MASKE Audumbar N, DESHMUKH Santoshkumar N: Traumatic abdominal injuries: our experience at rural tertiary care center. ***International Surgery Journal.*** 2016; 3(2): 543-548.
7. Cardi M, Ibrahim K, Alizai SW, et al: Injury patterns and causes of death in 953 patients with penetrating abdominal war wounds in a civilian independent non-governmental organization hospital in Lashkargah, Afghanistan. ***World J Emerg Surg.*** 2019; 14: 51.
8. Imad A. Jaboury, Re: Gunshot wounds to the colon: Predictive risk factors for the development of postoperative complications, an experience of 172 cases in 4 years, ***ANZ Journal of Surgery***. 10.1111/ans.160 83, 90, 9, (1824-1824), (2020).
9. van Gool MH, Giannakopoulos GF, Geeraedts LMG, et al: Complications after laparotomy for trauma: A retrospective analysis in a level I trauma centre. ***Langenbecks Arch Surg.*** 2015; 400: 83–90.
10. JAIN Sanjay, MASKE Dinkar, SONGRA MC: Clinical study of hollow viscus injury in abdominal trauma. ***International Surgery Journal.*** 2017: 5(1): 39-44.
11. S Pengelly JE A Berry, SE Herrick, DM Bowley, GL Carlson: Outcome of open abdominal ma nagement following military trauma, ***British Journal of Surgery.*** 2018; 105(8): 980– 986.
12. Relaparotomies in abdominal trauma, systematic review Haider Abdulhussein, Ahmed; Sajid Hameed, Abdal Helfy. ***IPMJ-Iraqi Postgraduate Medical Journal.*** 2015; 14 (1): 123-13 em Inglês | IMEMR | ID: emr-15991.