

Jejuno-Ileal Ruptures after Blunt Abdominal Trauma at the Teaching Hospital of Bouake

Kouakou Ibrahim Anzoua*, Kouamé Bernadin Kouakou, Mamadou Traoré, Kalou Ismael Leh Bi, Alassane Binaté, Venance Dago Aloka, Blaise Amos Kouakou, Amos Serge Ekra, Roger Lebeau, Bamourou Diané

Department of General and Digestive Surgery, Teaching Hospital of Bouake, Bouake, Côte d'Ivoire

Email: *ankib7@yahoo.fr

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Abstract

Objective: The aim of this study is to determine the causes, pattern, management, and outcome of jejunal-ileal rupture following blunt abdominal trauma at the teaching Hospital of Bouake. **Methods:** The study included 27 patients who underwent laparotomy for jejunoileal injuries from blunt abdominal trauma at the Teaching Hospital of Bouake over a period of 14 years from January 2007 to December 2020. A retrospective study was conducted and the patients were analyzed with respect to patient demographics data, cause, injury mechanisms, presentation, anatomical distribution, diagnostic methods, associated injuries, treatment and outcomes. **Results:** During the 14 year period from 2007 to 2020, 27 patients with blunt small bowel injuries were treated at our Teaching Hospital. That is 2.9% of all blunt abdominal trauma. Male to female ratio was 4.4:1 and the average age was 26.3 years (range: 15 and 50 years). The majority (66.7% 18 cases) were Victims of road traffic accident. Median delay between injury and arrival at hospital for these patients was 10.1 hours (range: 1 - 72 h). A single intestinal injury was present in 22 patients, while 5 patients suffered from 2 injuries. There were 32 perforations of the small intestine in 27 patients with two perforations being transection. All perforations were located on the antimesenteric border of the intestine. Out of the 32 jejuno-ileal ruptures 18 were located on the jejunum while 14 were located on the ileum. Associated intra-abdominal injuries were present in 6 patients and nineteen associated extra-abdominal injuries were present in 10 (70.4%) patients. A one-stage therapeutic strategy was performed in 20 cases (74.1%) and a two-stage strategy was performed in seven cases (25.9%). Intestinal continuity was restored 93.8 days later (range 60 and 140 days). The average length of hospital stay of the operated patients was 11.4 days. The operative morbidity was 25.9%. **Conclusion:** Jejuno-ileal ruptures are rare and characterized by a delay in management. An early diagnosis could

improve the vital prognosis of the patients.

Keywords

Rupture, Jejunum, Ileum, Blunt Abdominal Trauma, Peritonitis, Hemoperitoneum

1. Introduction

Blunt abdominal trauma may injure all the sections of the gastro-intestinal tract, and lesions may vary in their clinical presentation [1]. More than half of all blunt intestinal injuries are found in the small intestinal, with equal involvement of the jejunum and ileum. Jejuno-ileal ruptures rarely occurred in blunt abdominal trauma. The incidence of small bowel rupture associated with blunt abdominal injury range from 3% to 18% [2] [3] [4] [5]. In cases with the presence of early signs of hemoperitoneum or peritonitis diagnosis is readily made at laparotomy [6]. The diagnosis can be notoriously difficult, especially in patients with multiple injuries, head trauma with impaired consciousness or in patient with minimal or slowly emerging clinical signs of peritonitis or hemoperitoneum. In such cases the diagnostic can be challenging and the treatment delayed for several hours or days. In developed countries these diagnostic problems seem to be solved by the use of unenhanced computed tomography to visualize hollow visceral and/or mesenteric injury after blunt abdominal trauma [6] [7] [8] [9]. In our daily practice, using this diagnosis tool in emergency is not always possible due to its unpermanent availability and the high cost of performing the examination. This suggests diagnostic difficulties for jejuno-ileum ruptures in our practice. This study aimed to describe the epidemiological, diagnostic and therapeutic aspects of jejuno-ileal ruptures at the Teaching Hospital of Bouake.

2. Methods

During the 14 years period from January 01, 2007 to December 31, 2020, there were 930 admissions in our hospital for blunt abdominal trauma of which 27 patients underwent laparotomy for intestinal and mesenteric injuries. The Teaching Hospital of Bouake is a 283-bed urban public hospital. This hospital is a tertiary referral center and serves urban and rural population not only from Bouaké's agglomeration but also from the whole central and northern parts of the country. The city of Bouake (1,500,000 inhabitants) is located 350 km from the city of Abidjan, the economic capital of the ivory coast. The city is located at the crossroads of the main roads in the direction of Mali and Burkina Faso with the consequences of heavy road traffic.

Patients of any sex and age with abdominal contusion who arrived alive at the surgical emergency department were included in the study. Patients without a usable medical record, operated in another hospital and transferred secondarily to the digestive surgery department of the University Hospital were not included

in the study.

This was a comprehensive sampling that included all patients with abdominal contusion during the study period who met the inclusion criteria. Data were collected on a survey form. The source of the data was the surgical emergency registers, the operative report registers and the records of the patients hospitalized in the digestive surgery department.

A retrospective study was conducted and the patients were analyzed with respect to age, sex, cause of injury, presentation, site of injury, associated intra-abdominal and extra-abdominal injuries, delay in surgical intervention, type of surgical procedure performed, complications, total hospital stay, and outcome in terms of mortality and morbidity. Jejunioleal injuries were defined as perforation or transection of bowel [10].

3. Results

1) Epidemiological data

During the study period 27 patients were operated for traumatic jejunio-ileal rupture. These represent 2.9% of the 930 patients admitted for blunt abdominal trauma during the same period. There were 22 males and 5 females, the male to female ratio being 4.4:1. The average age of the patients was 26.3 years (range: 15 and 50 years). Eleven patients (40.7%) were between 20 and 30 years old.

Figure 1 represents the distribution of patients by age group.

Regarding the mode of injury, road traffic accidents accounted for 18 cases. The remaining cases resulted from miscellaneous accidents (**Table 1**).

In this study, the median delay between injury and arrival at the hospital for these patients was 10.1 hours (range: 1 - 72 h). This delay was less than 6 hours in 20 patients (74.1% of patients). Two patients came to hospital 72 hours after the trauma.

The type of injuring agent was identified in all patients (100%). These were

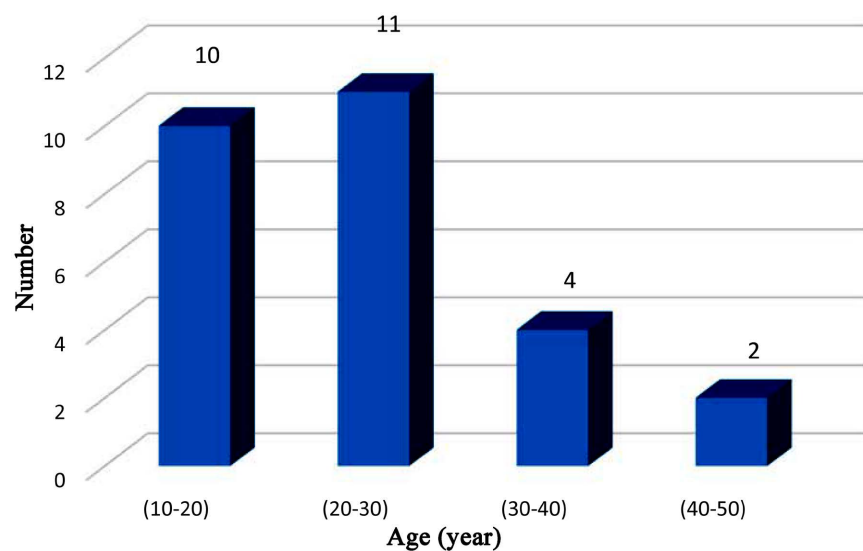


Figure 1. The distribution of patients according to age range.

Table 1. Mode of injury.

Mode of injury	Number	Percentage (%)
Road traffic accident	18	66.7
Gambling accident	6	22.2
Agression	2	7.4
Industrial accident	1	3.7
Total	27	100

Table 2. Type of injuring agent for blunt abdominal trauma.

Type of injuring agent	Number	Percentage (%)
Motorcycle against motorcycle	10	37.1
Motorcycle against motor vehicle	5	18.5
punch	5	18.5
kick	3	11.1
Motocycle against a tree	1	3.7
Motorcycle handlebars	1	3.7
plank	1	3.7
Steering wheel	1	3.7
Total	27	100

shown in **Table 2.**

2) Diagnostic data

The mechanism of injury was mixed mechanisms in 59% of cases (deceleration and impact secondarily). In 41% of the cases it was a direct mechanism such as a direct impact in the abdomen

The period between the last meal and the trauma was determined in all patients. This period was longer than six hours in 7% (n = 2) of patients. It was between 0 and 3 hours in 67% (n = 18) and between 3 and 6 hours in 26% (n = 7) of the patients. All patients Glasgow scale was 15. Nineteen patients remain hemodynamically stable while eighth patients (29.6%) presented with hypotension defined as systolic blood pressure < 90 mm Hg on admission. All patients had generalized abdominal tenderness on initial physical examination together with vomiting in three patients and inability to pass gas or stool in two patients.

Ultrasonography was performed in 25 patients. This revealed peritoneal fluid in 19 patients and hemoperitoneum in 6 patients. Twenty one patients had an abdominal x-ray on presentation. This revealed free intraperitoneal air in four patients. A complete blood count was performed in all patients. Twenty-four had hemoglobin levels between 10 and 15 g/dl and three had a level below 10 g/dl. Three patients had polynuclear neutrophilic hyperleukocytosis.

Eleven associated intra-abdominal injuries were present in 6 patients and in-

cluded the liver (n = 3), spleen (n = 2), large bowel (n = 1), pancreas (n = 1), bladder (n = 1), diaphragm (n = 1), stomach (n = 1), and kidney (n = 1). Nineteen associated extra-abdominal injuries were present in 10 (70.4%) patients and included extremities (n = 7), pelvic bone injury (n = 4), head injury (n = 3), faciomaxillary injuries (n = 3), Blunt trauma chest (n = 2).

One patient could have many associated injuries. Three patients sustained combined intra- and extra-abdominal injuries. The remaining eight patients had isolated jejunoileal rupture.

3) Thérapeutic data

All patients were resuscitated with a cristalloid solution, received antibiotics and analgesic medication. Seven patients received blood transfusion. The mean time from admission to laparotomy was 2 h 30 mn in twenty one patients (74%) and more than 2 days in the remaining six patients. During exploratory laparotomy, a large volume of free fluid with debris was found on entry into the peritoneal cavity in seven patients (**Figure 2**). An estimated 300 cc hemoperitoneum (range 150 - 700 cc) was evacuated in the remaining 20 patients. Five patients suffered 2 injuries (**Figure 3**) while a single intestinal injury was present in 22 patients (**Figure 4, Figure 5**). There were 32 perforations of the small intestine in 27 patients with two perforation being transection. All perforations were located on the antimesenteric border of the intestine (**Figures 3-5**).

Of the 22 patients (81.5%) who experienced a single intestinal injury, 16 injuries were ileal and six were jejunal.

Four jejunal ruptures were located 15 cm, 20 cm, 35 m and 60 cm respectively from the duodeno-jejunal angle. The remaining two jejunal ruptures were located both 30 cm from the duodenojejunal angle.

Of the five patients who suffered two intestinal injuries:

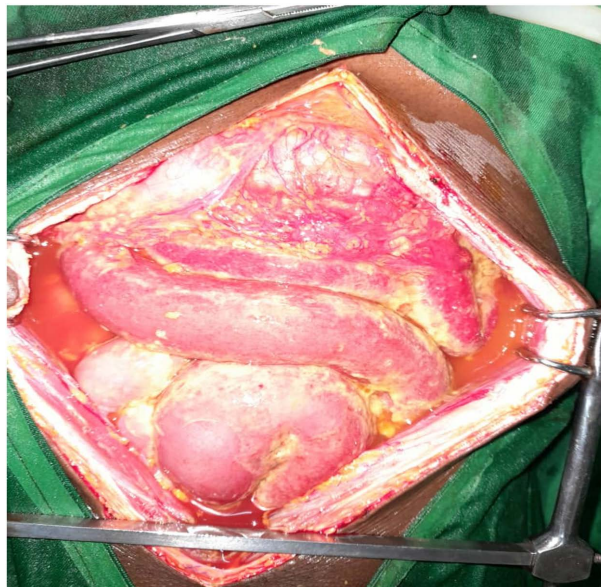


Figure 2. Highly septic abdominal cavity in a patient with ileal rupture and operated 48 hours later.

- one patient had two jejunal ruptures located 10 cm apart, the most proximal being located 35 cm from the ligament of Treitz;
- one patient had two jejunal ruptures located 15 cm apart, the most proximal being located 25 cm from the ligament of Treitz;
- one patient had two ileal ruptures located 25 cm apart, the most distal being located 20 cm from the ileo ceocal valve;
- one patient had two ileal ruptures located 10 cm apart, the most distal being located 30 cm from the ileocecal valve;



Figure 3. Double jejunum rupture.

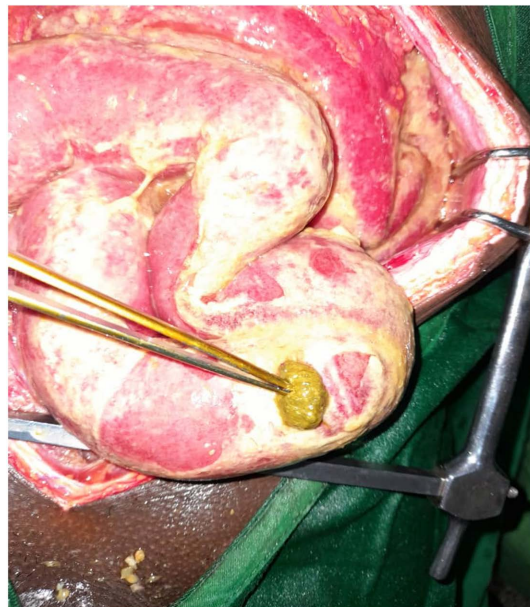


Figure 4. Rupture of the ileum at its anti-mesenteric edge with discharge of stool.



Figure 5. Rupture of the jejunum on the antimesenteric border. note the eversion of the edges of the perforation.

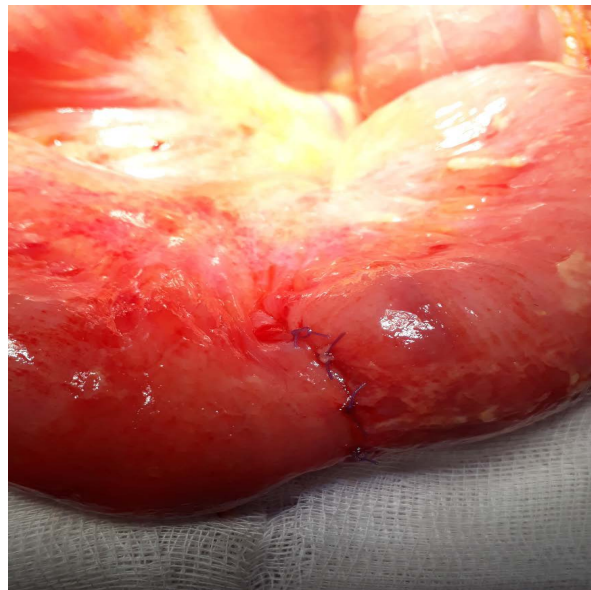


Figure 6. Primary repair of ileal rupture (same patient as in **Figure 5**).

- the remaining patient had one jejunal rupture located 20 cm from the ligament of Treitz and another perforation located 2 cm from the ileo cecal valve. Regarding treatment, all of the patients were managed surgically. Primary repair of the perforation was the most commonly used technique in 18 patients (66.7%) (**Figure 6**). Bowel resection with end-to-end anastomosis was performed in 2 patients (7.4%), resection and ileostomy was carried out in the remaining 7

patients (25.9%). Those seven patients had grossly contaminated peritoneal cavity and were hemodynamically unstable. The peritoneal cavity was washed-out with warm saline solution, and one drain was placed in the peritoneal cavity.

In patient with ileostomy, intestinal continuity was restored 93.8 days later (range 60 and 140 days).

The treatment of the other intra-abdominal lesions was as follows: splenectomy for splenic injury, bowel resection and anastomosis in patient with mesenteric injury, primary repair for colonic rupture, conservative management for blunt hepatic trauma and non-expanding mesenteric hematoma.

4) Evolution

Seven patients (25.9%) developed post-operative complications, including three peristomal dermatitis, two wound infection, two anastomotic leakage. All the post-operative complications were managed successfully.

Mortality rate was nil. The mean duration of total hospital stay in our patients was 11.4 days (range 7 and 34 days).

4. Discussion

1) In terms of épidemiology

The incidence of small bowel rupture associated with blunt abdominal injury ranged from 3% to 18% [2] [3]. Our 2.9% frequency of SBI in blunt abdominal trauma in the present study group is comparable with previous reports in the literature [2] [3] [11]. Jejunio ileal injuries and their mesenteries are considered a single clinico-anatomic entity and occur either as a result of high energy trauma involving motor vehicle accident or low energy impacts, such as bicycle falls [6] [12]. In our study road traffic accidents were the leading cause in 66.7%. It is said that there is an equal involvement of the jejunum and ileum [13] [14]. In this study, ruptures were more frequent on the ileum. Mechanisms of small bowel disruption with blunt trauma include shearing forces as it happens with sudden deceleration, compression between the abdominal wall and vertebral column as it occur in a crushing injury, and bursting injury due to a sudden increase in intraluminal pressure as it occur when the patient receive a blow on his abdomen or when a heavy object fell on abdomen [3]. It has been observed in earlier studies that these injuries are seen in the younger age groups and male patients [15] [16] [17] [18]. The present study showed similar results. This might be for the reason that this age group forms a major segment of the workforce. It has also been observed in earlier studies that the proximal jejunum and distal ileum were more prone to perforation [5] [13]. Our result sustained this previous finding as more than half of the perforations occurred in these zones. The most severe form of bowel injury is transection, which means the bowel loop loses its continuity completely. This type of injury rarely occurs in patients with blunt abdominal trauma, [18] [19] [20]. In this study 2 jejunoileal perforation were found to be bowel transection.

2) In terms of diagnosis

Owing to the rarity of small bowel injury after blunt abdominal trauma and absence of peritoneal signs, the diagnosis of small bowel perforation is often delayed. There are no specific clinical signs of jejuno-ileal rupture in the context of a blunt abdominal trauma [16] [17]. A high degree of clinical suspicion is necessary based on mechanism of injury and clinical findings. Abdominal tenderness, the presence of a seat belt mark and a chance fracture of the lumbar spine have all been associated with traumatic small bowel perforation in previous studies [2] [7]. Diagnosis of bowel injury was made based on signs of peritonitis, patient's hemodynamic status, and radiological findings. Radiological tests used to evaluate patients with blunt trauma include Xray and Ultra Sonography of the abdomen. Ultrasonography is an easily accessible, less expensive, and non-invasive investigation. The presence of free fluid without solid organ injury is considered to be suggestive of hollow viscus and/or mesenteric injury [13]. In our study blunt abdominal trauma mechanism and abdominal tenderness were suggestive of intra abdominal trauma. CT scans can help in diagnosis, although there is a significant false-negative rate for detecting perforation [7] [9] [21]. Recently laparoscopy has gained widespread acceptance as a method for the evaluation and treatment of selected blunt and penetrating abdominal injuries in hemodynamically stable patients [5] [21] [22]. Abdominal CT scans and laparoscopy are not available in our daily practice. Abdominal trauma is commonly associated with other injuries that complicate the management and also affect the outcome. In our study, 10 patients had 19 associated intra-abdominal and extra-abdominal injuries. Skeletal injury being the most common extra-abdominal injury. Among skeletal injuries, extremities injuries were noted in 7 patients. This is comparable to a study conducted by Ayoade *et al.*, which showed skeletal injuries to be the most common associated extra-abdominal injury [23].

On the other hand intrabdominal injury was present in 6 patients with the liver and the spleen being the most common injured solid organ. This finding is in accordance with other studies [13].

3) In terms of treatment

Regarding treatment, all patients were managed surgically. Primary repair of the perforation was the most commonly used technique. Diversion ileostomy was performed in those patients who were hemodynamically unstable, with the grossly contaminated peritoneal cavity. Resection and anastomosis was performed when there were two perforations in proximity or when bowel viability was compromised, as found in one patient with mesenteric injury

5. Conclusion

Jejuno-ileal ruptures are rare and are mainly caused by road accidents. Young people are the most affected. Preoperative diagnosis is difficult in our settings due to insufficient technical facilities. The severity of the lesions could be linked to certain risk factors that we did not find in our series.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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