DIAGNOSIS AND TREATMENT OF RUPTURE LIVER DUE TO BLUNT ABDOMINAL TRAUMA FOR 5 YEARS IN MILITARY HOSPITAL 103

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SUMMARY

Objectives: *To study the clinical and subclinical characteristics and treatment outcomes of patients with ruptured liver due to blunt abdominal trauma (BAT) at Military Hospital 103.* ***Subjects and methods:*** *A descriptive retrospective study in 85 patients diagnosed with ruptured liver due to BAT from 2015 - 2020.* ***Results:*** *Patients had an average age of 32.5 ± 15.2. The percentage of male patients was 80. A traffic accident was the most common reason for BAT (64.7%). Clinical signs on admission: 9.4% of cases went into shock, 17.6% had polytrauma, 72.9% had an abdominal hemorrhage, 68.2% had hemodynamic stability, and 24.7% had hemodynamic instability. 7.1% of patients had bradycardia and hypotension, 35.3% had associated injuries, and 1.2% had peritonitis. Death within the first 24 hours or death after emergency surgery occurred in 3.5% of cases. Abdominal ultrasound revealed that 60.0 % of cases had free fluid in the peritoneal cavity. CT demonstrated rupture liver of levels I, II, III, IV, V were 9.4%, 35.3%, 32.9, 16.5, and 5.9%, respectively. 84.7% of cases were treated conservatively: 35.5% underwent abdominal drainage under ultrasound guidance, 48.2% were treated via pharmacological methods, and 15.3% via open surgery. Operations were more often performed for patients with hemodynamic instability ($p < 0.05$). The average length of hospital stay was 9.0 ± 4.6 days.* ***Conclusion:*** *Diagnosis of the ruptured liver due to BAT depended on intra-abdominal symptoms, abdominal ultrasound, and CT. Patients with hemodynamic stability were often treated conservatively, and operations were often given for patients with hemodynamic instability.*

** Keywords: Abdominal trauma; Ruptured liver due to BAT.*

INTRODUCTION

Liver trauma is a very common solid organ injury in closed abdominal trauma (second after ruptured splenic), accounting for 15 - 20% [1, 2]. Recently, the rate of liver trauma has increased markedly both in number and extent of the damage. The most common cause of liver trauma is mainly traffic accidents. According to some authors in the West, about 70% of liver trauma cases are caused by traffic accidents [3]. According to statistics,

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CT scan abdomen allows determining how much damage the liver parenchyma with images hematoma in parenchymal hematoma subcapsular, contusion, torn tissue, blood in the abdominal cavity with injury combination [4]. Thereby making 31% of multi-injury cases had closed abdominal injury, of which 16% were reported to have liver trauma [2]. The diagnosis of liver injury is based on clinical manifestations of the syndrome, bleeding in the peritoneal cavity, based on clinical ultrasound and computerized tomography. fundamental changes in views and attitudes treatment of liver injury in 30 years. Regarding treatment, previous surgical indications for liver injury are very spacious. Today, advances in resuscitation anesthesia, surgical techniques, and intravascular interventions have reduced mortality from liver injury. The trend of non-surgical conservative treatment for patients with liver injury grades I, II, III with hemodynamic stability is increasing and achieving good results [5, 6, 7]. We carried out this research: *To summarize the experience related to the diagnosis and treatment of liver injury at Military Hospital 103 in the 5 years from 2015 to 2020.*

SUBJECTS AND METHODS

1. Subjects

85 patients hospitalised from January 2015 to January 2020 at Military Hospital 103, who was diagnosed with liver trauma due to blunt abdominal injury based on clinical features, ultrasound imaging, abdominal CT imaging, and lesions determined during surgery.

2. Methods

* *Study design:* A retrospective study.

Data including clinical features, causes of injury, presence of traumatic shock, intra-abdominal hemorrhage, peritonitis, and other coordinated injuries were collected. Treatment of liver trauma due to blunt abdominal injury by non-operative or operative treatments was also determined. The data was gathered and processed on Excel software with statistical algorithms.

RESULTS

1 Patients characteristics and causes of injury:

Average age: 32.5 ± 15.2, the lowest is 7 years old, the highest is 75 years old, most of them are in the working-age group of 20 - 40 years old, accounting for 53% of the sample population.

Male: 68 patients (80%); female: 17 patients (20%), male/female ratio: 4:1

- Causes of injury:

+ Traffic accidents: 55 patients, accounting for 64.7%.

+ Household accidents: 17 patients, accounting for 20.0%.

+ Working accidents: 9 patients, accounting for 10.6%.

+ Assault: 4 patients, accounting for 4.7%.

Traffic accidents are the most common cause of blunt liver injury.

2. Clinical features in blunt abdominal injury

Table 1

Variable	Number of patients (n)	Ratio (%)
The conditions of patients when hospitalised		
- Shock	8	9.4
- Polytrauma	15	17.6
- Coordinated damage	30	35.3
- Abdominal hemorrhage	62	72.9
- Acute peritonitis	1	1.2
- Death	3	3.5
The period of time from accidents to hospitalisation		
- (≤ 6h)	40	47.1
- (6 - 12h)	18	21.1
- (12 - 24h)	18	21.1
- (> 24h)	9	10.6
Ultrasonography and ultrasound-guided abdominocentesis		
- Fluid	51	60
- Evidence of liver injury	64	75.3
Computer imaging*		
- Grade I	8	9.4
- Grade II	30	35.3
- Grade III	28	32.9
- Grade IV	14	16.5
- Grade V	5	5.9
- Grade VI	0	0.0

* Grading liver rupture on CT base on Liver Injury AAST Grading System

Patients' hemodynamic conditions when hospitalised (heart rate and blood pressure):

- Hemodynamically stable (HR ≤100 bpm, systolic BP ≥ 100mmHg): 58/85 patients (68.2%).

- Hemodynamically unstable (100mmHg < HR ≤140 bpm and 80 mmHg < systolic BP ≤ 100mmHg): 21/85 patients (24.7%).

- Rapid but weak pulse, low blood pressure (HR >140 bpm and systolic BP < 80mmHg): 6/85 patients (7.1%).

Table 2: The relationship between CT imaging and hemodynamics of patients on admission.

Grade on CT / Hemodynamic	I	II	III	IV	V	VI	Total
Stable hemodynamics	8	28	21	1	0	0	58
Unstable hemodynamics	0	2	7	12	0	0	21
Rapid but weak pulse, low blood pressure	0	0		1	5	0	6
Total	8 (9.4%)	30 (35.3%)	28 (32.9%)	14 (16.5%)	5 (5.9%)	0 (0.0%)	85 (100.0%)

Table 3: Treatments.

Treatments		Number of patients (n)	Ratio (%)
Non-operative management	Observation only	41	48.2
	Ultrasound-guided peritoneal lavage	31	36.5
Operative management	Suture hemostasis	13	15.3
Total		85	100.0

Table 4: The relationship between treatment and patients' hemodynamics on admission.

Hemodynamic / Treatment	Stable hemodynamic	Unstable hemodynamic	Rapid but weak pulse, low BP	Total
Non-operative management	58	14	0	72
Operative management	0	7	6	13
Total	58 (68.2%)	21(24.7%)	6 (7.1%)	85

$p < 0,05$

Table 5: The relationship between treatment and CT imaging.

Grade on CT / Treatment	I	II	III	IV	V	VI	Total
Non-operative management	8	28	27	9	0	0	72
Operative management	0	2	1	5	5	0	13
Total	8 (9.4%)	30 (35.3%)	28 (32.9%)	14 (16.5%)	5 (5.9%)	0 (0%)	85 (100%)

Average time of hospitalisation: 9.0 ± 4.6 days.

DISCUSSION

** Patient's characteristics:*

- Average age: 32.5 ± 15.2 years old, the lowest is 7 years old, whereas the highest is 75 years old, most of them are in the group of 20 - 40 years old, account for 53%, which is the group of working age.

Male/Female: 4/1.

The most common cause of liver injury is traffic accidents which account for 64.7%. According to Doklestić Road, traffic accident was the leading cause of trauma, seen in 90.0% [8].

** Clinical features:*

- The period of time from accidents to admission: Most patients are admitted to the hospital in less than 24h, accounting for 89.6%.

- Death: 3 patients died (3.5%). Two patients died from multiple trauma and hypovolemic shock due to damage of multiple organs: abdominal hemorrhage, pleural effusion, pneumothorax, complicated pelvic trauma. The third patient died after an emergency operation due to right pleural effusion, pelvic injury, right kidney rupture, diaphragmatic rupture. The patient was in for liver sutures, nephrectomy, left pleural cavity drainage, repair of diaphragmatic tear, and died after 2 hours. The rate of death was even lower in a study by Siddiqui (2020), which was 10% [9].

- Shock: 8 patients were in shock and had a severe abdominal hemorrhage. 8/8 patients had resultant multiple trauma shock. The reason for shock in blunt abdominal injury patients is mostly due to loss of blood and multiple trauma. According to Doklestić, patients with high-grade liver trauma who present with hemorrhagic shock and associated severe injury should be managed operatively. Mortality from liver trauma is high for patients with higher AAST grade of injury, associated brain injury, and massive transfusion score [8].

- Coordinated damage: 30 patients (35.5%) have coordinated damage, with injuries to 5 regions of the body: brain, chest, abdomen, limbs, and face.

- Multiple trauma: 15 patients (17.6%) have multiple trauma, with severe damage in 2 different regions of the body, affecting crucial functions of the body.

- Abdominal hemorrhage: frequently seen in blunt liver injury. 72.9% of patients have abdominal hemorrhage syndrome.

- Acute peritonitis: there is 1 case with jejunal damage and liver injury. They were given an early diagnosis by ultrasound-guided abdominocentesis.

** Subclinical features:*

- Ultrasonography is a valuable method of diagnosis and prognosis in treating liver rupture due to BAT. 75.3% of liver lesions were detected on ultrasound, and 60% were detected on ultrasound-guided abdominocentesis (table 1).

- CT was also a valuable tool for diagnosis and evaluation of liver rupture due to BAT. In the study of detection of liver injury by grade I, II, III, IV, and V, the detection rate was 9.4, 35.3, 32.9, 16.5 and 5.9%, respectively. The majority of patients with liver rupture of I, II, III have stable hemodynamics, while patients with unstable hemodynamics had liver rupture of grade IV and V (*Table 2*).

** Treatment:*

Surgery used to be the treatment of choice in cases of blunt hepatic injury, but this approach gradually changed over the last two decades as increasing non-operative management (NOM) of splenic injury led to its use for hepatic injury. The improvement in critical care monitoring and computed tomographic scanning, as well as the more frequent use of interventional radiology techniques, has helped to bring about this change to non-operative management [10]. According to Hommes (2015), in stable hemodynamic patients without an acute abdomen, non-operative management (NOM) of blunt liver injuries has become the standard of care with a reported success rate of between 80 and 100% [2]. In a study by Cirocchi, minor injuries (grade I or II) are the most frequent liver injuries (80% to 90% of all cases); severe injuries are grade III-V lesions; grade VI lesions are frequently incompatible with survival. In the medical literature, the majority of patients who have undergone NOM have low-grade liver injuries. The safety of NOM in high-grade liver lesions, AAST grade IV and V, remains a subject of debate as a high incidence of liver and collateral extra-abdominal complications is still described. [10]

In this research, according to table 4, hemodynamics was the most important factor affecting the decision to consider the medical therapy: Non-operative management (NOM) or surgery. On studying NOM for the patient with unstable hemodynamics, surgery was indicated for a patient with unstable hemodynamic ($p < 0.05$).

Treated by surgical methods: 13 patients (15.3%) underwent surgery. The commonly used surgical method here is the suture of the liver wound. Based on Table 4, the 13 patients received emergency surgery 7 patients with hemodynamic instability, 6 patients have expressed shock, rapid pulse small, difficult to detect pulse, hypotension. In the case of patients with liver rupture admitted to the hospital in hemodynamic instability after the dialysis has been active and the fluid has not progressed, the indication for surgery should be made early in order to save the patient's life. From Table 5, rupture liver damage for patients with surgical treatment usually splenic rupture liver rupture of the IV and V 10/13 patients. 3 patients with grade III liver rupture, and the second due to surgery after conservative treatment by means of peritoneal fluid drainage under ultrasound guidance. After a few days, 1 patient with bile leakage expression while 2 other patients show signs of bleeding in the abdomen near 1-week relapse after conservative treatment. According to Table 4, conservative treatment was applied to the majority of patients (84.7%). Liver rupture grade I, II, III is often conserved, the success rate is very high. With the grade, IV rupture can also be treated conservatively when the patient has hemodynamic stability. In the study, 9 patients with grade IV rupture were successfully conserved in treatment. Nowadays, conservative and minimally invasive treatments are the trend for liver rupture injury treatment. Another method that we have not used for liver rupture is the hepatic vascular node. In addition, it is

also possible to use laparoscopic surgery to diagnose and manage liver rupture grade II and III that have complications such as biliary fistula or a combination of hollow viscera but in the case of patients with hemodynamic stability.

The average hospital stays for liver damage to be treated: 9.0 ± 4.6 days.

CONCLUSION

Ruptured liver caused by blunt abdominal trauma is a surgical emergency. The common cause is traffic accidents (67.7%). Diagnosis of the ruptured liver is mainly based on signs and symptoms, including abdominal bleeding syndrome (72.9%), abdominal ultrasound detecting abdominal fluid (60%), and liver lesions (75.3%). CT scans demonstrating liver rupture grades I, II, III, IV are 9.4, 35.3, 32.9, 16.5, and 5.9%, respectively. Treatment of ruptured liver is mainly based on the patient's hemodynamic. NOM is indicated for patients with stable hemodynamics, and surgery is indicated for patients with unstable hemodynamics ($p < 0.05$).

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