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Liver Trauma Among Obese: A local retrospective Study

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ABSTRACT

This retrospective observational study was conducted at a tertiary care hospital in Saudi Arabia in 3 years' period from January 2017 to December 2020. The records of liver trauma patients who had a body mass index (BMI) >35 and having isolated blunt hepatic injuries were studied. Collected data included; their clinical condition upon arrival to the emergency department as well as the conducted investigations. Forty-six patients had liver injury. They were 38 males and 8 females with a ratio of male 6 to 1. Their mean and median age were 30.02 (range = 16 to 67) and 26 years, respectively. Their BMI ranged from 38 to 63. Eleven (23.9%) patients had comorbidities like hypertension, diabetes mellitus, asthma plus others. The most common mechanism of injury was road traffic accident in forty-two (91.3%) patients. Four (8.7%) patients suffered of direct injuries due to insults and quarrels. Twenty-eight (60.8%) had associated extra-abdominal injuries, while 18(39.1%) had no extra-abdominal injuries. Thirty-five (76.1%) had isolated liver injuries, while 11(23.8%) had associated injuries. They were Spleen trauma in 6 (13.1%), kidney in 2(4.3%) and retroperitoneal hematoma in 3(6.5%). Those with liver trauma were; twelve (26.1%) with grade I, fifteen (32.6%) had grade II, seven (15.2%) had grade III, ten (21.7%) had grade IV, two (4.3%) had grade V and none had grade VI liver injuries. Seventeen (37%) patients were managed by surgical intervention, while 29(63%) underwent a non-operative conservative management.

1. INTRODUCTION

Trauma is the main 'illnesses" contributing the burden of hospital services. It may present as single or multiple organ injuries. Spleen is the most common organ injured followed by liver. The liver may be injured in isolation or in association with other organs and by blunt or penetrating injuries. Blunt trauma is most commonly caused by road traffic accidents or fall from height due to deceleration. It most commonly affects the right lobe of liver [1]. Different scales classify these injuries. American Association for Surgery of Trauma (AAST) has classified the liver injuries from grade I to VI, while the World Society of Emergency Surgery (WSES) has classified the liver injuries into minor, moderate and severe grades. [2], [3] Liver is a highly vascularized organ with dual blood supply via the hepatic artery and portal vein. Hence, its

injury may highly jeopardize the health or life of the patient if not managed accurately and promptly. Obesity renders another additional challenge in its management. It may delay the recovery of the patients depending upon the severity of obesity's degree [4]. Controversy exists as regards the conservative or surgical management of liver trauma in thin or obese patients. It usually depends on the grade of injury, patient's hemodynamic stability, available hospital facilities as well as other factors [5]. Many trauma scores like injury severity score (ISS), new injury severity score (NISS), organ injury scale (OIS), revised trauma score (RTS), Glasgow coma scale (GCS), APACHE score and others are important to predict the outcome [6].

2. PATIENTS AND METHODS

This retrospective 3 years' observational study gained an approval by our institutional review board. It took place in the period from January 2019 to December 2020. All obtained data underwent statistical analysis using SPSS version 23. The medical records of those morbid obese patients, whose heights and weights were available in the record. Their body mass indices (BMI) were more than 35. They had trauma and were admitted through emergency room (ER) with liver injuries alone or associated injuries along with liver. Excluded from the study; were those trauma patients who did not have liver injuries. Those with unavailable weight and height plus patients with a BMI of less than 35. In ER, the patients were managed according to the protocol of Advanced Trauma Life Support (ATLS). All the baseline investigations advised during the primary survey of the ATLS like complete blood count (CBC), blood urea nitrogen (BUN), blood sugar, serum creatinine and electrolytes and blood grouping and cross matching were done. Focused assessment by sonography for trauma (FAST) was performed to all the patients. The decision of operative or non-operative management based on hemodynamic condition, response to the initial fluid resuscitation, serial FAST findings i.e. organ injury or free fluid in the peritoneum, and continuous close observation/monitoring of the patients. The non-responders and the transient responders to the initial fluid resuscitation were shifted to operation room (OR) and operated instantly or on the same day. The responders and hemodynamically stable patients were further investigated by contrast CT scan and other necessary investigations of secondary survey and were admitted in intensive care unit (ICU). Those patients, whose hemodynamic stability deteriorated within 48 hours were also operated. The patients were discharged from the hospital when became completely stable and followed-up in outpatient clinic weekly. Their weight was recorded using the trauma stretcher integrated weighing scale.

2.1 Surgical technique

As per operative notes, the patients who needed surgery underwent abdominal exploration through a midline incision. Among those, who had severe hepatic injury (grade IV and above), the midline incision was extended to a right subcostal incision. Bleeding from liver injuries underwent suction and mopping, Pringle maneuver/atraumatic vascular clamp, mattress or running over with absorbable suture, putting Surgicel® within the lacerations and/or immediate peri-hepatic packing with sponges to create a tamponade effect. Injuries to other organs like spleen, kidney, intestine and mesentery were managed accordingly. Patients, who had retained sponges, were re-explored within 48 hours. Broad- spectrum antibiotics were instituted.

3. RESULTS

Out of the studied 46 patients who had liver injury, forty (87%) patients were males and six (13%) females. Mean and median age of the patients was 30.02 (range = 16 to 67) and 26 years respectively. Their BMI ranged between 38 to 63 with mean and median 47.04 and 46.5, respectively. Eleven (23.9%) patients had comorbidities like hypertension, diabetes mellitus, asthma….and other diseases. The remaining 35(76.1%) showed no other comorbidities. The most common mechanism of injury was road traffic accident. Forty-

two (91.3%) patients had blunt and four (8.7%) had penetrating injuries. Twenty-eight (60.8%) patients had extra-abdominal injuries, which included head injury, ribs fracture, hemo-pneumothorax, extremities fracture, spinal injury, pelvic fracture and multiple extra-abdominal injuries, while 18(39.1%) had no extra-abdominal injuries. Thirty-five (76.1%) had isolated liver injuries while 11(23.8%) had associated abdominal organs/areas injured as follows. Spleen 4(8.7%), bowel and mesentery 2(4.3%), kidney 2(4.3%) and retroperitoneal hematoma 3(6.5%). Twelve (26.1%) had grade I, fifteen (32.6%) had grade II, seven (15.2%) had grade III, ten (21.7%) had grade IV, two (4.3%) had grade V and none had grade VI liver injuries. Thirty-one (67.3%) patients needed blood transfusion, ranging from 1 to 7 units of packed red blood cells, while 15(32.6%) patients did not need it. Eighteen (39.9%) patients needed transfusion of fresh frozen plasma, while 28(60.9%) did not need it. Seventeen (37%) patients were managed by surgical intervention, while 29(63%) non-operatively. Those who were managed surgically, fifteen (32.6%) were operated on the 1st day and two (4.3%) on the 2nd day of the admission. In the operated patients, the liver injuries were managed by suturing the wounds ± putting Surgicel® or by packing the liver depending upon the grade of liver injury. Three (6.5%) patients had an associated procedure like splenectomy, one (2.2%) nephrectomy and two (4.3%) had intestinal/mesentery repair/resection. The hospital stays of the patients ranged between 2 to 32 days with mean and median stay of 11.7 and 10 days (Std. Deviation = 7.53) respectively. The mortality was four (8.7%) (Table I).

4. DISCUSSION

In our study, the mean age of the patients is 30.02 years. The M: F ratio was 6 to 1. This may be explained by the fact that the young populations are more active in day-to-day life; therefore, they more susceptible to trauma on the global scale [7]. The wide difference of male/female ratio is due to cultural circumstances. Obesity has incurred an increased healthcare costs and is related to increased morbidity like infections, length of stay in hospital and mortality as well [8], [9]. An increasing trend of morbidity and mortality was observed in the patients having elective surgeries with BMI ≥40 [10]. Several studies have shown that the perioperative morbidity like infection and critical care complications and mortality are higher in super-obese patients as compared to morbid-obese or non-obese patients, proving a linear relationship with increasing obesity. Hence, the length of hospital stay is also increased [11], [12]. Although obese patients can be optimized before elective non-bariatric surgeries by different strategies such as physical therapy and good control of co-morbidities by medication, this is hardly possible in trauma surgeries. However, the complications can be reduced by good wound care, intensive care and strictly abiding by the surgical protocols. The limitation of our study was that it does not have the cohorts to compare the different variables in obese and non-obese patients. Yet, an increasing trend of hospital stay was observed in the obese patients. Most liver injury patients in our study underwent a conservative non-operative management. This coincides with the trend of non-operative strategy for management, that has been also established in penetrating injuries of liver in grade I and II, anticipating that they do not have other indications of exploration and are hemodynamically stable [13]. Out of 42 patients having blunt trauma, 35 had isolated liver injuries and 29 (63.04%) were managed without operation. Such patients had grade I to IV liver injuries and were hemodynamically stable upon receiving in ER or were responders to the initial fluid resuscitation. These patients were admitted in ICU under closed monitoring. Two (4.3%) patients eventually became hemodynamically unstable and were operated on the second day of admission. Some patients having lower grade liver injuries were managed surgically due to associated abdominal organ injuries. (Figure I & II). These findings are comparable with a studies conducted by in which, 74% of the patients of grade I to III having isolated blunt liver trauma were managed successfully without surgical intervention and 2.32% who became hemodynamically unstable were operated within due course of time 13,14.

Therefore, it is not merely the grade of liver injury only but the hemodynamic instability and associated abdominal organ injuries, which dictates to apply a non-operative or operative strategy of management15. The conservative approach in hemodynamically stable patients and responders to initial fluid challenge has increased the overall survival and decreased mortality rate16. Grade II liver injury is the most frequently observed in our study (Table I & Fig-I), while some studies show the grade III and IV liver injuries as the most frequent [13], [17]. Peri-hepatic packing creating a tamponade effect is now considered as a well acceptable procedure of damage control surgery in advanced liver trauma in an unstable patient. In our study, 8 (17.4%) patients, mostly of grade V, were managed in the same way and was found a successful method to save the life of the patients. Factors causing increased morbidity and hence increased hospital stay in our study were the wound and chest infections. These findings were dependent upon multiple factors like grade of liver injury, associated intra- and extra- abdominal organ injuries, hemodynamic instability at the time of admission and afterwards, obesity and presence of pre-trauma co-morbidities. This is comparable with other studies found in the literature [18], [19]. The mortality in our study is 4 (8.7%) which is also comparable with study conducted by in which two patients died due to liver failure [20]. Obesity poses an extra challenge in the management of the patients related to complications and the special facilities requires at the hospital. Almost all the body systems like cardiovascular, pulmonary, gastrointestinal, renal, musculoskeletal, endocrine and immunologic are affected by obesity. Hence, the complications like deep vein thrombosis, pulmonary embolism and infections, wound infections/dehiscence etc. are expected in higher rate. These complications may be due to increased insulin resistance, decreased lung volume and compliance, increased ventilation/perfusion mismatch, gastroesophageal reflux, chronic renal failure etc. [21], [22]. Apart from that, the obese patients need special transport facilities, increased number and specially trained hospital staff, special beds and lavatory facilities for their management.

5. CONCLUSION

Most of the isolated blunt liver injuries of grade I to III can be managed conservatively. The hemodynamic instability dictates the type of management of liver injury rather than the grade. Obesity poses an extra challenge/requirement in the management of such patients.

6. DECLARATIONS

Ethics approval and consent to participate

Study was conducted after obtaining the institutional researchers' board (IRB) of college of Medicine, King Faisal University on the manuscript.

Consent for publication

I authorize the journal for publication of identifying images or other personal or clinical details of participants that compromise anonymity. (Not applicable)

Availability of data and material

All data and material are available upon request

Competing interests

The author declares that there is no compete or conflict of interests regarding the publication of this article.

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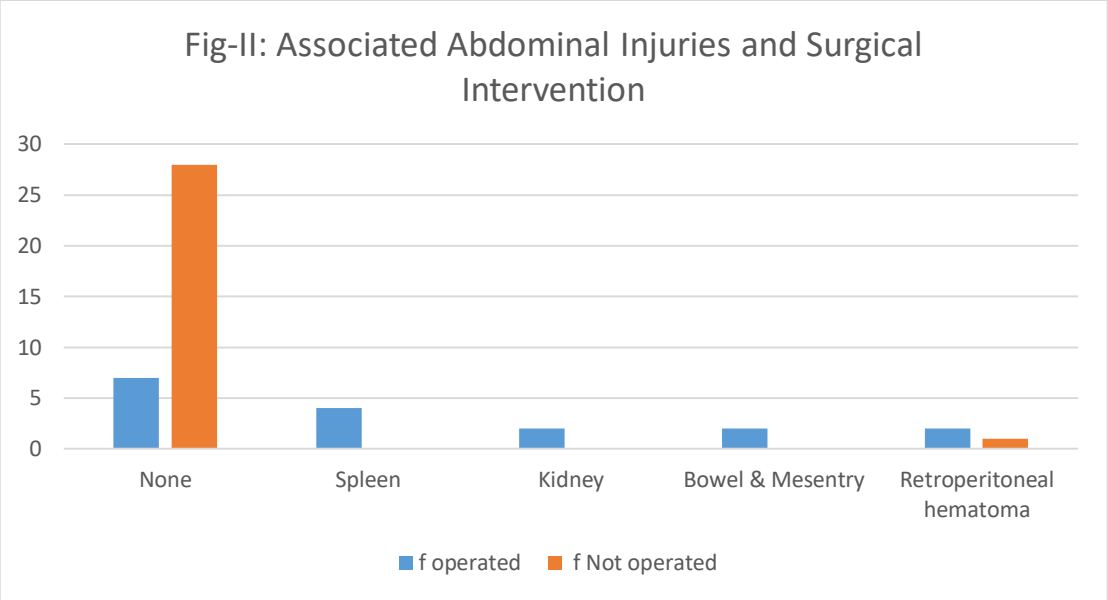

Figure 1: Grade of liver injury related to surgical intervention

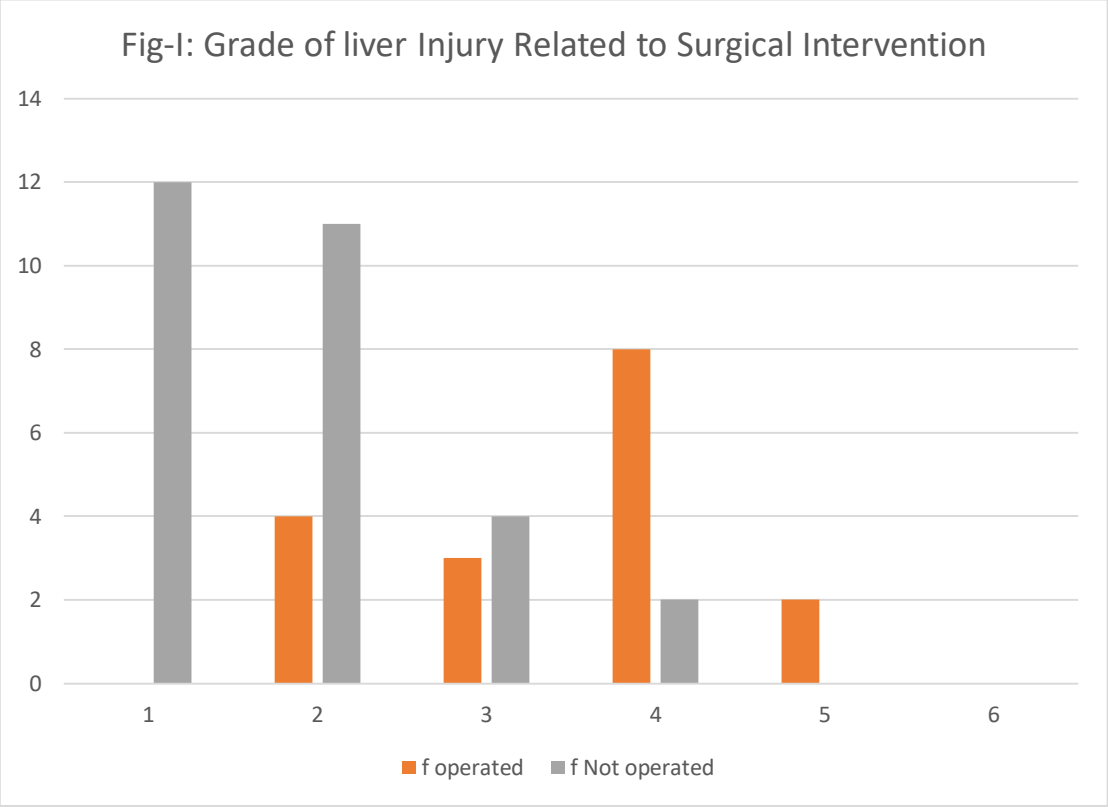

Figure 2: associated abdominal injuries and surgical intervention.

Table 1: patients' demography and types of injury

Characteristic	**(n) %**
Gender	
M	(40) 87.0%
F	(6) 13.0%

Comorbidity	
None	(35) 76.1%
Hypertension	(2) 4.3%
DM	(3) 6.5%
Asthma	(1) 2.2%
Multiple	(5) 10.9%
Type of injury	
Blunt	(42) 91.3%
Penetrating	(48) 0.7%
Grade of liver injury	
1	(12) 26.1%
2	(15) 32.6%
3	(7) 15.2%
4	(10) 21.7%
5	(2) 4.3%
Extra-abdominal injury	
None	(18) 39.1%
Ribs fracture	(3) 6.5%
Head trauma	(5) 10.9%
Hemo/pneumothorax	(3) 6.5%
Extremities fracture	(9) 19.6%
Spinal injury	(2) 4.3%
Pelvic fracture	(3) 6.5%
Multiple injured organs	(3) 6.5%
Associated abdominal organ injured	
None	(35) 76.1%
Spleen	(4) 8.7%
Bowel & mesentry	(2) 4.3%
Kidney	(2) 4.3%
Retroperitoneal hematoma	(3) 6.5%
Blood transfused (PRBCs)	
No	(15) 32.6%
1 Unit	(6) 13.0%
2 Units	(9) 19.6%
3 Units	(5) 10.9%
4 Units	(6) 13.0%
5 Units	(3) 6.5%
7 Units	(2) 4.3%
FFP transfused	
No	(28) 60.9%
1 Unit	(7) 15.2%
2 Units	(11) 23.9%
Surgical intervention done	
No	(29) 63.0
Yes	(17) 37.0
When surgical intervention done (days)	
0	(29) 63.0%
1	(15) (88.2%)
2	(2) (11.8%)

Splenectomy **Not done** **Done**	 (43) 93.5% (3) 6.5%
Liver packing Not done Done	 (38) 82.6% (8) 7.4%
Nephrectomy Not done Done	 (45) 97.8% (1) 2.2%
Intestinal/mesentry resection **Not done** **Done**	 (44) 95.7% (2) 4.3%
Patient died **No** **Yes**	 (42) 91.3% (4) 8.7%

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