

Gunshot to the Abdomen with Severe Hepatic Injury: Successful Non-Operative Management in a Resource-Constrained Setting

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Abstract:

➤ *Introduction:*

Non-operative management is done for some carefully selected penetrating abdominal injuries. A thorough clinical examination is essential for screening and identifying patients without haemodynamic instability and peritonitis. Gunshot injuries undergoing non-operative management require detailed trajectory imaging with a CT scan. Isolated solid organ injury is not an absolute contraindication to non-operative management and may benefit from advanced endovascular and percutaneous interventions to facilitate management.

➤ *Objective:*

To encourage selective non-operative management of penetrating abdominal injuries to decrease the rate of unnecessary laparotomy, length of hospital stay and management cost.

➤ *Case Presentation:*

A 25-year-old man sustained a gunshot injury to the abdomen and was brought to our hospital after 18 hours. His chief complaint was abdominal pain. On the primary survey, he was haemodynamically unstable with respiratory insufficiency. He was resuscitated and stabilised. Abdomen shows asymmetric fullness over the epigastrium and right hypochondrium with a 1.5x1.5cm entry point on the epigastrium, 2x3cm exit point just anterior to the right posterior axillary line through the 11th intercostal space, tenderness over the right hypochondrium. Abdominal ultrasonography showed grade IV hepatic injury involving segments 4b, VII, and VIII. He was managed non-operatively with close monitoring and subsequently discharged home afterwards. His follow-up shows a stable patient with no complaints.

➤ *Conclusion:*

Prompt and accurate management of penetrating abdominal injury by resuscitation, close monitoring, investigation and follow-up is beneficial to most patients. Careful selection of these patients is necessary for good outcome.

Keywords: *Hepatic Injury, Non-Operative Management, Gunshot Injury, Penetrating Abdominal Injury*

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I. INTRODUCTION

The liver is an important organ in the body, saddled with several metabolic functions. It is located in the right upper quadrant of the abdomen where it lies just under the right hemidiaphragm. The anatomic location and the size of the liver make the organ even more susceptible to trauma.

Abdominal injuries can be in the form of blunt trauma or penetrating injuries. These forms of injuries can affect one or more of the intraabdominal organs, including the liver. High-velocity missile injuries are of particular concern due to the high rate of complications associated with them. The degree of these complications is dependent on the extent of damage. The American Association for the Surgery of Trauma established a detailed classification system that provides for uniform comparisons of hepatic injury.¹

The World Society For Emergency Surgery(WSES) classification divides liver injuries into four classes considering the AAST-OIS classification and the hemodynamic status:²

Minor (WSES grade I), Moderate (WSES grade II), Severe (WSES grade III and IV)

Minor hepatic injuries: WSES grade I includes AAST-OIS grade I-II hemodynamically stable lesions. Moderate hepatic injuries: WSES grade II includes AAST-OIS grade III hemodynamically stable lesions. Severe hepatic injuries: WSES grade III includes AAST-OIS grade IV-V hemodynamically stable lesions. WSES grade IV includes AAST-OIS grade I-VI hemodynamically unstable lesions

Most patients admitted for liver injuries have grade I, II or III and are successfully treated with nonoperative management (NOM). In contrast, almost two-thirds of grade IV or V injuries require laparotomy.

The decision whether patients need to be managed operatively or undergo NOM is based mainly on the hemodynamic status, associated injuries, and the anatomical liver injury grade. Several innovative multimodal approaches such as Endovascular Trauma and Bleeding Management have allowed to greatly increase in the likelihood of non-operative management (NOM) for selected patients. Appropriate assessment with history, physical examination, close monitoring and investigations (USS, CT scan) is crucial in the management of these patients.

This case report aims at encouraging non-operative management of hepatic injuries in selected patients amidst infrastructural shortages in developing countries.

II. CASE PRESENTATION

The patient is a 25-year-old motorcyclist who presented with a gunshot injury to the abdomen of 18 hours duration. He ran into armed bandits who attempted to kidnap him but he resisted vehemently.

They subsequently shot him in the abdomen, but he managed to escape into a nearby home where he was sheltered until the situation became calm before he was taken to a hospital.

He bled from the site of the injury with associated dizziness and generalized body weakness, with no loss of consciousness

There was severe upper abdominal pain, sharp, non-radiating, no associated abdominal distension, vomiting, yellowish discolouration of the eyes, and hematochezia. There was no associated difficulty in breathing, cough, chest pain or hemoptysis. No haematuria, no long bone deformities.

He was rushed to a nearby hospital where he was admitted, had IVF and medications and was then referred to our facility. He has no comorbidities and no previous history of surgery or blood transfusion. He is married in a monogamous family with 2 children, and neither smoke nor take alcohol.

On physical examination, he was acutely ill-looking, in pain, afebrile, acyanosed, pale, anicteric, dehydrated, no pedal edema. He was conscious but drowsy, with no cervical tenderness, neck stiffness, cranial nerve palsies, spine tenderness or limb weakness

PR – 138bpm, low volume, regular, synchronous with other pulses, BP – 88/56mmhg, no apical heave, heart sounds 1 and 2, no murmur

RR-42cpm, SPO2= 96% on room air, no chest asymmetry, tracheal was central with equal chest expansion, resonant percussion notes, normal tactile and vocal fremitus, good air entry bilaterally and vesicular breath sound

On abdominal examination, there was right upper quadrant fullness, moves with respiration.

There was 1.5X1.5cm wound in the epigastrium 4cm below the right costal margin medial to the midclavicular line and 3cm from the midline (figure 1). There was another 2X2cm wound with ragged edge in the right 11th intercostal space in the midaxillary line with blood tracking from the wound (figure 2). There was tenderness on the right hypochondrium and epigastric regions. Bowel sound was present and normoactive.

Digital rectal examination was of normal findings. There was no blood at the tip of the penis



Fig 1, Entry point



Fig 2 Exit point

He was connected to a continuous digital monitor for real-time observation of the pulse rate, blood pressure and oxygen saturation. Intravenous access was secured on both arms with a size 16 cannula, a size 16FG urethral catheter was inserted and a nasogastric tube (18FG) passed. Initially, there was no urine output. IVF normal saline 2litres were rushed within one hour and he made 200ml of urine with some clinical improvement as the pulse rate improved to 112bpm, moderate volume and regular, BP 92/56mmhg, respiratory rate 36cpm. He was subsequently maintained on IVF normal saline 1 litre alternating with 5% dextrose water 1 litre 8 hourly.

Urgent haemoglobin was 8.8g/dl, he received 3 units of blood in the first 24 hours of admission. Following the transfusion, his clinical state improved remarkably with a pulse rate ranging from 86 – 98bpm, BP systolic 90-110, diastolic 62-68mmhg, respiratory rate 22 – 26cpm, spo2 95 – 99% on room air. He had antibiotics, omeprazole and tetanus toxoid. Wound debridement was done and packed with EUSOL-soaked gauze. Dressing was changed PRN. Serial abdominal examination was done 1 hourly.

Serum urea was 13mmol/L, serum bicarbonate, 22mmol, other electrolytes (K⁺, Na⁺, Cl⁻) were normal

Abdominopelvic ultrasonography revealed; liver laceration involving segments IV A, B, VII, and VIII, with multiple parenchymal hyperechoic collections. No intraabdominal collections. The gallbladder was intact. normal spleen, pancreas and both kidneys. The USS was repeated after 24 hours on admission with the same findings.

He remained clinically stable in the accident and emergency for 48 hours, abdominal pain subsided significantly and he was taken to the ward where he continued the IVF, parenteral antibiotics, omeprazole and tetanus toxoid. The nasogastric tube and urethral catheter were removed on the 3rd day and he was commenced on oral sips which he tolerated. Wound dressing was continued and the entry point was sealed within 7 days. Bloody discharge from the exit wound gradually changed to serous discharge which reduced significantly within 10 days of admission. He was discharged home on day 16 with the residual wound to continue dressing at a nearby hospital. At his follow-up visit, the wound was closed and he had no new complaints.

III. DISCUSSION

Hepatic injury is a life-threatening injury occurring in the majority of abdominal injuries. This injury may be isolated or occur in combination with other organ injuries. Non-operative management of blunt liver injury is widely practised.^{3,4,5,6,7,8,9} Most penetrating gunshot liver injuries cause significant parenchymal injury because the liver is a solid inelastic organ and hence does not have the necessary stretch tolerance to cope with a gunshot wound. The principles for non-operative treatment are fairly well standardized. A literature review of collected contemporary series disclosed that about 80% to 90% of hepatic injuries can be safely managed without operation.¹⁰ The key factor in determining whether conservative approach can be safely used is hemodynamic stability. CT scan is employed in the diagnosis of hepatic trauma but in our centre due to limitations in obtaining CTscan, the diagnosis was made by putting into consideration the trajectory of the bullet and abdominopelvic USS which was repeated 24 hours. Asuquoet al¹¹ were able to manage 30% of their patients with liver trauma non-operatively, using ultrasound scanning and haemodynamic monitoring. In case of

severe lesions, non-operative management can be possible if continuous monitoring of patients and access to angiography procedures can be ensured.¹² Even though our institution has no facility for an angiographic procedure, the patient's clinical state was monitored continuously in the emergency room with a continuous digital monitor and a serial abdominal examination was done for early detection of peritonitis. In the course of this monitoring, he was initially haemodynamically unstable as such resuscitation was commenced. The patient and his relatives were also counselled for surgery in case an operation became imperative. Within the initial 2 hours of resuscitation with intravenous fluid (crystalloid) and 3 units of blood, he responded positively as observed from the improved sensorium, pulse rate, blood pressure, respiratory rate and oxygen concentration, the plan for surgery was therefore aborted. Studies have also shown that early transfusion may promote healing of liver injury.¹³

The best evidence suggested that LMWH-thromboprophylaxis is required due to the hypercoagulation state of the patient within 48 hours of the traumatic event and it is safe in NOM.¹² It is estimated that more than 50% of patients without thromboprophylaxis may develop deep vein thrombosis and pulmonary embolism with high-risk mortality.²

This index patient neither received any form of systemic thromboprophylaxis as there was fear of continuous bleeding from the exit wound which at presentation was tracking blood for up to day 3 on admission. Prophylactic broad spectrum antimicrobial agents have been found to be beneficial to patients with penetrating abdominal injury as they help to reduce the risk of infection.¹⁴ The patient received intravenous ciprofloxacin and metronidazole for 7 days and there were no features suggestive of intraabdominal infection. The simultaneous goals of achieving analgesia and arriving at an accurate diagnosis are clearly both achievable. However, doing so may require more diagnostic studies and/or more observation time than might otherwise be necessary.¹⁵ Analgesics were avoided in this patient to aid in the early detection of complications such as peritonitis. The patient received tetanus toxoid 0.5ml at day 0,3,7,21. Tetanus prophylaxis should be administered as soon as possible following a wound or traumatic injury and even upon delayed presentation due to the long and variable incubation period of tetanus.¹⁶ Oral feeding is recommended within the first 72 hours in a stable patient without any gastrointestinal complications.² Our patient had his nasogastric tube removed on the third day, oral sip was commenced which he tolerated adequately. Before discharge he was counselled on the need to be self-vigilant in case he noticed abdominal pain, abdominal swelling, jaundice etc to present to the hospital.

CT scan is a useful modality to evaluate the healing of liver injury. The resolution of high-grade injury at 4 weeks is low.¹³ CT documentation of resolution was once the standard

of care, a follow-up CT is no longer recommended unless clinically indicated. However, some recommend returning to unlimited activity only after a normal CT scan, usually 3 to 6 months after the injury, especially in the case of professional athletes.¹² There was no follow-up CT scan on the index patient due to financial constraints, he also had no clinical indication for the investigation.

IV. CONCLUSION

There is tremendous success in the management of severe liver lacerations by non-operative means especially in regions with well-equipped facilities for strict monitoring, early detection and management of complications. Due to the lack of these facilities such as CTscan in resource-poor regions like ours, it may be difficult to adequately select patients for non operative management. For the fact that patients pay out of pocket to get treatment and are also dependent on their relatives to donate blood in the setting of emergency, their survival is tied to these people who may not even be fit to donate blood.

LIMITATIONS include; financial constraints on the side of the patients and relatives and lack of CT scan as at the time of the patient's presentation.

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