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Multiple Organ Injury (Liver, Spleen, Kidney) Following Blunt Abominal Trauma, Without Sign of Acute Abdomen

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Abstract: Blunt abdominal trauma accounts for 80% of all abdominal trauma cases, with the liver, spleen, and kidneys being the most commonly affected organs. However, multiple organ injuries are rare, particularly in patients managed without surgical intervention. **Case Report**: A 52-year-old male presented to the Emergency Room (ER) with complaints of headache and left shoulder pain following a fall from a coconut tree. The mechanism of injury was unclear, and the patient denied abdominal pain. Initial investigations included brain MSCT, left shoulder X-ray, and laboratory tests. Brain MSCT findings were normal, while left shoulder dislocation was confirmed. The patient developed hemodynamic instability, prompting resuscitation, Focused Assessment with Sonography for Trauma (FAST), and laboratory evaluations. FAST revealed no intra-abdominal free fluid; however, laboratory results showed a decline in hemoglobin (Hb) levels. A contrast-enhanced abdominal CT scan was performed, revealing Grade II liver trauma (segment 5), Grade III splenic trauma (upper pole), and Grade IV right kidney trauma. The patient was managed conservatively with non-operative management (NOM) in the Intensive Care Unit (ICU). **Results and Discussion**: This case highlights the management of multiple abdominal organ injuries in the absence of overt clinical signs of blunt abdominal trauma. Initial FAST results were negative, with no evidence of intra-abdominal free fluid. In trauma patients with hemodynamic instability and an unclear source of bleeding, blunt abdominal trauma must remain a differential diagnosis. A contrast-enhanced CT scan, the gold standard for diagnosing intra-abdominal injuries, identified significant liver, spleen, and kidney trauma. Following stabilization with resuscitation, the patient was successfully managed with NOM. No signs of acute abdomen were observed during the hospital stay or at discharge. **Conclusion**: Contrast-enhanced CT scanning is essential for diagnosing high-risk intra-abdominal injuries in blunt abdominal trauma cases where FAST results are negative. It facilitates informed decision-making regarding conservative versus operative management and optimizes patient outcomes.

Keyword: Blunt Abdominal Trauma, FAST, CT Scan, Acute Abdomen

INTRODUCTION

Blunt abdominal trauma (BAT) is one of the most common forms of abdominal injury, alongside penetrating trauma, and is a frequent occurrence in emergency settings. BAT typically results in injuries to intra-abdominal organs, which may not always present with clear clinical signs, particularly in patients with polytrauma. A rapid and accurate diagnosis is critical to enable timely intervention, optimize recovery, and minimize morbidity. Radiologists play a pivotal role in the accurate and comprehensive evaluation of BAT cases.

In developing countries, trauma is the leading cause of death in individuals under 45 years of age. In 2015, trauma ranked as the third leading cause of death among individuals aged 45–65 years and the fourth among all age groups, with over 145,000 trauma-related fatalities reported in the United States alone. BAT accounts for approximately 80% of all abdominal trauma cases. A 2023 study in Nepal, involving 1,450 BAT patients, identified the most commonly affected organs as the spleen, liver, kidneys, intestines, abdominal wall, mesentery, retroperitoneum, pancreas, bladder, stomach, and vasculature, in descending order of frequency. Similarly, in Asia, including Qatar, blunt abdominal trauma constitutes 15% of trauma cases presenting to emergency departments. Among 44 new cases in Qatar, 75% involved males, and 79.5% exhibited intra-abdominal organ rupture.

A previous study conducted at Professor I.G.N.G Ngoerah General Hospital in Bali reported on 80 BAT patients, where the spleen was injured in 42.6% of cases, followed by the liver (32%), combined liver and spleen injuries (2.6%), intestines (16%), pancreas (1.3%), bladder (4%), and kidneys (1.5%). Although multiple organ injuries are less common, especially in cases managed non-operatively, BAT remains a critical concern. In pediatric populations, trauma accounts for 10–15% of emergency admissions, with BAT being a notable contributor.

The diagnosis of BAT is often challenging, particularly in asymptomatic or minimally symptomatic patients. Effective diagnosis and management necessitate a multidisciplinary approach to ensure rapid and precise interventions. Radiologists, as integral members of the trauma care team, are essential for conducting diagnostic evaluations and guiding clinical decision-making.

Case Report

A 52-year-old male patient, identified as IWD, presented to the Emergency Room (ER) at Klungkung Regional Hospital with a chief complaint of headache following a fall from a height of approximately 5 meters while climbing a coconut tree. The patient denied loss of consciousness but reported nausea without vomiting. He also experienced neck pain and left arm pain radiating to the left elbow, while denying abdominal pain. The mechanism of injury was described as falling while climbing to harvest mushrooms, though the exact details of the fall, including the initial point of contact, were unclear. The patient had no significant past medical history, denied any allergies, and had no family history of notable illnesses. He is a farmer engaged in daily fieldwork.

The primary survey revealed a clear airway and a respiratory rate of 22 breaths per minute with oxygen saturation (SpO_2) of 91% on room air, which improved to 98% with oxygen delivered via a nasal cannula at 4 liters per minute. Blood pressure was 90/65 mmHg, pulse rate was 105 beats per minute (regular but weak), and extremities were cold. The patient appeared to be in pain (VAS 5–6) but was fully conscious with a Glasgow Coma Scale (GCS) score of E4V5M6.

Physical examination revealed no cephalhematoma on the head, with only a scratch wound on the face. The neck and chest showed no contusions, and chest cavity movement was normal. Abdominal examination was unremarkable, with no contusions, tenderness, or

distension, and normal bowel sounds. Examination of the extremities revealed swelling and tenderness in the left shoulder.

The patient was diagnosed with hypovolemic shock, mild head injury, suspected left shoulder dislocation, and possible cervical spine injury. Initial management included resuscitation with 500 mL of crystalloid solution, oxygen therapy at 4 L/min via nasal cannula, application of a cervical collar, and intravenous paracetamol (1 g every 8 hours). A urinary catheter was inserted for monitoring urine output, which was normal with no hematuria. Laboratory and radiological investigations were initiated.

Initial laboratory results showed leukocytosis (WBC: 20,260/µL, neutrophils 74%) with normal Hb, platelet count (PLT), kidney function, electrolytes, and blood glucose levels. Liver function tests revealed elevated SGOT (177 U/L) and SGPT (324 U/L). Radiological examinations included a head CT scan, cervical X-ray, thoracic X-ray, left shoulder X-ray, and pelvic X-ray. Findings included Head CT scan: No intracranial hemorrhage or fractures. Cervical X-ray: No compression fractures or listhesis. Shoulder X-ray: Left humeral head dislocation. Thoracic X-ray: Cardiomegaly. Pelvic X-ray: No fractures.

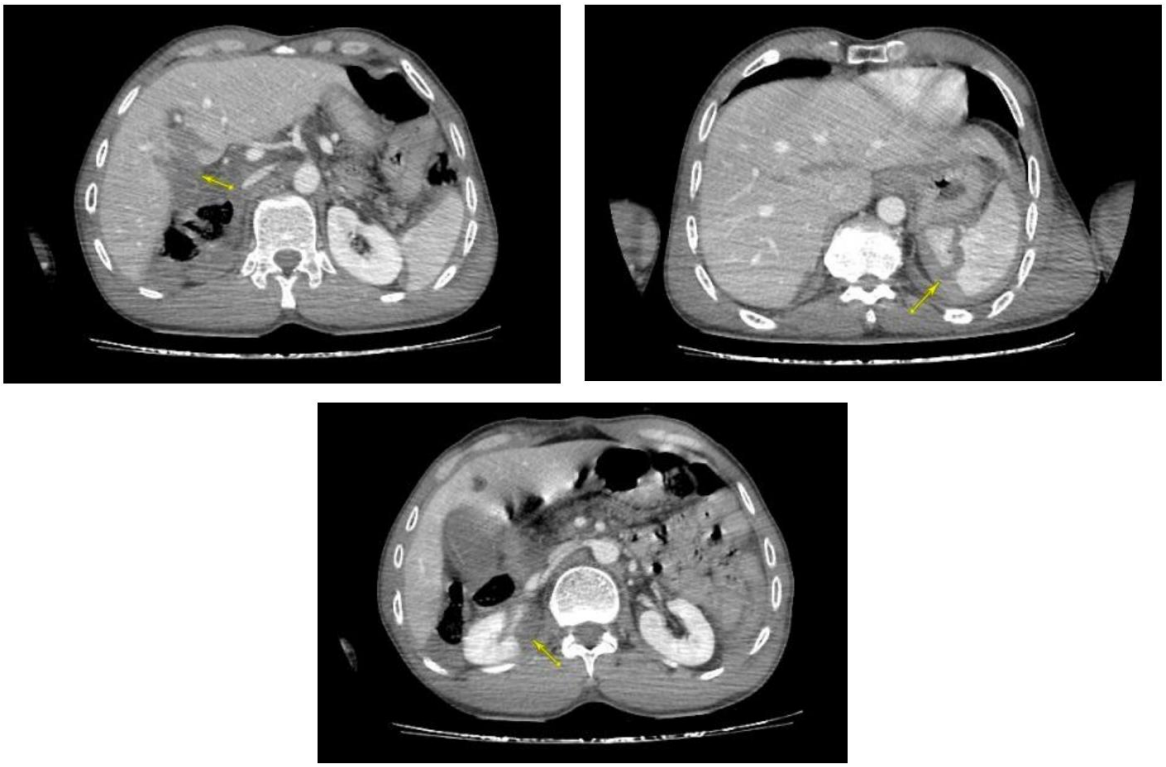

Figure 1. The Result of Abdominal CT Scan with Contrast

The patient responded well to fluid resuscitation, with blood pressure improving to 110/70 mmHg, pulse decreasing to 90 beats per minute, and extremities warming. On the second day, the patient developed recurrent hypotension. Repeat CBC revealed a drop in Hb to 9.5 g/dL and PLT to 95,000/µL. Contrast-enhanced abdominal CT scan revealed Grade II liver trauma (segment 5), Grade III splenic trauma (upper pole), and Grade IV right kidney trauma without contrast extravasation. Free fluid was noted in the abdominal cavity. The patient was managed conservatively in the Intensive Care Unit (ICU) with strict bed rest, oxygen therapy, nutritional support (Clinimix and Tutosol), intravenous analgesics, antiemetics, proton pump inhibitors, tranexamic acid, vitamin K, and packed red blood cell transfusion. Close monitoring for signs of acute abdomen and serial CBCs were performed. By

the third day, Hb levels normalized at 11 g/dL; however, PLT continued to decline to 56,000/µL, necessitating transfusion of 5 units each of thrombocyte concentrate and fresh frozen plasma.

By the sixth day, the patient was hemodynamically stable with no abdominal pain. CBC showed Hb of 12.3 g/dL and PLT of 150,000/µL. The patient was transferred to the regular surgical ward and prepared for close reduction under general anesthesia (GA) with a Velpeau bandage. On the eighth day, the patient was pain-free, hemodynamically stable, and without signs of acute abdomen. He was subsequently discharged with follow-up plans for further management.

RESULT AND DISCUSSION

Blunt abdominal trauma can cause significant internal organ damage, leading to internal bleeding and injuries to the stomach, spleen, liver, and intestines. Common mechanisms of BAT include motor vehicle accidents, falls from heights, assaults, and sports injuries. Substantial force is required to damage solid or hollow abdominal organs, often involving mechanisms such as rapid deceleration, external compression, and crushing injuries. The pattern and severity of organ injuries depend on several factors, including the energy of impact, the affected anatomical region, the patient's physical condition, and the specifics of the trauma. For instance, frontal impacts often injure the pancreas, small intestine, left liver lobe, and aorta. Injuries to the left side commonly affect the spleen, left kidney, and left liver lobe, while right-sided injuries often involve the right liver lobe and right kidney.

In this case, the patient experienced BAT following a fall from a height of 5 meters, resulting in multiple organ injuries. The rapid deceleration and external compression mechanisms likely contributed to injuries to the liver, spleen, and kidneys. Deceleration injuries often cause tears at sites of vascular pedicles or mesenteric attachments, while external compression leads to a sudden increase in intra-abdominal pressure. Crush injuries occur when abdominal contents are compressed between the abdominal wall and the spine or chest bones, leading to diverse organ damage. The involvement of multiple intra-abdominal organs right kidney, liver, and spleen suggests the patient experienced multiple impacts during the fall.

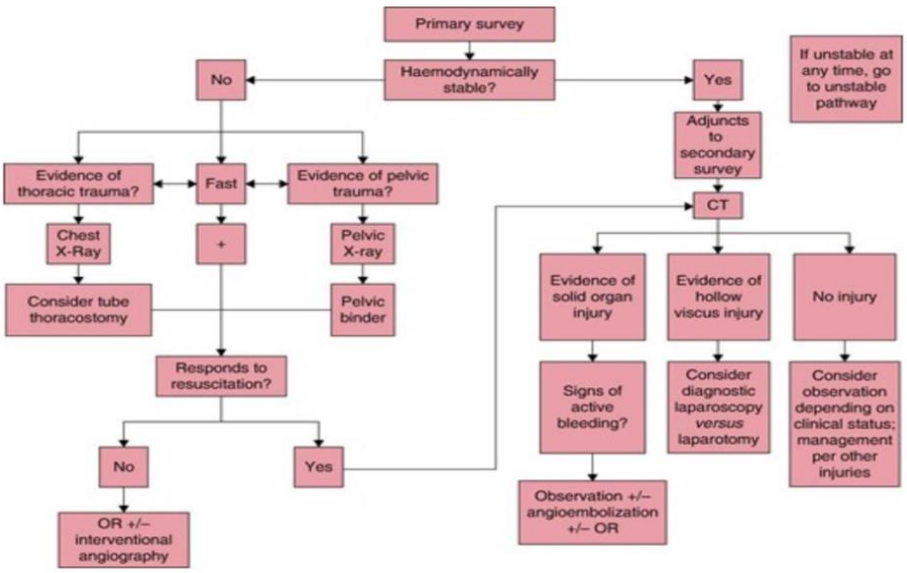

Figure 2. Evaluation of Abdominal Blunt Trauma in Adult

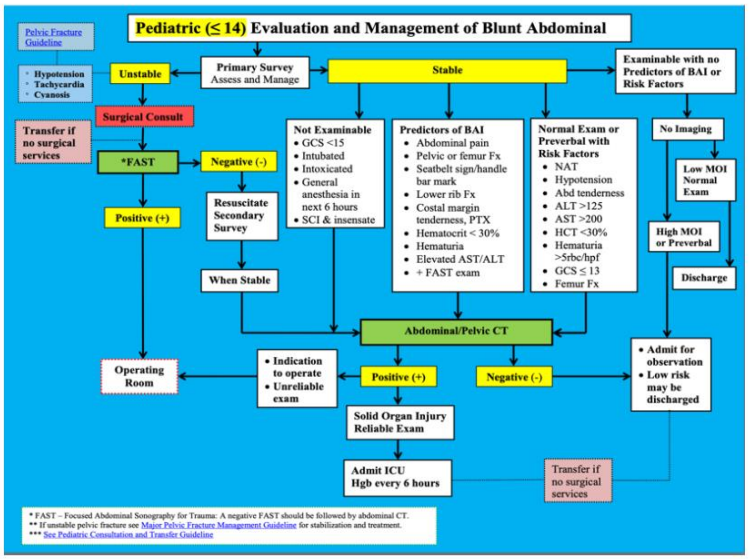

Figure 3. Evaluation of Abdominal Blunt Trauma in Pediatric

BAT diagnosis can be challenging due to unclear clinical presentations, especially in patients without typical symptoms. Common signs include abdominal pain, rectal bleeding, unstable vital signs, and signs of peritonitis. Physical examination findings may include contusions or hematomas (e.g., *seatbelt sign*), abdominal distension, diminished or absent bowel sounds, and tenderness. In this patient, the initial presentation lacked clear indications of BAT. He denied abdominal pain, physical examination revealed no contusions or distension, bowel sounds were normal, and urinary catheterization showed no hematuria with normal urine output. These findings complicated the early diagnosis.

Trauma patients require a structured approach with a primary and secondary survey to identify injuries and determine appropriate diagnostic methods based on hemodynamic status. A multidisciplinary approach is essential for prompt and accurate management. According to the American College of Radiology (ACR), in hemodynamically unstable patients, Focused Assessment with Sonography for Trauma (FAST) is recommended as the initial diagnostic tool. FAST quickly evaluates intra-abdominal organs for free fluid in key areas, including Morison's pouch, perisplenic space, pelvis, and diaphragm. However, not all patients with organ injuries exhibit free intra-abdominal fluid.

For hemodynamically stable patients, the ACR recommends contrast-enhanced abdominal CT scans as the gold standard for diagnosing abdominal trauma. CT imaging identifies organ injuries, active bleeding, and vascular disruptions. Contrast-enhanced phases, including arterial and delayed phases, provide detailed insights into the extent and source of injuries. For specific conditions, such as bladder injuries, CT cystograms can differentiate between intraperitoneal and extraperitoneal ruptures. In this patient, FAST findings were negative, actually a repeat FAST could be performed, but because CT scan was available, as a gold standard for diagnosis, especially in stable patients, contrast-enhanced abdominal CT scan was performed. The result revealed multiple organ injuries, including grade II liver trauma (segment 5), grade III spleen trauma (upper pole), and grade IV right kidney trauma without ureteral extravasation.

Laboratory evaluations support BAT diagnosis by revealing the physiological consequences of trauma. Common findings include a decrease in Hb and PLT, along with elevated liver enzymes in cases of liver trauma. This patient's initial Hb decreased from 13.2 g/dL to 9.5 g/dL within less than 24 hours, suggesting acute hemorrhage. PLT levels also dropped from 195,000/µL to 95,000/µL, reaching a nadir of 56,000/µL during hospitalization.

This thrombocytopenia could result from trauma-related platelet consumption and hemorrhage. Liver function tests revealed elevated SGOT and SGPT levels, consistent with hepatic injury.

Management of BAT begins with stabilizing the airway, breathing, and circulation (ABC), along with cervical spine protection. Fluid resuscitation is initiated in unstable patients, with blood transfusion as needed. Immediate laparotomy is indicated for patients with peritonitis, visible bleeding, or worsening clinical status. However, non-operative management (NOM) has become the standard of care for hemodynamically stable patients with solid organ injuries. NOM requires close monitoring in facilities equipped with intensive care units, 24-hour surgical teams, and blood bank services.

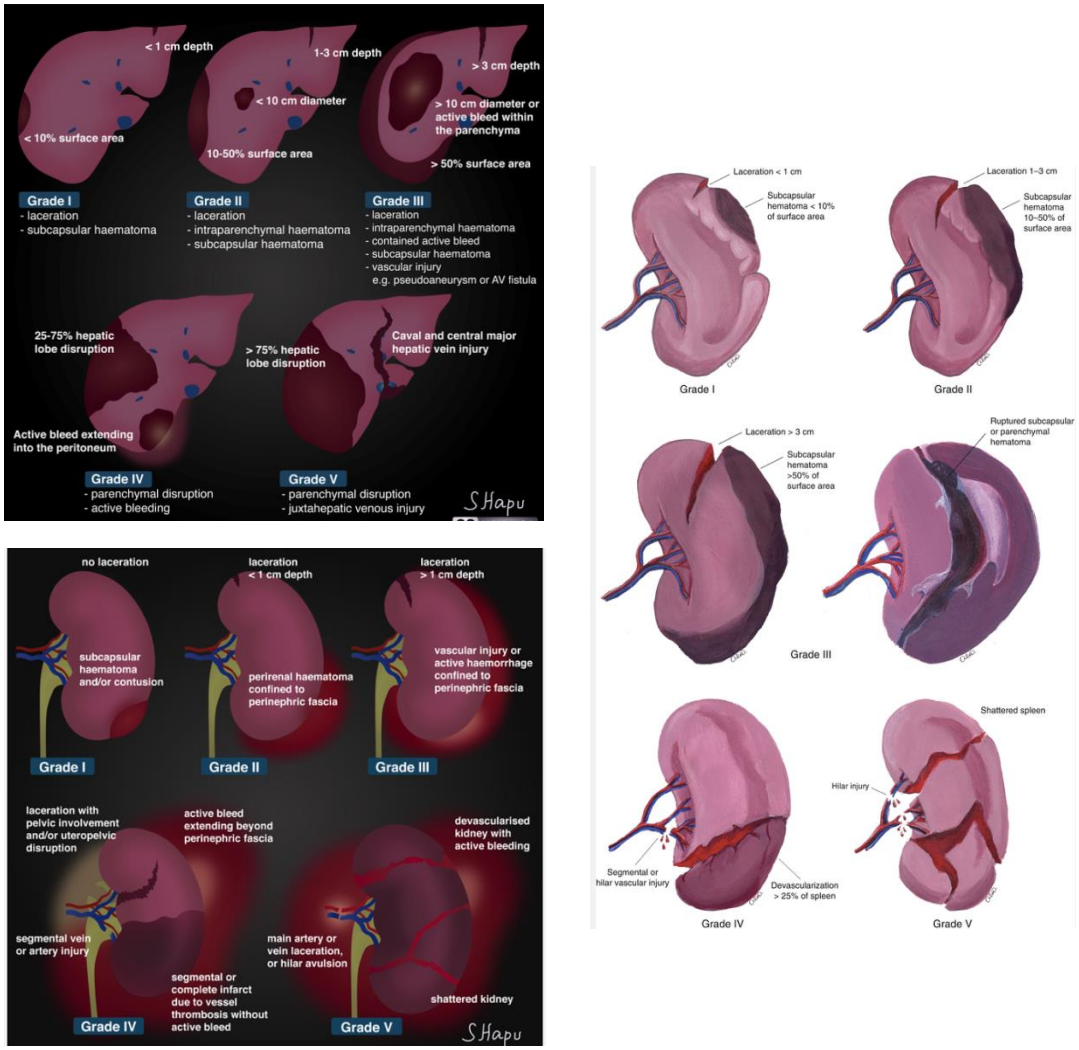

Figure 4. Liver, Spleen and Kidney Injury Scale Grading According to The American Association for the Surgery of Trauma (AAST)

This patient underwent NOM, responding well to resuscitation and remaining stable throughout treatment. He was managed in the intensive care unit (ICU) for five days, followed by two days in the surgical ward. Serial CBC monitoring was performed, and transfusions of packed red cells, thrombocyte concentrate, and fresh frozen plasma addressed anemia and thrombocytopenia. Pharmacological therapy included analgesics, antiemetics, proton pump inhibitors, antifibrinolytics, and hemostatic agents. The patient showed no signs of acute abdomen, abdominal distension, or worsening clinical conditions during hospitalization. On discharge, the patient remained stable, with plans for follow-up care and further evaluation.

METHOD

Patients with abdominal trauma were given fluid resuscitation for hemodynamic stabilization. A follow-up CT scan showed liver, spleen and kidney trauma. Conservative treatment in the ICU included strict bed rest, oxygen therapy, blood transfusion, and serial CBC monitoring. Platelet transfusion was done due to decreased PLT. Close monitoring of acute abdominal signs was also done. After six days, the patient was transferred to the surgical ward for preparation for closed reduction, and on the eighth day, the patient was discharged with follow-up.

CONCLUSION

A 52-year-old patient presented to the Emergency Room (ER) without symptoms or clinical signs suggestive of an acute abdomen. However, radiological and laboratory investigations confirmed blunt abdominal trauma with multiple organ injuries involving the spleen, liver, and kidney. Diagnostic imaging included Focused Assessment with Sonography for Trauma (FAST) and contrast-enhanced abdominal CT scan. The CT scan played a pivotal role in identifying high-risk abdominal organ injuries that could not be fully assessed with FAST, facilitating accurate diagnosis and guiding the choice between conservative and operative management. The patient was managed with non-operative management (NOM) in the Intensive Care Unit (ICU). Throughout the hospital stay and until discharge, the patient exhibited no symptoms or signs of an acute abdomen.

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