

Original research article

The influence of ultrasonography in diagnosing abdominal trauma in the department of surgery

Dr. Kallya Vinayak Shenoy

Associate Professor, Department of General Surgery, Srinivas Institute of Medical Sciences and Research Centre, Mukka, Mangalore, India

Corresponding Author:

Dr. Kallya Vinayak Shenoy

Abstract

Ultrasonography (USG) has proven to be an indispensable tool in diagnosing and managing abdominal trauma, providing a non-invasive, rapid, and efficient means for evaluating internal injuries. The Focused Assessment with Sonography for Trauma (FAST) is frequently employed in emergency situations to detect free fluid, a potential indicator of organ damage or hemorrhage. Advantages such as portability, repeatability, and the absence of ionizing radiation make USG ideal for a wide range of patient groups, including children and pregnant women. It is particularly effective in detecting injuries to solid organs like the liver, spleen, and kidneys, though limitations exist in assessing hollow organs and deep retroperitoneal structures. Although USG is not a standalone diagnostic tool, it plays a critical role in the early evaluation of trauma patients, helping determine the need for further imaging or surgical intervention.

Keywords: USG, abdominal trauma, diagnosis, emergency imaging, fast

Introduction

Ultrasonography (USG) has become an essential tool in the initial assessment and management of patients presenting with abdominal trauma. The non-invasive and swift nature of USG makes it ideal for emergency settings where timely diagnosis can greatly reduce morbidity and mortality. Abdominal trauma, whether due to blunt or penetrating injuries, presents a diagnostic challenge due to the complex nature of abdominal anatomy and the potential for multiple organ involvement. Traditional diagnostic methods like physical examination and laboratory tests often fall short in providing the detailed information needed, especially in critically ill or non-communicative patients^[1, 2].

In this regard, Focused Assessment with Sonography for Trauma (FAST) has gained widespread use, especially for identifying free intra-abdominal fluid, which typically indicates internal hemorrhage. FAST primarily targets areas like the perihepatic, perisplenic, pelvic, and pericardial regions to efficiently assess injuries that may necessitate urgent surgical intervention. This is particularly beneficial in cases of blunt abdominal trauma where clinical signs may be delayed or nonspecific^[3, 4].

A key advantage of USG is its portability, allowing it to be used bedside, in the operating room, or even in pre-hospital settings. Unlike imaging modalities that involve ionizing radiation, USG is safe for repeated use, particularly in vulnerable populations like pregnant women and children. However, USG does have limitations, including its operator-dependency and reduced effectiveness in detecting injuries to hollow organs and retroperitoneal structures^[5-7].

In conclusion, while USG is not a definitive diagnostic tool, it plays an integral role in the initial triage of trauma patients. When combined with clinical judgment and supplementary imaging, USG significantly enhances the speed and accuracy of diagnosis in abdominal trauma cases.

Materials and Methods

A prospective study was conducted from September 2022 to January 2023 at Srinivas Institute of Medical Sciences, Mangalore, involving 100 patients who presented with abdominal trauma. Inclusion criteria included patients above the age of 18 with suspected blunt or penetrating abdominal trauma, while those with prior abdominal surgeries or existing abdominal conditions were excluded.

Ultrasonographic examinations were performed using a portable ultrasound machine equipped with a 3.5 MHz convex transducer. The FAST protocol was employed to assess free fluid in perihepatic, perisplenic, pelvic, and pericardial regions, while solid organs such as the liver, spleen, and kidneys were examined for signs of injury.

All ultrasonographic assessments were conducted by radiologists with a minimum of five years of experience in trauma ultrasonography. The findings were subsequently compared with clinical outcomes, computed tomography (CT) scans, and surgical results when applicable, to determine the diagnostic accuracy of USG in abdominal trauma cases.

Results: In this study involving 100 patients, ultrasonography (USG) was compared with computed tomography (CT) in diagnosing injuries to various abdominal organs. The results are as follows:

- **Liver injuries:** USG detected 30 cases, while CT identified 35.
- **Spleen injuries:** USG detected 25 cases, with CT identifying 30.
- **Kidney injuries:** USG detected 18 cases, while CT identified 22.
- **Bladder injuries:** USG detected 10 cases, while CT identified 13.
- **Bowel injuries:** USG detected 7 cases, and CT identified 10.
- **Pancreas injuries:** USG detected 6 cases, with CT identifying 9.

The results demonstrate that while CT offers greater sensitivity in detecting organ injuries, USG remains a valuable first-line diagnostic tool due to its speed and ease of use, particularly in emergency settings.

Table 1: Comparison between USG and CT in detecting organ injuries

Organ Injured	Cases Detected by USG	Cases Detected by CT
Liver	30	35
Spleen	25	30
Kidney	18	22
Bladder	10	13
Bowel	7	10
Pancreas	6	9

Discussion

USG has cemented its role in the initial evaluation of abdominal trauma, especially in emergency situations where rapid decision-making is critical. This study highlights both the strengths and limitations of USG when compared to the gold standard of CT imaging. The results show that while USG effectively identifies major injuries to organs such as the liver and spleen, it does have limitations in identifying subtle or complex injuries, such as those affecting the pancreas, kidneys, or hollow organs. USG's speed and portability make it a vital tool in early trauma care, particularly when time is of the essence or in resource-limited environments. However, the study also underscores the importance of follow-up imaging with CT, especially when USG findings are negative or inconclusive, to ensure that no injuries are overlooked.

Conclusion

While CT remains the gold standard for detailed imaging of abdominal trauma, USG plays an indispensable role in the initial triage and assessment of trauma patients. Its rapid, non-invasive nature and portability make it particularly useful in emergency settings. When used in conjunction with clinical judgment and other diagnostic modalities, USG enhances the accuracy and efficiency of abdominal trauma management.

References

1. Blaisdell FW, Trunkey DD. Abdominal Trauma. New York: Theime-Strtton; 1982. 4. Peitzman AB, Makaroun MS, Slasky BS and Ritter P. Prospective study of computed tomography in initial management of blunt abdominal trauma. *J Trauma*. 1986;26:585-592. <https://doi.org/10.1097/00005373-198607000-00001>
2. Webster VJ. Abdominal trauma: Pre-operative assessment and postoperative problems in intensive care. *Anaesth Intensive Care*. 1985;13(3):258-262. <https://doi.org/10.1177/0310057X8501300305>
3. Sclafani SJ, Shaftan GW, Scalea TM, Patterson LA, Kohl L, Kantor A, *et al*. Non operative salvage of computed tomography diagnosed splenic injuries: Utilization of angiography for triage and embolization for hemostasis. *J Trauma*. 1995;39(5):818-825. <https://doi.org/10.1097/00005373-199511000-00004>
4. Yoshii H, Sato M, Yamamoto S, Motegi M, Okusawa S, Kitano M, *et al*. Usefulness and limitations of ultrasonography in the initial evaluation of blunt abdominal trauma. *J Trauma*. 1998;45(1):45-50. <https://doi.org/10.1097/00005373-199807000-00009>
5. Goletti O, Ghiselli G, Lippolis PV, Chiarugi M, Braccini G, Macaluso C, *et al*. The role of ultrasonography in blunt abdominal trauma: Results in 250 consecutive cases. *J Trauma*. 1994;36(2):178-181. <https://doi.org/10.1097/00005373-199402000-00004>
6. McGahan JP, Rose J, Coates TL, Wisner DH, Newberry P. Use of ultrasonography in the patient with acute abdominal trauma. *J Ultrasound Med*. 1997;16(10):653-662; 663-664.

<https://doi.org/10.7863/jum.1997.16.10.653>

7. LV F, Tang J, Nie Y, Liang T, Jiao Z, Zhu Z, *et al.* Emergency contrast-enhanced ultrasonography for pancreatic injuries in blunt abdominal trauma. *Radiol Med.* 2014;119(12):920-927. <https://doi.org/10.1007/s11547-014-0410-3>