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INCIDENCE OF INTRA-ABDOMINAL INJURIES IN BLUNT TRAUMA PATIENTS UNDERGOING CT ABDOMEN IN EMERGENCY DEPARTMENT OF A HIGH-VOLUME PUBLIC-SECTOR HOSPITAL OF A DEVELOPING COUNTRY

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Abstract

Background: *Blunt abdominal trauma is a frequent occurrence in emergency trauma and poses a significant diagnostic challenge since serious intra-abdominal trauma can easily be overlooked when no signs are present; the diagnostic ability of abdominal CT scans is valued when assessing trauma patients.*

Objectives: *The purpose of this study is to assess the frequency and patterns of intra-abdominal injuries in blunt trauma patients that underwent CT scans in the Emergency Department, and to evaluate how the patient management changed according to the CT scan results.*

Methodology: *A cross-sectional observational retrospective study was performed in the Radiology Department of Lady Reading Hospital Peshawar, from November 1, 2023 to October 31, 2024. 135 patients who presented with blunt abdominal trauma and underwent non-contrast abdominal CT scans were selected using non-probability convenience sampling. Retrospective study of the patients was conducted using the Hospital Information Management System (HIMS). A 16 slice CT scanner was used for the exams and images were analyzed by a consultant radiologist on Picture Archiving and Communication System (PACS). Data analysis was done using SPSS version 26. Descriptive statistics were used in the analysis.*

Results: *From a total of 135 patients, majority were male (86.7%), and most of them were in the 21-30year age group (28.1%). The most common mode of blunt trauma in patients advised CT abdomen was road traffic accidents followed by a history of fall. The commonest finding on non-contrast CT abdomen was hemoperitoneum, 8.9%and less frequent findings included abdominopelvic hematoma 5.2% and injuries to solid organs, such as a liver and kidneys. Hemopneumothorax was the most common extra-abdominal injury 17.80%. The majority of patients were managed either conservatively, or were simply discharged after emergency assessment. 22.2% of patients required a surgical intervention.*

Conclusion: *For assessment of abdominal trauma patients in emergency situations, CT abdomen with contrast is the gold standard imaging technique, however in developing and underdeveloped countries with constrained resources a non-contrast CT can be helpful in identification of abdominal injuries and devising a roadmap for patient management.*

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INTRODUCTION

Blunt abdominal trauma refers to non-penetrating injury to the abdominal cavity resulting from external force. It most frequently occurs due to road traffic accidents, fall from a height, physical violence, and injuries related to sports or occupational activities.[1] Due to the presence of vital solid and hollow organs, blunt abdominal trauma represents a serious diagnostic challenge since intra-abdominal injuries can be very serious despite minor or nonspecific clinical signs, especially during the early stage of presentation.[2]

Trauma takes a heavy burden on the world population and in particular, affecting the younger generation. Abdominal injuries are reported in approximately 5-13% of the blunt trauma patients, and a delayed diagnosis increase the morbidity and mortality, increasing the length of the hospital stay, and affecting patient prognosis.[3,4] The problem has become worse in low- and middle-income countries because of rapid urbanization, the increased number of vehicles, the lack of adequate road safety measures and lack of health facilities due to constrained resources. In Pakistan, road traffic accidents have emerged as a major cause of blunt abdominal trauma creating a substantial patient burden and placing a significant strain on the already overworked public emergency health departments.[5,6]

Abdominal injuries assessment conducted clinically have their limitations and require radiological investigations for confirmation of clinical examination findings or in unequivocal cases. FAST (Focused Assessment with Sonography in Trauma) is often employed in the first instance, particularly in patients who are hemodynamically unstable. But it also has its limitations in detecting the hollow viscus, mesentery, and injuries within the retroperitoneum.[7,8] CT scan with contrast on the other hand is the gold standard in terms of both its sensitivity and specificity, as well as the accuracy compared to ultrasound in terms of anatomical delineation and diagnostic accuracy, with its invaluable contribution towards making the decision for an operative or non-operative management.[9]

Since in high-volume trauma center, CT abdomen is significant in managing patients by defining injury patterns, reducing missed diagnoses, and avoiding unnecessary laparotomies. However, there is still some variability in clinical indications for CT imaging, injury patterns, and even what the final management decision is. Moreover, certain injuries still missed on CT, so highlighting the need for continued assessment of clinical findings along with closed monitoring of the patients.[10,11]

While most studies on the blunt abdominal trauma in emergency setting include Contrast Enhanced CT imaging the data on Non-Contrast CT scan (NECT) is scarce. In addition, there is minimal regional evidence on the pattern of injuries and their outcomes in the public sector. The main focus of this study is to address the incidence and patterns of intra-abdominal injuries in patients with blunt trauma, and the various management options that were implemented based on the findings of the NECT scan.

MATERIALS AND METHODS

Study Design: cross-sectional observational study.

Study Setting: The study is conducted in the Emergency Department of Lady Reading Hospital (LRH) Peshawar, Pakistan.

Study Duration: One year, from 1st November 2023 to 31st October 2024.

Sampling Technique: Non-probability convenience sampling technique is used.

Sample Size: OpenAI online sample size calculator is used for calculations. Sample size was determined to be 135 patients for 10% expected intra-abdominal injury frequency (as per literature) and a 95% confidence interval.

Inclusion Criteria:

- Patients presenting to the Emergency Department with blunt abdominal trauma
- Patients who underwent non-contrast CT abdomen for evaluation of blunt abdominal trauma

Exclusion Criteria

- Patients with penetrating abdominal trauma are excluded.

Data Collection Procedure: The Hospital Information Management System (HIMS) was used for gathering data in patients presenting with blunt abdominal trauma to the Emergency

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Department between 1st November 2023 to 31st October 2024. All patients underwent CT abdomen in emergency setting without contrast, using the GE Optima 16 CT slice Scanner. The scans were review on the Picture Archiving and Communication System (PACS) by a consultant radiologist (CPSP Fellow). The CT patterns of the abdominal injuries, as well as the subsequent management were recorded.

Confidentiality and Ethical Considerations: Ethical approval was granted from the Institutional Research Ethics Committee. Patient identity is not disclosed and the information was used solely for the purposes of this study.

Statistical Analysis: Data was analyzed using Statistical Package for Social Sciences (SPSS) version 26. Descriptive statistics were applied. Qualitative variables presented as percentages. Measures such as median and mode were calculated where appropriate.

RESULTS:

This study consisted of 135 patients who presented to the emergency department with blunt abdominal trauma and underwent a non-contrasted CT abdomen for suspected abdominal injury.The commonest age group is in the 21–30-year with 38 patients (28.1%) (Figure 1). There was notable male dominance, 117 (86.7%) were male and rest were female (13.3%).

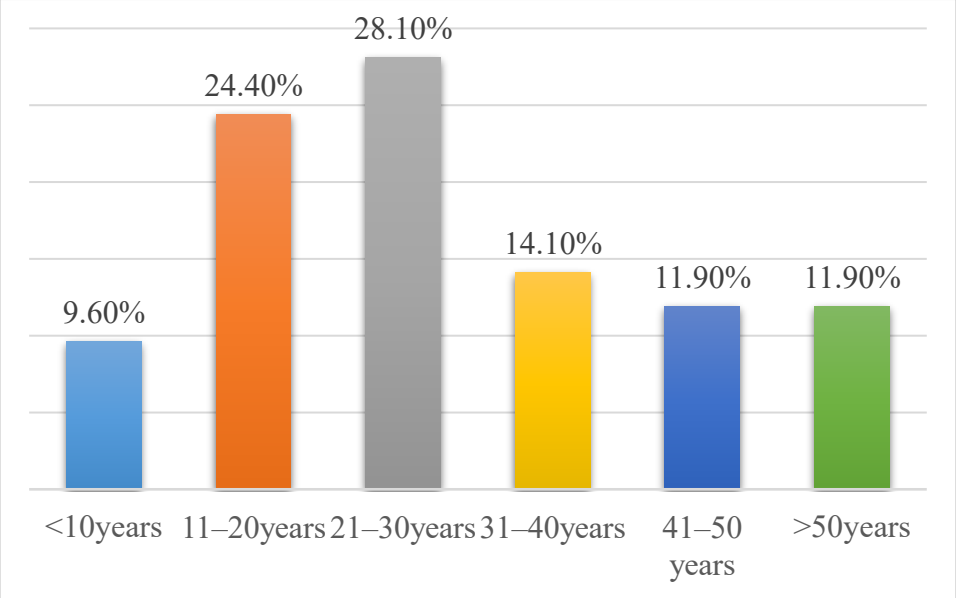


Figure 1: Age distribution (n = 135).

Figure 2 shows a spectrum of intra-abdominal findings from non-contrast CT abdomen. The most frequent clinical finding was a hemoperitoneum, representing 8.9%. This was followed by an abdominopelvic hematoma (5.2%). Additional significant findings included, pneumoperitoneum (4.4%), gut injury (4%) and bladder injury (3.7%). Solid organ injuries were also present, with renal (3%) and hepatic injury (3%). The less frequently detected were splenic injury (2%), and pancreatic injury (1.50%).

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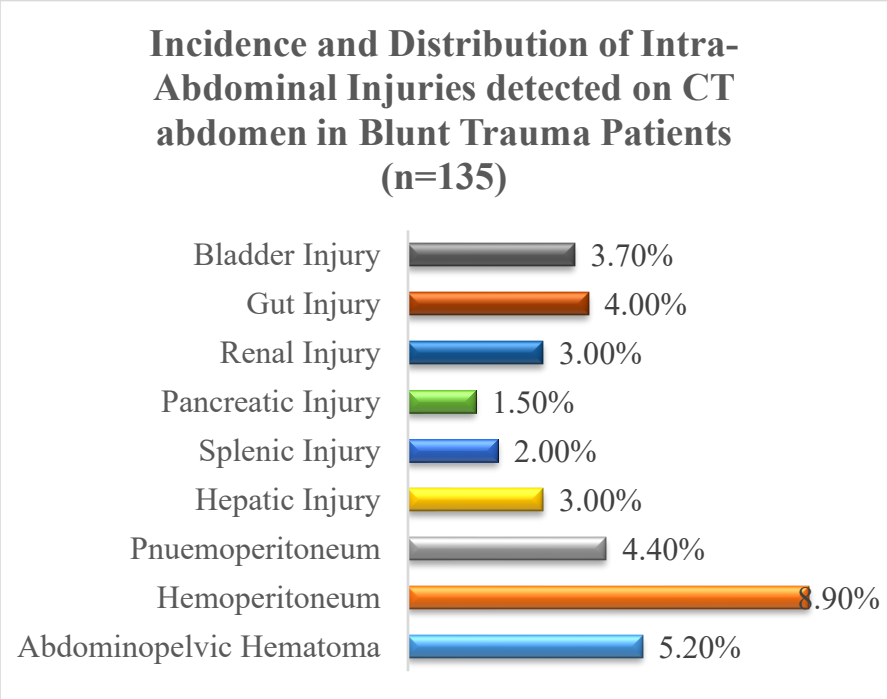


Figure2: Abdominal findings detected on non-contrast CT abdomen (n = 135)

Figure 3 shows a spectrum of extra-abdominal findings on non-contrast CT abdomen. The most frequent finding was a hemopneumothorax, representing 17.80%. Additional significant findings included, pelvic fractures (5.20%), and limb fractures (3.00%). The less frequently detected were lung contusions (2.20%), spinal fractures (1.50%), hip fractures (0.70%) and perineal injury (0.70%).

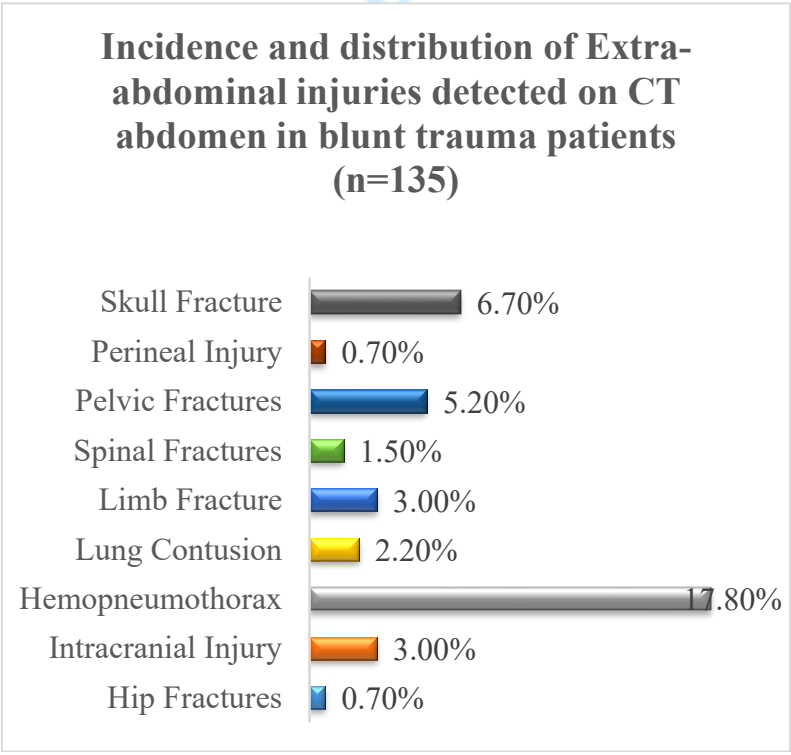


Figure 3: Extra-abdominal findings on non-contrast CT abdomen (n = 135)

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Patient management been illustrated in Figure 4. Most patients (30.4%) were discharged from the emergency room. 21.5% of patients were placed on conservative management. 22.2% of patients required a surgical intervention based on positive CT scan finding of abdominal injury while 25.9% patients had a surgery for other than abdominal injuries, as poly trauma is common in road traffic accidents and fall from height.

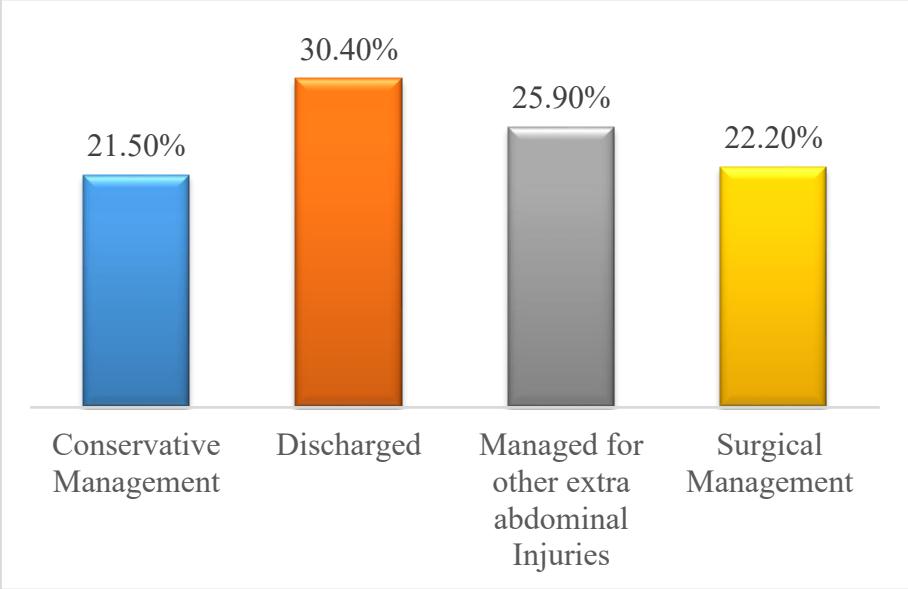


Figure 4: Management of patients presenting with blunt abdominal trauma based on CT abdomen findings and clinical assessment in Emergency Department (n = 135).

DISCUSSION

Blunt abdominal injuries are an important diagnostic and management concern at emergency departments especially in high-volume public sector hospitals. This hospital-based cross-sectional study aimed at assessing the frequency, range and management outcomes of blunt trauma non-contrast CT abdomen. The findings are aimed at providing local information on the patterns of injuries, the scope of CT imaging done, and how the patient was managed later.

In our study, most of the patients fell in the young adult age category, especially in the 21–30year range, with the 11–20year age range next in line. This age range is in accordance with other studies which highlight that trauma incidents are largely sustained by the younger members of the population who are usually the breadwinners.[12] The prominent male-to-female ratio of the population in our study, where 86.7% of the patients were male, is also congruous with findings in other studies and could be an outcome of the higher engagement in outdoor activities, and road traffic and violent attacks which are also higher amongst the male population in Pakistan.[13]

There were different modes of blunt trauma injury which are the reasons for requesting a CT of the abdomen in this population cohort study. Most frequent reasons for requests were road traffic accidents and history of fall.[14,15]

Hemoperitoneum was the most frequent intra-abdominal finding, corroborating earlier reports identifying it as a key indicator of intra-abdominal injury in blunt trauma.[16] Solid organ injuries were less frequently detected, likely reflecting the reduced sensitivity of non-contrast CT for parenchymal injuries compared to contrast-enhanced studies.[17] The detection of extra-abdominal injuries such as hemopneumothorax and fractures highlights the value of CT in identifying multisystem injuries in polytrauma patients.[18] Injuries to the hollow viscus were suspected on the basis of presence of pneumoperitoneum. The predominance of conservative management and discharge supports the growing trend toward non-operative management in selected blunt trauma patients. Surgical intervention was

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required in approximately one-fifth of cases, emphasizing the role of CT in triaging patients, preventing unnecessary laparotomies, and guiding timely surgical care. [19,20]

This study has several limitations that should be acknowledged. First, the retrospective cross-sectional design relies on existing hospital records, which may be subject to incomplete documentation and information bias. Clinical variables such as hemodynamic status, laboratory findings, and long-term patient outcomes were not included as these could not be consistently assessed due to limitations of record availability.

Secondly, only non-contrast CT abdomen was evaluated. While non-contrast CT is valuable in resource-limited settings, it has reduced sensitivity for detecting solid organ parenchymal injuries, vascular injuries, and subtle hollow viscus or mesenteric injuries compared to contrast-enhanced CT. Consequently, the true incidence of certain intra-abdominal injuries may be underestimated. Finally, management decisions were influenced not only by CT findings but also by clinical judgment, associated extra-abdominal injuries, and institutional protocols. Therefore, a direct causal relationship between CT findings and management outcomes cannot be definitively established. Despite these limitations, the study provides valuable local evidence on the role of non-contrast CT abdomen in evaluating blunt abdominal trauma in a resource constrained environment.

CONCLUSION

Non-contrast CT abdomen plays a crucial role in the timely detection of clinically significant intra-abdominal and associated extra-abdominal injuries in hemodynamically stable patients, particularly in resource-limited public-sector hospitals. The identification of injuries such as hemoperitoneum significantly influences patient triage, supports appropriate conservative management, and helps identify cases requiring surgical intervention. Despite its limitations compared to contrast-enhanced CT, non-contrast CT abdomen remains a practical and effective imaging modality for guiding emergency trauma management in resource constrained environments.

REFERENCES

Zarama V, Torres N, Duque E, Arango-Ibañez JP, Duran K, Azcárate V, Maya DA, Sánchez ÁI. Incidence of intra-abdominal injuries in hemodynamically stable blunt trauma patients with a normal computed tomography scan admitted to the emergency department. BMC Emergency Medicine. 2024 Jun 21;24(1):103.

Bhatia V, Koshi S, Bansal V, Debi U, Singh L, Sandhu MS. Pattern of injuries in blunt trauma abdomen: A retrospective evaluation of imaging findings at a high-volume tertiary care trauma centre. Journal of Emergency Practice and Trauma. 2022 Jan 1;8(1):13-8.

Akeel AS, Mahdi BA, Alshammasi ZA. Emergency assessment and management of abdominal trauma. EC Microbiology. 2021;17:121-8.

Zaki Y, Bilal S, Matar M, Zaki D. Clinical and laboratory evaluation of blunt trauma patients for the early diagnosis of intra-abdominal injuries. Ain Shams Journal of Forensic Medicine and Clinical Toxicology. 2021 Jan 1;36(1):61-74.

Bhunker P, Yadav VK, Randhawa as. role of multidetector computed tomography in evaluation of abdominal trauma. Int J Acad Med Pharm. 2024;6(3):744-9.

Achatz G, Schwabe K, Brill S, Zischek C, Schmidt R, Friemert B, Beltzer C. Diagnostic options for blunt abdominal trauma. European Journal of Trauma and Emergency Surgery. 2022 Oct;48(5):3575-89.

Suliman O, Marwah Tarabishi AO, Marwi K, Sokail R, Hawsah E, Khalmurad R, Alsharif R. Patterns, Management, and Outcomes of Blunt Abdominal Trauma in Adults Presenting to the Emergency Department: A Systematic Review. Vascular and Endovascular Review. 2025 Nov 22;8(12s):152-61.

Bharde P, Sai RV, Sripriya S. Role of computed tomography imaging in the diagnosis of blunt and penetrating abdominal trauma injuries. International Journal. 2023 Jan;10(1):10.

Safari S, Aghili SH, Maneshi H, Paydar S, Shayan Z, Ranjbar MF. Developing a model for predicting intra-abdominal injuries following blunt trauma; a cross-sectional study. Frontiers in Emergency Medicine. 2025 May 5:e11-.

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

Ayaz M, Hussain S, Ali H, Zamir H, Saeed MA, Zeb A. *The Role of Focused Assessment with Sonography for Trauma (FAST) in Identifying Intra-Abdominal Injuries in Blunt Abdominal Trauma: Focused Sonography in Blunt Trauma Evaluation. Pakistan Journal of Health Sciences. 2025 Jun 30:237-41.*

Gautam PL, Paul G. *Abdominal Trauma Emergency Radiological Imaging. ISCCM Manual of Trauma Care. 2023 Feb 23:73.*

Mukharjee S, BV D, SV B. *Evaluation of management of CT scan proved solid organ injury in blunt injury abdomen–a prospective study. European Journal of Trauma and Emergency Surgery. 2024 Dec;50(6):2753-63.*

Abdihakim HM. *Comparison of Pre-operative Ct Scan and Laparotomy Findings in Adult Patients With Blunt Abdominal Trauma at Kenyatta National Hospital: a Comparative Cross-sectional Study (Doctoral dissertation, University of Nairobi).*

Ziaei M, Ei AD, Bahmani A. *Investigation of the Frequency of Abdominal Contrast-Enhanced CT Scan Findings in Multiple Trauma Patients Presenting to the Emergency Department of Khatam-al-Anbia Hospital in Zahedan in the Year 2023. Academic Journal of Surgery. 2024.*

Khan MH, Waqar SH, Khubaib H, Shamsuddin S, Ahsan MF, Shah SA. *Pattern of intra-abdominal injuries and their management in penetrating abdominal trauma. MedERA-Journal of CMH LMC and IOD. 2025 May 26;7(1).*

Elmorsy MM, El-Moghazy MB, Elhawary MA. *Incidence and Degree of Traumatic Kidney Injury in Polytrauma Patients Detected by Ultrasound versus Computed Tomography of the Abdomen. The Egyptian Journal of Hospital Medicine (April 2024).;95:2049-55.*

Mehanathan PB, Metha S, Jeyapaul A, Pa R. *Blunt Abdominal Injury. InTrauma and Emergency Surgery 2021 Jun 24. IntechOpen.*

Mirzamohamadi S, HajiAbbasi MN, Baigi V, Salamati P, Rahimi-Movaghar V, Zafarghandi M, Isfahani MN, Fakharian E, Saeed-Banadaky SH, Hemmat M, Sadrabad AZ. *Patterns and outcomes of patients with abdominal injury: a multicenter study from Iran. BMC emergency medicine. 2024 May 31;24(1):91.*

Sarkar PK, Biswas D, Biswas S, Samanta R. *Management of abdominal trauma patients in a peripheral hospital of Eastern India–A prospective study. Asian Journal of Medical Sciences. 2025 May 1;16(5):71-6.*

Reddy PA. *A study on the prevalence and pattern of abdominal organ injury in blunt trauma abdomen at a tertiary care centre.*

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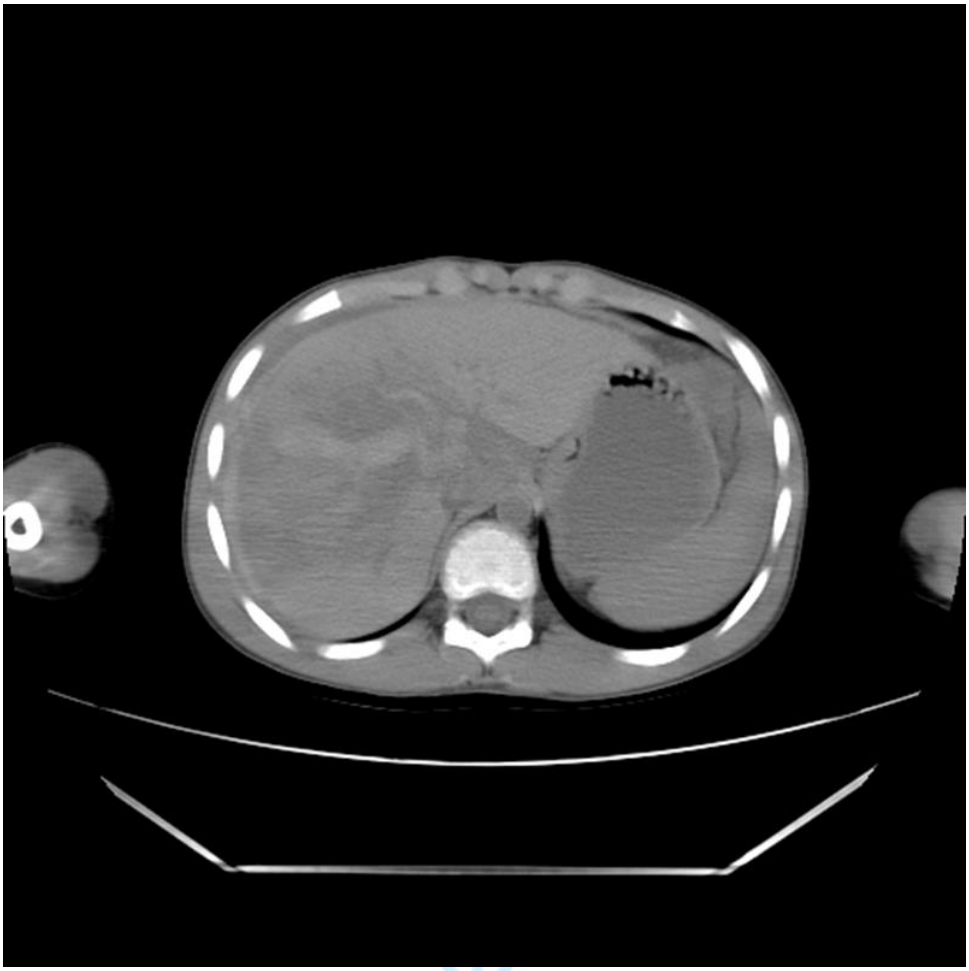


Figure: NECT abdomen in patient having RTA shows ill defined hypodense area in the liver consistent with hepatic injury.

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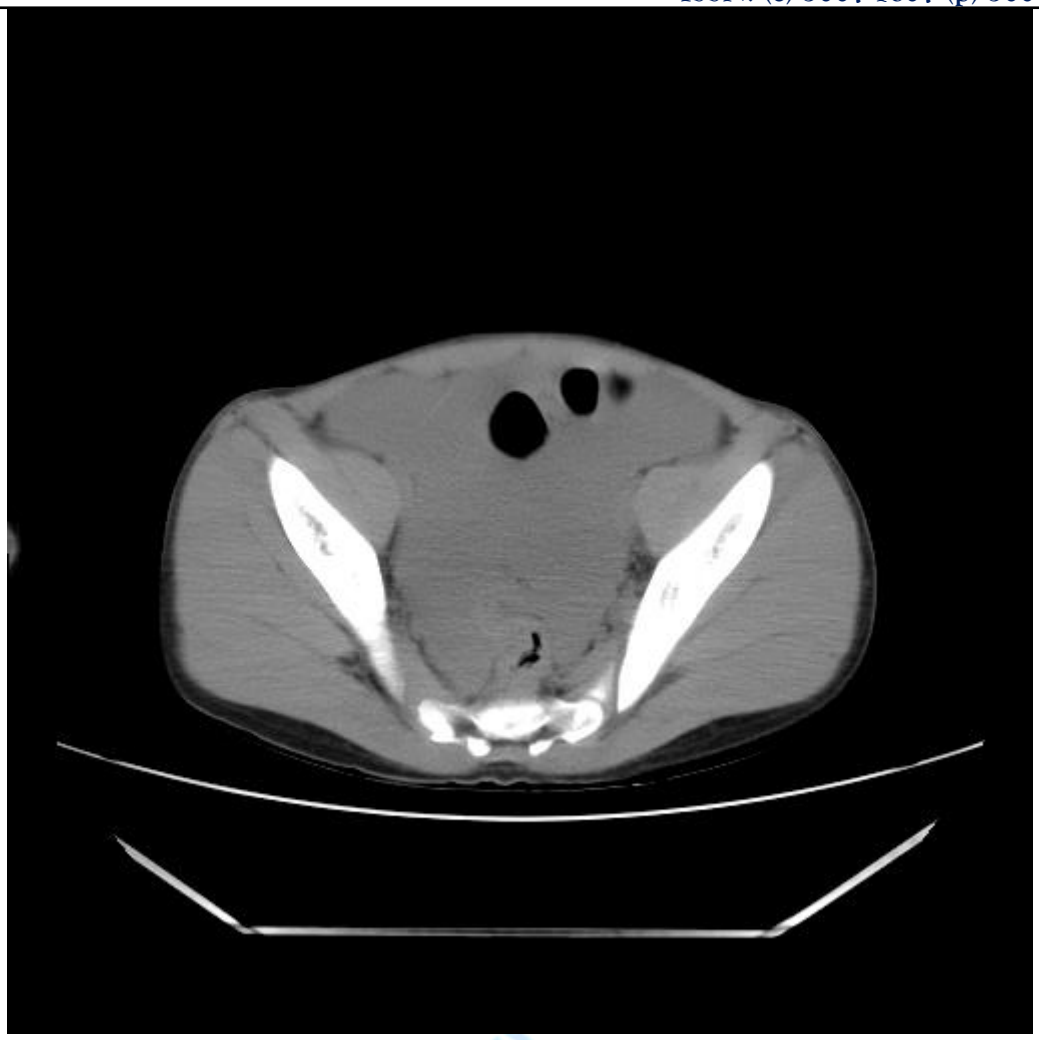


Figure: NECT Pelvic sections of the same patient show hyperdense fluid suggesting hemoperitoneum