

Evaluation of Retroperitoneal Trauma Using Multi-Detector Contrast-Enhanced CT

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Received: 01-07-2024 Revised: 15-08-2024 / Accepted: 21-09-2024

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Conflict of interest: Nil

Abstract

Background and Aim: Traumatic injuries to the abdomen or pelvis can damage retroperitoneal structures such as the kidneys, ureters, pancreas, major blood vessels, and duodenum. Accurate diagnosis of retroperitoneal injuries is crucial for proper intervention and management. The main objective of this research was to assess the effectiveness of contrast-enhanced MDCT, in identifying injuries, in the area for patients who had pelvic trauma. Additionally, we examined the CT results that are often associated with retroperitoneal trauma.

Material and Methods: This retrospective observational study was carried out over a period of one-year in 50 patients diagnosed with abdominal trauma. Detailed clinical history was elicited from the patients/ attendants and findings of general physical examination were recorded. Renal Function Tests were performed in all the patients and the study performed with minimum 6 hours fasting. CT examination was performed using MDCT machines. Multiplanar and 3-D reconstructions were performed on dedicated work station. The lesions were evaluated with respect to site of origin, consistency, components of the lesion and pattern of enhancement.

Results: The primary mechanisms of injury were assaults (58%) and falls (42%). Most patients (58%) presented within six hours post-injury, with a majority of CT scans performed within the same timeframe (48%). Predominant symptoms were abdominal pain or tenderness (90%), vomiting (38%), respiratory distress (24%), and abdominal guarding (16%). CT imaging revealed high prevalence of retroperitoneal injuries: renal lacerations (58%), extraperitoneal urinary bladder rupture (12%), pancreatic lacerations (12%), duodenal lacerations (10%), and adrenal lacerations (8%).

Conclusion: MDCT is a highly effective imaging modality for the evaluation of retroperitoneal trauma, offering superior sensitivity and specificity in detecting injuries.

Keywords: Multi-Detector Contrast-Enhanced CT, Pain, Pancreatic Lacerations, Retroperitoneal Trauma.

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Introduction

Traumatic injuries, to the abdomen or pelvis can cause damage to structures located behind the lining, including the kidneys, ureters, pancreas, major blood vessels and duodenum. It is crucial to accurately diagnose retroperitoneal injuries for intervention and management.

Initial diagnostic methods often involve examination and bedside tests like focused assessment with sonography for trauma (FAST) or diagnostic peritoneal lavage (DPL). However, these methods may not fully capture retroperitoneal trauma as they primarily focus on assessing the cavity. [1,2] Multi-detector computed tomography

(MDCT) has become an imaging technique for evaluation of abdominal and pelvic trauma. Contrast-enhanced CT provides an assessment of organs and hollow structures, vascular components, and potential sites of active bleeding. While CT findings for injuries are well established there is characterization of imaging features specific to retroperitoneal injuries.

The use of contrast enhancement allows for visualization of anatomy and injuries that may be subtle or inconclusive on non-contrast CT scans. [3-5] MDCT showed higher acquisition speed and spatial resolution, motion artifact reduction, and

introduction of intravenous contrast material bolus timing. Studies reported that MDCT has a high degree of accuracy regarding traumatic injuries of the abdomen with a sensitivity reaching up to 100%. It can identify and diagnose a different spectrum of abdominal injuries following blunt abdominal trauma such as mesenteric, pancreatic, and bowel injuries with a high degree of accuracy.

In another study, MDCT showed a specificity of 100%, sensitivity of 94%, and an accuracy of 97% in detecting high-energy traumatic injuries. MDCT also plays an important role in the triage of trauma patients in the acute setting. Accurate radiologic characterization of injury can help in selecting patients who need urgent surgical intervention. [6,7]

The main objective of this research was to assess the effectiveness of contrast-enhanced MDCT, in identifying injuries, in the area for patients who had pelvic trauma. Additionally, we examined the CT results that are often associated with retroperitoneal trauma.

Material and Methods

This retrospective observational study was carried out over a period of one year. Institutional Review Board approved this study, and an informed written consent was obtained from all patients who were included in the study.

The patients were informed in detail about the procedure of the study and informed consent was signed prior to the inclusion in the study. The inclusion and exclusion criteria were as follows:

Inclusion criteria

Patients of either sex of any age group who had presented with involvement of retroperitoneal organs detected by routine ultrasound and postoperative patients with recurrence were included in the study.

Exclusion criteria

Patients who had history of allergy to intravenous contrast agents, deranged kidney function tests and, pregnant women were excluded from our study. All patients with clinically suspected or USG detected RP masses referred for CT evaluation formed the material of the study. Patients with allergy to iodinated contrast media, patients with renal failure or on dialysis and patients with acute abdominal trauma were excluded from the study.

Detailed clinical history was elicited from the patients/ attendants and findings of general physical examination were recorded. Renal Function Tests were performed in all the patients and the study performed with minimum 6 hours fasting. CT examination was performed using MDCT machines (GE Bright speed 16 slice and Siemens Somatom Definition AS+ 64 slice). Multiplanar and 3-D reconstructions were performed on dedicated work station. The lesions were evaluated with respect to site of origin, consistency, components of the lesion and pattern of enhancement. Imaging findings were correlated with the pathological/laboratory findings wherever possible. The results were subjected to statistical analysis and expressed as percentages and proportions.

Results

The present study included total of 50 patients diagnosed with abdominal trauma. There were 32 males and 18 females in the study. The age range of the included patients was found to be 10 years to 70 years. The mean age was found to be 39 years.

The majority of the patients presented with the reason for the abdominal injury were due to assaults found in 29 patients and second most common reason was found to be fall, recorded in 21 patients. Majority of the patients that is 29; were admitted to the hospital within time limit of 6 hours of the injury, while 10 patients were admitted between 6 to 12 hours, 6 patients were admitted between 12 to 24 hours and 5 patients were admitted after 24 hours of injury.

Table 1: Demographic analysis of the patients

Timely admission of the patients	
With 6 hours	29
6 to 12 hours	10
12 to 24 hours	6
More than 24 hours	5
Mechanism of abdominal injury	
Assault due to trauma	29
Injury due to fall	21
Time for CT scans results	
2 to 6 hrs	24
6 to 12 hrs	8
1 to 7 days	4
> 7 days	3

The abdominal CT scans were obtained with 2 to 6 hours for 24 patients, for 8 patients it was obtained in 6 to 12 hours, for 4 patients it was obtained between 1 to 7 days and for 3 patients the CT was obtained after 7 days. Majority if the patients presented with the major symptoms of abdominal pain and/or tenderness, recorded in 45 patients, next major symptoms was vomiting found in 19 patients, respiratory distress was found in 12 patients and the least number of patients had abdominal guarding. Traumatic laceration was detected in 29 patients, whereas in 6 patients pancreatic laceration was found, duodenal laceration was found in 5 patients, in 4 patients there were adrenal laceration and in 6 patients there was urinary bladder rupture (Figure 1,2,3,4). MDCT findings in abdominal organ injury: Out of 50 cases, the multi-organ injury was seen in 18 (36%) cases, single organ injury was noted in 22 (44%) cases and there are 10 (20%) cases, with no organ injury.

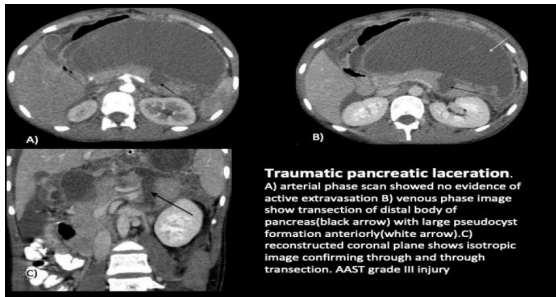


Figure 1

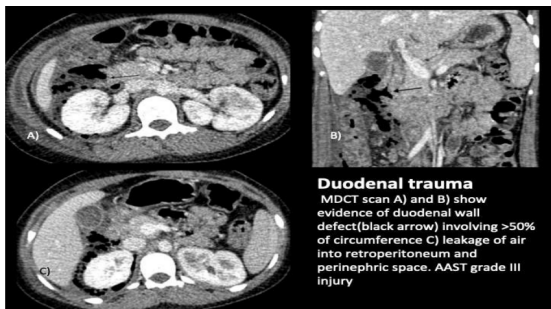


Figure 2



Figure 3

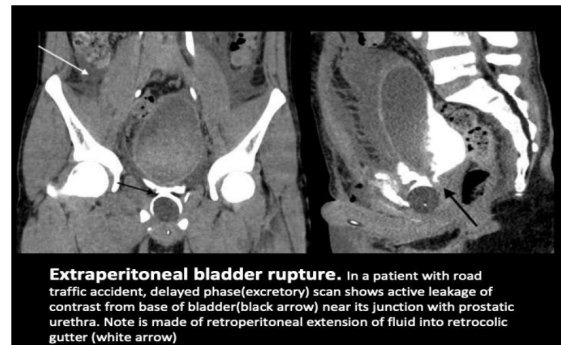


Figure 4

Discussion

This study demonstrates a high prevalence of abdominal trauma in young males, congruent with other studies showing abdominal trauma is more common in men due to risk-taking behaviour. Assaults were the leading cause, indicating the role of interpersonal violence in blunt trauma.

Timely CT within 2-6 hours of injury allows for prompt diagnosis and treatment planning. Delayed presentation beyond 24 hours occurred in a minority of patients but can increase morbidity if critical injuries are missed. Abdominal tenderness was the most consistent presenting complaint, though lack of guarding does not preclude significant intra-abdominal trauma. [8] Overall, understanding injury mechanisms, risk factors, timing, and clinical presentation are key to recognizing patients who warrant urgent CT imaging to detect potentially life-threatening retroperitoneal injuries. [9]

The use of MDCT to assess abdominal trauma has affected the directions of treatment, spotting a large focus on conservative treatment. Surgical intervention decision was essentially depend on clinical signs instead of imaging findings. CT scan information raises the diagnostic confidence and reduces unnecessary surgeries. [9,10]

MDCT Protocols in abdominal trauma: modifications: Delayed phase images acquired selectively at 3-5 minutes post-contrast administration in all protocols. Done to detect pelviccalyceal contrast extravasation. Decision to be made at the time of scan after reviewing the previous phases in the presence of renal lacerations with possible extension to pelviccalyceal system.

CT cystography – indicated in patient’s unexplained free pelvic fluid and in presence of gross or significant microscopic hematuria. Technique is retrograde filling of bladder with 300-400 ml of diluted contrast by gravity drip infusion followed by a CT scan of pelvis.

Conclusion

Trauma to major retroperitoneal structures can be a major cause of morbidity and mortality and is easily missed on imaging. Familiarity with the CT protocols, organ injury scoring and the imaging appearances of trauma in major retroperitoneal structures is very important for every radiologist. MDCT is a highly effective imaging modality for the evaluation of retroperitoneal trauma, offering superior sensitivity and specificity in detecting injuries. Its use significantly influences clinical management decisions, facilitating prompt and appropriate intervention. These findings support the integration of MDCT into the standard diagnostic protocol for patients with suspected retroperitoneal trauma, ultimately improving patient outcomes

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