

Computed tomography (CT) evaluation of acute cholecystitis

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Abstract

Background: USG has an already established role in diagnosis of acute cholecystitis with some limitations. However, Computed Tomography (CT) is useful in patients with atypical presentation. It also help in differential diagnoses like pancreatitis, intra-abdominal abscesses or ischemic bowel disease. Although, several literature for role of CT in acute cholecystitis are already available but its efficacy as primary diagnostic modality is still not ascertained. With these perspective these study is undertaken to evaluate different CT signs in diagnosis of acute cholecystitis. **Methods:** Data of patients who were diagnosed to have acute cholecystitis on CT between the year 2018 to 2019 were included in the study. Confirmed diagnosis of cholecystitis was obtained from histopathology those without confirmed diagnosis was excluded from study. CT images of cases were obtained using MDCT scanners (Aquilon One and Aquilon 64 from Toshiba Healthcare systems) **Results:** Pericholecystic inflammatory changes was the most common CT sign followed in order by; gall bladder distention, wall thickening, mucosal enhancement, visualization of calculi, tensile fundus sign, reactive hepatic hyperemia and Pericholecystic fluid collections. **Conclusion:** An evaluation of CT signs in diagnosis of acute cholecystitis will help improve the diagnostic confidence in acute cholecystitis and will also help in differential diagnosis **Keywords:** Computed Tomography, Abdominal Pain, Acute Cholecystitis, Gallstone.

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INTRODUCTION

Acute cholecystitis is the commonest cause of acute right upper quadrant pain in addition to other conditions such as peptic ulcer disease, pancreatitis and acute hepatitis. Diagnostic criteria for Acute cholecystitis defined by Japanese authors recently are¹ A. Clinical: Local signs of inflammation, Murphy's sign, right upper quadrant mass / pain / tenderness B. Systemic signs of inflammation: fever, elevated CRP, abnormal WBC count Acute cholecystitis can occur as a result of gall stone disease or in case of debilitated chronic ill patients with acute a calculous

cholecystitis². USG has an already established role in diagnosis of acute cholecystitis. It has benefits of being cheap, reliable, portable and readily available³. It also has limitations that of obesity, gaseous distention and operator dependency. However, Computed Tomography (CT) is useful in patients with atypical presentation. It also help in differential diagnoses like pancreatitis, intra-abdominal abscesses or ischemic bowel disease⁴. acute cholecystitis may have symptoms suggestive of an abscess or other intra-abdominal inflammation and, therefore, may be referred for a Computed Tomography CT of the abdomen. Computed Tomography CT is also helpful in detecting complications of cholecystitis like

- Hyperemia: increased enhancement of the hepatic parenchyma adjacent to gall bladder fossa
- Tensile fundus sign positive: absence of flattening of the gall bladder fundus by contact with anterior abdominal wall.
- pericholecystic inflammatory changes: Stranding of adjacent mesenteric fat or visualization of fluid
- perforation, emphysematous or gangrenous cholecystitis, hemorrhage and gall stone ileus.

Typical CT findings in acute cholecystitis include^{5,6,7}

1. Gallbladder distention
2. Increased wall thickening
3. Mucosal hyper enhancement
4. Pericholecystic fat stranding or fluid
5. Reactive hyperemia
6. Tensile fundus sign
7. Visualization of gallstones that have sufficient attenuation difference from bile.

Although, several literature for role of Computed Tomography CT in acute cholecystitis are already available but its efficacy as primary diagnostic modality is still not ascertained⁸. With these perspective these study is undertaken to evaluate different Computed Tomography CT signs in diagnosis of acute cholecystitis.

MATERIALS AND METHODS

Approval of institutional ethics committee was taken prior to commencement of these study. Data of patients who were diagnosed to have acute cholecystitis on Computed Tomography CT between the year 2018 to 2019 were included in the study. Confirmed diagnosis of cholecystitis was obtained from histopathology those without confirmed diagnosis was excluded from study. Computed Tomography CT images of cases were obtained using MDCT scanners (Aquilon One and Aquilon 64 from Toshiba Healthcare systems). Additional Contrast-enhanced images were obtained during short breath-holds after 65 seconds of IV administration of 2 mL/kg of nonionic iodinated contrast material injected at a rate of 2.5–2.8 mL/s by power injector. Computed Tomography CT parameters used were

1. Slice thickness, 5 mm;
2. Tube voltage, 120 kVp;
3. Tube current–exposure 80-700 mAs.

All images, were reviewed on “Zillion” Picture Archiving and Communication systems (PACS)

Computed Tomography CT signs for acute cholecystitis applied for study

- A. Gall bladder distention: gall bladder measured more than 8 cm in long axis.
- B. Wall thickening: more than 0.3 cm in non-collapsed gall bladder.
- C. Reactive hyperemia (presence of increased enhancement of the hepatic parenchyma adjacent to gall bladder fossa, visualized in dedicated liver window).
- D. Positive Tensile fundus sign (absence of flattening of the gall bladder fundus by contact with anterior abdominal wall).
- E. Positive pericholecystic inflammatory changes (Stranding of adjacent mesenteric fat or visualization of fluid)

The sample size for this study was taken as 100. Results were calculated in Microsoft Excel sheet and analyzed using SPSS software

RESULTS

In total 100 patients were included in this study between the age of 20 to 80 years. Most common presenting complains were abdominal pain (86.3%) followed by nausea and vomiting (30.5%). Leukocytosis was present in 67.1 % of the patients. Regarding CT signs Pericholecystic inflammatory changes were most commonly present (86.3%). This was followed by gall bladder distention (85.5%), wall thickening (76.3%), enhancement of gall bladder mucosa (75.5 %), visualization of gall stones (58.8%), tensile gall bladder fundus (38.8%), reactive hyperemia (37.1%) and Pericholecystic fluid collections (31 %). Most common complication was perforation and abscess formation.

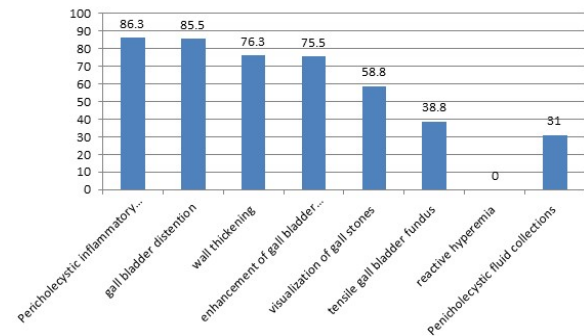


Figure 1: Observations

DISCUSSION

Imaging form an integral part of evaluation of acute cholecystitis. Though the role of Cholescintigraphy and ultrasound have been quite well established in diagnosing acute cholecystitis with sensitivities reaching up to 94% and 82% respectively, Computed Tomography CT remains to be under evaluated as imaging modality in suspected cases of acute cholecystitis⁹. Some patients with acute cholecystitis will not present with the classic signs and symptoms and also because of the wide differential diagnosis, Computed Tomography CT scans are often performed to look for intraabdominal abscess or other evidence of intraabdominal inflammation. In our study pericholecystic inflammation and stranding was the commonest finding (86.3%) but it has a little importance as a sign of cholecystitis. Still stranding of the pericholecystic fat provides a useful clue to the presence of cholecystitis. Although it has presumed to represent edema, it could be due to inflammation, bile, or engorged blood vessels¹⁰. The second most common finding was Gallbladder distention (85.5%) and it was more common in the patients with acalculous cholecystitis. But this

finding is contrary to the findings of Mirvis *et al.*¹¹, who found that gallbladder distension had a poor correlation with acalculous cholecystitis. The next common finding was gallbladder wall thickening (76.3%). But gallbladder wall thickening is a nonspecific finding and may occur in a variety of conditions including hepatitis, hypoproteinemia,. Furthermore, the normal gallbladder wall may appear spuriously thickened if the gallbladder is collapsed. Pericholecystic fluid collections (31 %) may represent either a localized peritonitis or microperforation¹². In the study by Lamki *et al.*¹³ of complicated cholecystitis they found pericholecystic fluid collections with evidence of perforation at surgery. Gall bladder distention, increased wall thickness and mucosal hyper enhancement followed in order after pericholecystic inflammatory changes, similar to signs previously reported in published literature^{5,14}. Least common finding in this study was reactive hyperemia of liver parenchyma with previous literature suggesting that there is little importance of reactive hepatic hyperemia in diagnosis of acute cholecystitis¹⁴. Computed Tomography CT scanning is widely accepted as modality of choice in evaluating complications of cholecystitis such as gangrenous *and* emphysematous cholecystitis, gall bladder perforation, abscess formation and gall stone ileus. Although Computed Tomography CT yet has not surpass the established diagnostic abilities of ultrasound^{3,9} but a detailed understanding of its signs is essential for improving confidence of both radiologists as well as referring physicians in use of this modality. Limitations of this study include cases were also diagnosed on histopathology, hence there may be chance of false positives findings of Computed Tomography CT. Further work needs to be done in these topic for better understanding of Computed Tomography CT as imaging modality for acute cholecystitis.

CONCLUSION

Computed Tomography CT had proved its role as an important diagnostic tool in evaluation of abdominal pain. An evaluation of Computed Tomography CT signs in diagnosis of acute cholecystitis will help improve the diagnostic confidence in acute cholecystitis and will also help in differential diagnosis

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