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A Prospective Observational Study of Role of Ct in Evaluation of Acute Cholecystitis

Dr.Chidananda Murthy M[1],Dr.Pooja G Kulkarni[2*], Dr.Akshit Aiyappa MJ[3]
[1]*Associate Professor, Department of Radiology, AJ Institute of Medical Sciences and Research, Mangalore, Karnataka.*
[2*]*Post Graduate, Department of Radiology, AJ Institute of Medical Sciences and Research, Mangalore, Karnataka.*
[3]*Junior Resident, Department of Radiology, AJ Institute of Medical Sciences and Research, Mangalore, Karnataka*
Corresponding Author: Dr.Pooja G Kulkarni

Abstract
Introduction:*Acute cholecystitis is an acute inflammatory condition of the gall bladder; 95% of cases of acute cholecystitis are due to an obstructing calculus in the gall bladder neck orcystic duct.1The pathophysiology of acute cholecystitis is complex and not completely understood. In 96% of cases there are gallstones, and typically, a calculus causes cystic duct obstruction.The trapped concentrated bile has an irritative effect onthe gallbladder wall, causing increased secretions leading to distention, wall edema, and hypervascularity of the wall.*
Materials and Methods:*The study was a Cross Sectional study conducted at Department of Radiology, AJ Institute of Medical Sciences and Research, Mangalore, Karnataka for a period of 12 months between January 2019 to December 2019.All patients with clinical suspicion/Diagnosis of Acute cholecystitis referred for CT were consecutively inducted into the study after receiving informed consent. Imaging was performed on SIEMENS SOMATOM64*2 DUAL ENERGY CT scanand sections from above the level of Diaphragm to Pubic symphysis. Plain study was first performed, and contrast was injected to get the arterial, venous and delayed phases as needed. Non-Ionic Contrast media (OMNIPAQUE 350) was used and the flow rate was adjusted to 4ml/s by an injection pump for every 1.5ml/Kg of body weight.*
Results:*They study included fifty patients with acute cholecystitis. The average age of the group was 60.7 ± 1.76 (range from 30-80) with a sex distribution in the group being 21:29 (M: F). The highest incidence was found in 61-70 years age group accounting for 32.0% of cases and least was seen in age group of 41-50 years constituting 8%.*
Conclusion:*CT is the imaging modality of choice for diagnosis of acute cholecystitis and its associated complications in emergency department setting due to its wide availability. Cholelithiasis, gall bladder wall thickening, gall bladder distension, pericholecystic fluid/edema, pericholecystic fat stranding, transient increased enhancement of adjacent liver parenchyma is often associated with acute cholecystitis and these findings can be well established from CT.*
Key Words:*CT, IOP, SAP, acute cholecystitis*

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I. Introduction

Acute cholecystitis is an acute inflammatory condition of the gall bladder; 95% of cases of acute cholecystitis are due to an obstructing calculus in the gall bladder neck orcystic duct.1The pathophysiology of acute cholecystitis is complex and not completely understood. In 96% of cases there are gallstones, and typically, a calculus causes cystic duct obstruction.[1]The trapped concentrated bile has an irritative effect onthe gallbladder wall, causing increased secretions leading to distention, wall edema, and hypervascularity of the wall.As intraluminal pressure rises, vessels become compressed that may result in thrombosis, ischemia, and subsequent necrosis of the gallbladder wall.[2] Bacterial colonization, perforation, or abscess formation may also follow.Most (95%) patients with acute cholecystitis have gallstones. As opposed to ultrasound, which is very sensitive and specific for the detection of gallstones, CT detects onlyapproximately 75% ofpatients with gallstones.With CT, gallstones have a varied appearance based on their composition and pattern of calcification. Stones with calcifications tend to be well seen with CT.[3] However, stones with a high cholesterol content may be difficult to detect because they may be hypoattenuating or isoattenuating compared with bile.

In patients younger than 50 years of age, women are affected by acute cholecystitis 3 times more frequently than men, reflecting the higher prevalence of gallstones in women. After 50 years of age, the distribution of acute cholecystitis between men and women is nearly equal.[4] In 75% of cases, there is a history of biliary colic characterized by right upper quadrant pain, nausea, vomiting, or dyspepsia. Pain may radiate to the epigastrium, back, or shoulder. On physical examination, right upper quadrant tenderness and guarding are noted. Murphy's sign orpoint tenderness over the gallbladder's may be present.[5] This sign was originally described as the arrest of inspiration when the right subcostal margin is palpated. Laboratory findings are nonspecific and include mild elevations of serum bilirubin, amylase, and transaminases. An elevated white blood cell count is usually present.[6]

The objective of this study is to assess the role of CT in the evaluation of acute cholecystitis and its complications. The study compares the CT findings of acute cholecystitis with clinical findings and helps in understanding the associated complications and extent of involvement before planning the management of acute cholecystitis.[5]

II. Materials And Methods

The study was a Cross Sectional study conducted at Department of Radiology, AJ Institute of Medical Sciences and Research, Mangalore, Karnataka for a period of 12 months between January 2019 to December 2019.

All patients with clinical suspicion/Diagnosis of Acute cholecystitis referred for CT were consecutively inducted into the study after receiving informed consent. Imaging was performed on SIEMENS SOMATOM64*2 DUAL ENERGY CT the sections from above the level of Diaphragm to Pubic symphysis. Plain study was first performed,and contrast was injected to get the arterial, venous and delayed phases as needed. Non-IonicContrast media (OMNIPAQUE 350) was used and the flow rate was adjusted to 4ml/s by an injection pump for every 1.5ml/Kg of body weight.

Inclusion Criteria

1.Patients with signs and symptoms of Acute cholecystitis that is who are presenting with Right upper quadrant pain and Positive Murphy's signon clinical examination.

2.Patients with suspected Complicated Acute cholecystitis.

3.Patients with Inconclusive Ultrasound who needs CT as further imaging for confirmation of diagnosis.

Exclusion Criteria

1.With history of chronic kidney disease whose Serum creatinine values are more than 1.2 md/dl.

2.Contrast medium was contraindicated like pregnant females and who are allergic to the contrast medium.

3.Patients who didn't give consent to participate inthe study.

The images were analyzedby the operator blinded to the clinical details and histopathological, surgical/ follow up details. The following observations were looked into:

- Presence or absence of calculus was noted. Most of the stones are cholesterol stones which are Radiolucent on CT. The site of the gall bladder calculus was also noted as the calculus impacted in the cystic duct or neck causes extrinsic compression over the adjacent CBD and resulting in Dilated CBD and IHBRD.
- Wall thickening was noted and considered significant if the wall thickness is more than 4mm.The Enhancement pattern of the gall bladder wall was also assessed weather there is Irregular and discontinuous enhancement.
- Distension of the Gall bladder was noted. It was further categorized into grossly distended (length is more than 8 cm and transverse diameter more than 4-5 cm)
- Pericholecystic Fluid and edemain the form of mural striations are noted. It can be assessedin the plain study also but better delineated on contrast study as the wall and the edemacan be clearly demarcated.
- Pericholecystic fat stranding was noted and assessed weather it is present or not. The fat stranding is seen in both Plain and contrast study.
- On contrast administration few cases of cholecystitis show transient increased hepatic attenuation around the gall bladder in arterial phase in curvilinear fashion. The presence or absence of the increased hepatic attenuation was assessed.
- The presence of any intramural defect or discontinuity in the gall bladder wall was noted and the site of the defect involving which wall of the gall bladder was also noted. A note is also made of presence of pericholecystic collection.
- A note made if any Intraluminal membranes are present.
- Presence of Intraluminal or Intramural air was noted.

•Other features like Ascites, Thickened Peritoneum with enhancement, dilated small bowel loops in case of obstruction due to passed off gall stone was noted.

III. Results

They study included fifty patients with acute cholecystitis. The average age of the group was 60.7 ± 1.76 (range from 30-80) with a sex distribution in the group being 21:29 (M: F). The highest incidence was found in 61-70 years age group accounting for 32.0% of cases and least was seen in age group of 41-50 years constituting 8%.

S.No	Age Group	Number (%)
1	**31-40**	**05 (10%)**
2	**41-50**	**04 (8%)**
3	**51-60**	**13 (26%)**
4	**61-70**	**16 (32%)**
5	**71-80**	**12 (24%)**

Table 1: Age Distribution (N=70)

S.No	Clinical Symptom	No of patients (%)
1	Right upper quadrant (RUQ) pain	42 (84%)
2	Vague abdominal discomfort	08 (16%)
3	RUA mass	08 (16%)
4	Fever	18 (6%)
5	Nausea	16 (32%)
6	Vomiting	15 (30%)
7	Dyspepsia	14 (28%)
8	Jaundice	11 (22%)
9	Abdominal distension	1 (2%)

Table 2: Clinical Symptoms

S.No	Description	No of patients (%)
1	Calculus	42 (84%)
2	GB Wall thickening	33 (66%)
3	GB distension	32 (64%)
4	Pericholecystic fluid/edema	32 (64%)
5	Pericholecystic fat stranding	42 (84%)
6	Transient adjacent liver parenchymal enhancement	21 (42%)
7	Intramural defects	13 (26%)
8	Pericholecystic collection	12 (24%)
9	Others	11 (22%)

Table 3: Findings

S.No	Description	No of patients (%)
1	Calculi	23
2	GB Wall thickening (>4mm)	17
3	GB distension	13
4	Pericholecystic fluid/edema	11
5	Pericholecystic fat stranding	20
6	Transient adjacent liver parenchymal enhancement	10

Table 4: Simple Acute Calculous Cholecystitis (23/50)

S.No	Description	No of patients (%)
1	Calculi	-
2	GB Wall thickening (>4mm)	4
3	GB distension	4
4	Pericholecystic fluid/edema	4
5	Pericholecystic fat stranding	4
6	Transient adjacent liver parenchymal	2

enhancement

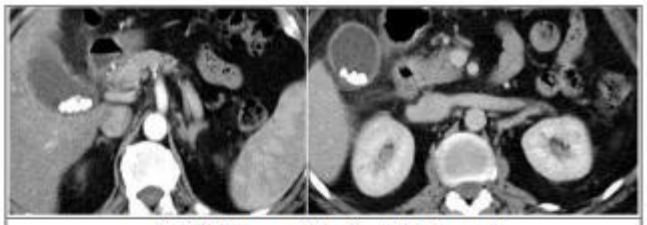
Table 5: Acute Acalculous Cholecystitis (5/50)

S.No	Description	No of patients (%)
1	Calculi	1
2	GB Wall thickening (>4mm)	3
3	GB distension	3
4	Pericholecystic fluid/edema	4
5	Pericholecystic fat stranding	4
6	Transient adjacent liver parenchymal enhancement	2

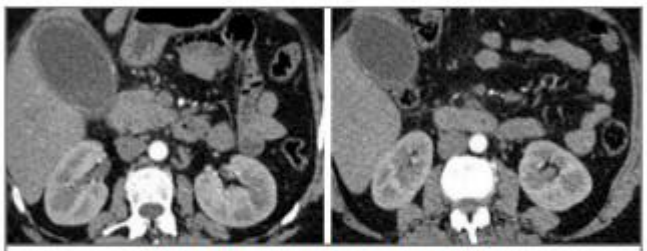
Table 6: Gangrenous Cholecystitis (4/50)

S.No	**Description**	**No of patients (%)**
1	Calculi	11
2	GB Wall thickening (>4mm)	10
3	GB distension	08
4	Pericholecystic fluid/edema	-
5	Pericholecystic fat stranding	08
6	Transient adjacent liver parenchymal enhancement	09

Table 7: GB Perforation with Pericholecystic Collection (12/50)

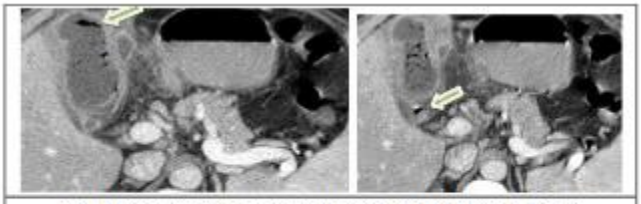


CECT Abdomen Showing Features of Simple Acute Calculous Cholecystitis

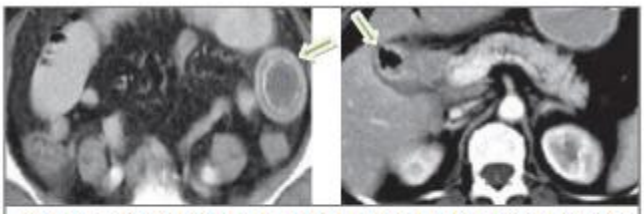


CECT Abdomen Showing Features of Simple Acute Acalculous Cholecystitis

CT Abdomen-Gangrenous Cholecystitis with Irregular GB Mucosa and Hyperdense Intraluminal Membrane



Emphysematous Cholecystitis A) and B) CECT Abdomen Showing Intramural and Intraluminal Air with Thickened and Enhancing Walls. Pericholecystic Fluid, Oedema and Fat Standing Seen



Gall stone Ileus. A) CECT Abdomen Showing well Defined Round Hypodense Lesion of Size 3 x 3 cm with Peripheral Calcification in the Distal Jejunal Loop Causing Obstruction with Dilatation of Proximal Small Bowel. B) Associated Air Pocket Noted in The Lumen of Gall Bladder

IV. Discussion

Out of the 50 patients, acute acalculous cholecystitis was found in 5 (10.0%) cases with the sex distribution of 1:4 (M: F).[6]All 5 cases had no demonstrable calculus, 4 cases had wall thickening, 4 cases had GB distension, 4 cases had pericholecystic fluid/edema, 4 cases had fat stranding and 2 cases had transient adjacent liver parenchymal enhancement. Kalliafas S et al stated that AAC is a rare, but potentially lethal, disease occurring in critically ill patients and those recovering from non-biliary tract operations.[7] The clinical presentation is nonspecific, and significant delays in diagnosis result in a high incidence of gangrene, perforation, abscess, and death. To improve outcome, a high index of suspicion with early radiographic evaluation, often employing multiple studies, is necessary.[8]

Of the 50 patients, 4 (8%) cases were diagnosed as Gangrenous cholecystitis with a sex distribution of 3:1 (M: F). Calculus was seen in 1 case and absent in 3 cases. Wall thickening was seen in 3 cases.[9] Grossly distended GB was seen 3 cases and pericholecystic fluid/edemawas seen in 4 cases. Pericholecystic fat stranding was seen in 4 cases. Transient adjacent hepatic parenchymal enhancement is seen in 2 cases, Irregular mucosal enhancement of the GBwall is seen in 4 cases, Intraluminal membranes was seen in 4 cases. Bennett GL et al stated that computed tomography findings most specific for acute gangrenous cholecystitis are gas in the wall or lumen, intraluminal membranes, irregular wall, and pericholecystic abscess. Gangrenous cholecystitis is associated with a lack of mural enhancement, pericholecystic fluid, and a greater degree of gallbladder distention and wall thickening.[10]Chang WC et al stated that markedly distended gallbladder associated with decreased wall enhancement is highly specific for gangrenous cholecystitis.Wu CH et al stated that computed tomography was found to accurately diagnose acute cholecystitis, with the presence of perfusion defect, pericholecystic stranding, or no-gallstone condition significantly correlated with that of gangrenous change.[11]

V. Conclusion

CT is the imaging modality of choice for diagnosis of acute cholecystitis and its associated complications in emergency department setting due to its wide availability. Cholelithiasis, gall bladder wall thickening, gall bladder distension, pericholecystic fluid/edema, pericholecystic fat stranding, transient increased enhancement of adjacent liver parenchyma are often associated with acute cholecystitis and these findings can be well established from CT.

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