Original Research Article

Systemic approach in diagnosis of Gall bladder mass by Ultrasonography and Computed tomography and its correlation with Fine needle aspiration cytology

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Abstract

Introduction: Carcinoma of gallbladder (GB) is the most common malignant tumor of the biliary tree. It is highly lethal, median survival being six months. Proper evaluation and development of a systemic approach in cross sectional noninvasive imaging play key role in early diagnosis of GB mass. Ultrasonography (USG) is the initial screening tool for suspected GB neoplasms. USG abdomen has certain limitations like interference by bowel gas, limited depth resolution and posterior acoustic shadowing in the presence of calculi. Computed Tomography (CT) scan overcomes these drawbacks. CT provides definitive information regarding locoregional spread, distant metastasis and involvement of the biliary tree and portal vein. **Aims and Objectives:** Role of USG and CECT in evaluation of gallbladder (GB) masses. **Materials and Methods:** This study was conducted in the Department of Radio diagnosis in coordination with the surgery and pathology at KIMS Bhubaneshwar. A total of 50 patients with suspected GB masses were included in our study. **Result:** Maximum no of patients (50%) were in the age group of 61-70 year and female to male ratio was 1.6:1. GBCA was diagnosed in 48 (96%) patients on USG whereas in 49 (98%) patients on CECT. Mass detection as heterogeneous echotexture mostly hypoechoic seen in 39 (78%) patients on USG and heterodense mostly hypodense on CECT in 41 (82%) patients. Mass filling the GB lumen complete or partial was detected in 38(76%) patients on USG and on CECT in 42(84%) patients. Focal wall thickening was detected in 21(42%) patients on USG and 30 (60%) patients on CECT. Diffuse wall thickening of Gall bladder seen in 5 (10%) patients in both USG and CECT. **Conclusion:** Carcinoma GB is most common in elderly females. GB calculus is an important risk factor for Gall bladder carcinoma. CECT abdomen is superior to USG in characterization of GB masses, dilated CBD, bilobar IHBRD, adjacent bowel invasion and loco regional lymphadenopathy. USG abdomen is better than CECT abdomen in detection of GB calculus and both have similar accuracy in detecting porcelain Gall bladder.

Key words: Gall bladder (GB), GB carcinoma (GBCA), Contrast enhanced CT (CECT), Ultrasonography (USG), Fine needle aspiration cytology (FNAC).

Introduction

Gallbladder Carcinoma (GBCA) is the most common malignant tumor of the biliary tree. It is highly lethal, median survival being six months[1, 2]. GBCA is more common in South American countries such as Chile and Ecuador, Asian countries such as India, Pakistan, and South Korea[3].

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However, various other factors have been linked to gallbladder cancer, including chronic calculus cholecystitis, congenital malformation in biliary tree, age, sex and carcinogen exposure[4, 5].It is more common in middle age group female and has associated to a number of risk factors that have been documented throughout the world[6].Most of patients present with vague symptoms such as right hypochondrium pain, vomiting, loss of appetite, weight loss, jaundice, and anorexia, so early diagnosis of gallbladder cancer is challenging. Symptomatic cholelithiasis or chronic cholecystitis cases are commonly confused with this appearance[7, 8].

USG abdomen has certain limitations - interference by bowel gas, limited depth resolution and posterior acoustic shadowing in the

presence of calculi. Computed Tomography (CT) scan overcomes these drawbacks. CT provides definitive information regarding locoregional spread, distant metastasis and involvement of the biliary tree and portal vein[9, 10].

Aims and objective

1. To evaluate the features of gallbladder mass with available techniques in USG and CECT abdomen.
2. FNAC correlation following radiological diagnosis.

Materials and methods

Prospective consecutive sampling of the patients with suspected GB pathology referred to the Department of Radio diagnosis for USG and CECT evaluation was included in the study over a period of 2 years from September 2019 – September 2021.

Examination instrumentation

USG examination of GB will be performed after an overnight fasting using GE VOLUSION S6 for GB wall thickness, irregularity, echotexture, mass lesions, locoregional lymphadenopathy, stones and pericholecystic fluid collection.

Contrast enhanced CT (CECT) of abdomen was performed using GE OPTIMA 64 SLICE, non-ionic contrast Iopromide (1.5ml/kg body weight (max dose: 150ml) I.V contrast media with pressure Injector at the rate of 5cc/sec using 18G IV catheter and images was taken in late arterial/portocaval phase at 35 sec and delayed phase at 90 sec.

Inclusion criteria

Patients who have undergone USG and CECT abdomen followed by FNAC examination for GB mass lesions.

Exclusion criteria

Patients who did not undergo all the three investigation (USG, CECT, FNAC).

Results

The current study was conducted in the Department of Radiology, KIMS Bhubaneswar in collaboration with the departments of Surgery and Pathology. A total of 50 patients were included in our study, most of them were presented with right upper quadrant pain, vomiting, anorexia, jaundice and weight loss.

Table 1:Age demographics

AGE	F	M
31-40	1	0
41-50	3	2
51-60	8	6
61-70	15	10
71-80	1	2
81-90	0	2

Table 2:Findings and modality

FINDINGS		MODALITY	
		USG	CECT
HETEROGENEOUS APPEARANCE		39(78%)	41(82%)
WALL THICKENING	FOCAL	21(42%)	30(60%)
	DIFFUSE	5(10%)	5(10%)
GB LUMEN FILLED WITH MASS		38(76%)	42(84%)
VASCULARITY		22(44%)	45(90%)
CALCULUS		26(52%)	24(48%)
PORCELAIN GALL BLADDER		1 (2%)	1(2%)
LYMPH NODES	PERIPORTAL	9(18%)	32(64%)
	PERIPANCREATIC	6(12%)	10(20%)
	RETROPERITONIAL	2(4%)	21(42%)
	MESENTERIC	1(2%)	14(28%)
INVASION	LIVER	36(72%)	36(72%)
	HEPATIC DUCT	5(10%)	12(24%)
	DUODENUM	3(6%)	10(20%)
	PYLORUS	0	1(2%)
	COLON	0	1(2%)
DILATED CBD		14(28%)	17(34%)
IHBRD		19(38%)	29(58%)

Spectrum of findings seen in both USG and CECT

Gender distribution

In our study Gallbladder mass was seen in 31females (62%) and 19 males (38%). The mean age of the presentation was 58.3 year in female and 64.6 year in male. Female to male ratio was 1.6:1.

Discussion

Gender distribution

In our study patients of GB mass were included in the range of 30-90 years (Table1). Maximum no of patients (50%) were in the age group of 61-70 year. Overall mean age of the patients presented with GB mass were 61.2 year. Out of 50 patients, 31 (62%) were female and 19 (38%) were male, resulting in a female to male ratio of 1.6:1. The average age of presentation for females was 58.3 years and for males it was 64.6 years. Olusola-Bello et al[11]. and Fong et al[12]. in their separate studies opined that most common age group of presentation of GB mass was primarily in the sixth to seventh decade of life, which is matching from our study sample. In one study by George et al[13]. the peak incidence age group of GBCA was 51-70 years which is also supporting the our study but according to this study, the female to male ratio was 5:2 which is not supporting our study, and the average age of presentation was 57 years for females and 52 years for males in his study.

Detection of mass lesions by both usg and cect

In this study (Table 2), GBCA was diagnosed in 48 (96%) patients on USG whereas in 49 (98%) patients, GBCA was diagnosed on CECT showing that CT is relatively more sensitive than USG to detect the GBCA. According to Weiner SN et al[14]. in their study has opined that GBCA was present in 60% patients on USG and 70% patients on CT. Which is significantly low than our study.

Patients showing heretogenous appearance of gb mass

Heterogeneous echotexture (Table 2) mostly hypoechoic seen in 39 (78%) patients on USG and hetero dense mostly hypo dense on CECT in 41 (82%) patients. In our study we found that CECT is more accurate than USG in detection of heterogeneous character. In a study done by Kushwah et al[15]. they found that heterogeneous echotexture seen in 35 (70%) patients on USG and hetero dense on CECT in 36(72%) patients which is quite low than our study.

GB masses filling the lumen (partial and complete)

In our study mass filling the GB lumen complete or partial (Table 2) was detected in 38(76%) patients on USG and on CECT in 42(84%) patients. 8% of cases were not detected by USG due to overlying bowel gas shadow which were detected on the CECT. It shows that CECT is more sensitive than USG to detect mass partially or completely filling the GB lumen in patients having excess bowel gas. In a study done by Kushwah et al[15]. it is stated that on USG 24 (48%) and 32 (64%) patients were detected on CECT which is quite low than our study.

Patients presenting with focal and diffuse wall thickening

Focal wall thickening (Table 2) was detected in 21(42%) patients on USG, whereas on CECT 30 (60%) patients were detected. Diffuse wall thickening of gall bladder seen in 5 (10%) patients in both USG and CECT. Focal wall thickening was defined as involvement of <50% of the gallbladder wall. Diffuse gallbladder wall thickening was defined as involvement of >50% of the GB wall. Kushwah et al[15]. in their study found focal wall thickening in 5(10%)on USG and 9(18%) on CECT whereas diffuse wall thickening in 4(8%) on USG and 7(14%) on CECT.

GB masses showing vascularity

On colour Doppler 22(44%) patients, were detected showing colour flow in gall bladder masses whereas on CECT 45 (90%) patients, were showing moderate enhancement. Therefore, in our study (Table 2) CECT is more sensitive than USG for detection of vascularity of gall bladder masses. Hirooka et al[16]. in there study found that the colour signal pattern was diffuse or arborizing (sensitivity 90.5% (19/21); specificity 62.5% (10/16)) and the velocity and RI were 39.0 ± 12.4 cm/s and 0.62 ± 0.12, respectively in GB masses on color doppler study.

GB masses associated with calculus

Calculi (Table 2) were detected in 26(52%) patients on USG and 24 (48%) patients on CECT in our study, showing that USG is more sensitive than CT to detect calculus as some of the calculi appear hypodense or isodense on CECT because of cholesterol content of calculus. Lowenfels et al[17]. in their study of more than 1600 patients with GB disease reported that 40% of patients with GB carcinoma had stones that were >3 cm.

Patients associated with adjacent organ invasion

In this study, in 36 (72%) patients liver invasion (Table 2) was detected on both USG and CECT. Hepatic duct invasion was detected in 5 (10%) patients on USG and in 12 (24%) patients on CECT. Duodenal invasion was detected in 3, (6%) patients on USG and in 10 (20%) patients on CECT. Invasion of pylorus and colon were detected in 2% of cases only on CECT showing that CECT is better to detect adjacent organ invasion than USG. Lower rate of detection of adjacent organ invasion by USG is due to the presence of bowel gas and also due to different body habitus.Dr. Ashok k Mandal et al[18]. in their study they found that around 28 patients (56%) out of 50 cases was infiltrating mass type and most of the lesion were invading segment 5 in 14 cases and segment 4 in 5 cases.

Patients associated with lymph node involvement

Hilar or periportal lymph nodes (Table 2) were detected on USG in 9(18%) patients and on CECT 32 (64%) patients. Peripancreatic lymph nodes were detected in about 6(12%) patients on USG and on CECT were 10(20%) patients. Retroperitoneal lymph nodes in 2(4%) patients were detected on USG while on CECT 21(42%) patients. In 1(2%) patient of mesenteric lymph node was detected on USG, while on CECT 14(28%) patients. It shows that CECT is more sensitive than USG for detection of distant lymphatic spread due to poor penetration in deeper structure and bowel gas shadow.

Manoj Pandey et al[19]. in their study on CT, the node groups most often involved were the periportal 51(58%) followed retroperitoneal 18(20%).

GB masses associated with dilated CBD

In this study, dilated CBD (Table 2) as an associated feature of gallbladder mass, were detected in 14(28%) cases on USG and 17(34%) cases on CECT, showing that CECT is more sensitive than USG to detect dilated CBD due to the presence of excess bowel gas shadow and high grade fatty infiltration of liver parenchyma in USG.

GB masses associated with dilated IHBR

In terms of IHBRD (Table 2) associated with gallbladder mass, 19 (38%) patients were detected on USG and 29 (58%) patients were detected on CECT , showing that CT is more sensitive than USG in detection of dilated IHBR associated with gallbladder masses. Jindal G et al[20]. in their study IHBRD detected on CT was 63% .

Patients associated with porcelain GB

USG and CT both were equally sensitive (1patient, about 2%) to detect the porcelain GB in our study (Table 2).Stephen AE et al[21]. in their study opine that out of 150 patients of CAGB 17 patients of porcelain GB was found.

Conclusion

Carcinoma GB is most common in elderly females with mean age of presentation is 61.2 years, with higher female to male ratio (1.6:1).

CECT abdomen is superior to USG in detection of GB masses, dilated CBD, bilobar IHBRD, adjacent bowel invasion and loco regional lymphadenopathy (periportal, peri- pancreatic and retroperitoneal) as bowel gasses may obscure the field of view in USG and it is not operator dependent.

CECT abdomen is superior to USG in detection of focal GB wall thickening; however both have similar efficacy in detection of diffuse wall thickening.

USG abdomen is better than CECT abdomen in detection of GB calculus and both have similar accuracy in detecting porcelain Gall bladder.

GB calculus is an important risk factor for Gall bladder carcinoma.

Heterogeneous character of GB mass is better appreciated in CECT abdomen than USG abdomen so that the lesion characterization is better in CECT which helps in the evaluation of response to chemotherapy.

CECT is less time consuming, however it is more costly and is less easily available than USG.

USG is better for screening, follow up after surgery and chemotherapy where as CECT is preferred for accurate diagnosis, adjacent organ invasion, lymphadenopathy and distant metastasis.

Patient 1

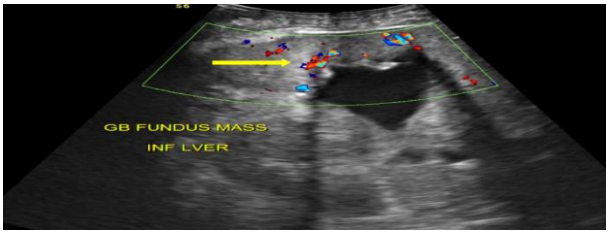

Fig. 1A USG image showing large hetero echoic mass lesion (yellow arrow) in GB fossa with increased vascularity on color Doppler study.

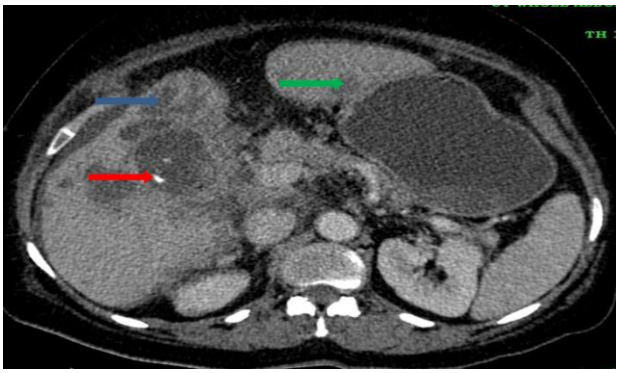

Fig. 1B CECT axial image showing non enhancing heterogeneous mass lesion in the GB fossa invading into the adjacent liver parenchyma (blue arrow), hyper dense calculous (red arrow) and hypo dense non enhancing rounded metastatic lesion in left lobe (segment-III) of liver (green arrow).

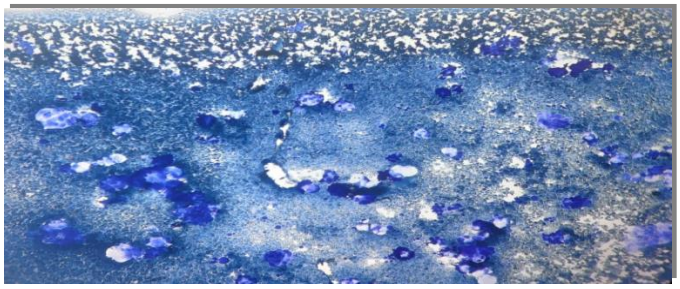

Fig. 1C Moderately cellular smear shows clusters of malignant epithelial cells with occasional acinar pattern.

Patient 2

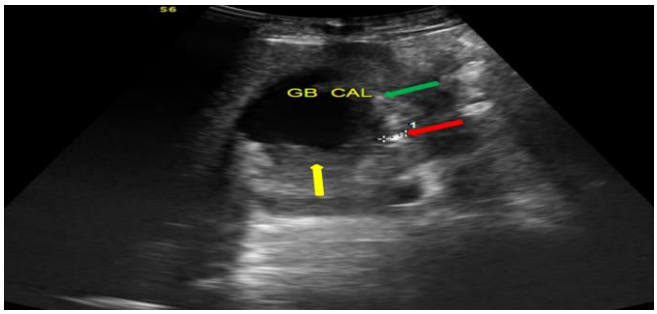

Fig. 2A USG image showing heterogeneous predominantly hyperechoic lesion in fundic region invading into the adjacent liver parenchyma (green arrow), impacted calculous (red arrow) and GB sludge (yellow arrow).

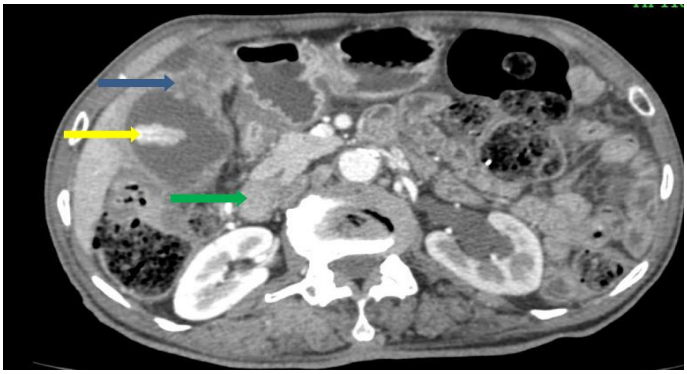

Fig. 2B CECT axial image of the same patient showing heterogeneous enhancing fundic lesion invading into the adjacent liver parenchyma and pylorus of the stomach (blue arrow), large calculus in GB lumen (yellow arrow) and enhancing enlarged right para-caval lymph node (green arrow).

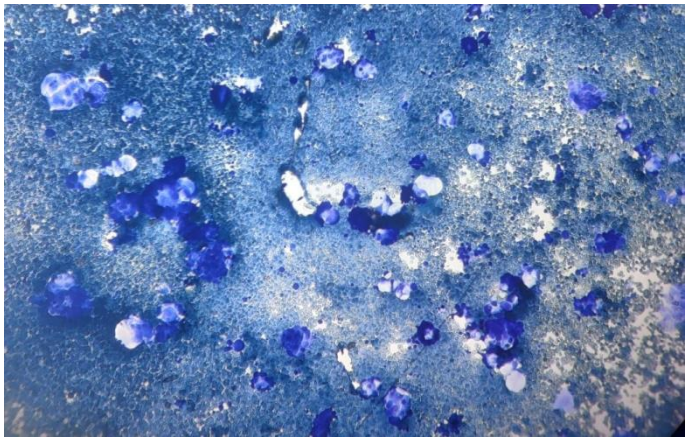

Fig. 2C Epithelial cells have moderate degree of nuclear pleomorphism, high nuclear cytoplasmic ratio, hyperchromatic nuclei with prominent nucleoli on a background of RBCs.

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