Section: Radiodiagnosis

Original Research Article

CARCINOMA GALL BLADDER: MDCT IMAGING PROSPECTIVE IN DIAGNOSIS AND STAGING

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ABSTRACT

Background: Gall bladder carcinoma is a relatively rare among the gastrointestinal malignancies, however it is the commonest of the biliary tree malignancies. The presentation and findings are nonspecific at the early stages and lead to delay in diagnosis which in turn culminate in incurable stage of disease at most of the times at final diagnosis. Chronic cholecystitis and xanthogranulomatous cholecystitis are the most common mimics and these two by their shear common incidences present difficulty in diagnosing Ca GB. The objective of this retrospective study is to highlight the importance of morphological patterns of contrast enhancement CT scan in the histopathologically proven cases of carcinoma gall bladder. Review its role in diagnosis, staging and asses for surgical resectability.

Materials and Methods: Retrospective study of MDCT scans of 50 subjects of histopathologically proven cases of carcinoma gallbladder. All the subjects underwent dynamic contrast helical CT scans of the abdomen according to standard protocol. Before and after administration of dilute oral and intravenous iodinated contrast agents. Findings were assessed for tumor type, enhancement and staging.

Results: Three CT morphological patterns were recognized viz., focal or diffuse wall thickening, polypoidal mass and mass replacing the gall bladder in the GB fossa. Infiltration to the liver and adjacent structures was most reliable indicator of the malignancy. Locoregional spread, lymph nodal involvement and distant metastasis was well delineated compared to ultrasonography.

Conclusion: MDCT scan is most effective investigation in recognizing the morphological patterns, diagnosis, spread of the disease and TNM staging of carcinoma gall bladder.

Keywords: Gall bladder carcinoma, Computed Tomography, Staging

INTRODUCTION

Carcinoma gallbladder (GB) is fifth most common carcinoma of the gastro intestinal tract after colorectal, pancreatic, gastric and oesophageal carcinoma and commonest malignancy of the biliary tree. [1-2] It is common with advancing age and more than 90 % of patients are aged above 50 years (yrs) & frequently seen in women than in men.[2] The youngest case reported in the literature was a 22 yrs old male.[3] It is more prevalent in South America, Pakistan, Northern and north-eastern India.

The carcinoma gallbladder is lethal because of its biology. It is locally invasive and early aggressively metastatic malignancy. The risk factors for carcinoma GB are gall stones (65-90%), chronic cholecystitis (40-50%), porcelain gall bladder (22%).[4] Early clinical diagnosis is difficult due to nonspecific symptoms of the upper gastrointestinal tract, such as right hypochondriac pain, nausea, vomiting, anorexia, weight loss, and jaundice. Ultrasonography and Computed Tomography (CT) scan are important tools in diagnosis and management. The ultrasound has limitations in early diagnosis of carcinoma GB due to poor delineation of the pathology caused by acoustic shadowing of calculus or bowel gas. The CT scan overcomes these limitations and is the modality of choice in diagnosis and staging. Most tumors are inoperable at the time

of diagnosis with an average survival rate of 6 months after the development of first symptoms due to disease. Long term benefits with treatment are noted in incidentally diagnosed Carcinoma GB in post cholecystectomy patients operated for gall stones.[5]

MATERIAL AND METHODS

This is a retrospective study performed in the department of Radiodiagnosis, VIMS&RC. 50 patients with histopathologically proven gallbladder malignancies were identified and the corresponding Contrast enhanced Computed Tomography (CECT) abdomen images retrieved from the hospital PACS. CT was obtained using 128 slice Siemens Somatom Sensation scanner. The CT protocol included helical sections in the axial plane of 5 mm/sec (pitch1.0, kV120 and mA 280) with breath-hold of 10-15 sec. Preliminary non contrast study was done followed by injection of 100 ml of 300 mg I /ml intravenously using pressure injector at a rate of 3.5 ml/sec with arterial phase, Porto-venous phase and delayed scan at 30 sec, 60 sec and 3 min delay respectively. Oral contrast of 800 ml was given 45 min before the scan with 200 ml on table just prior to the scan.

Statistical analysis:

Data was entered into Microsoft Excel sheet and analyzed using SPSS22 version software. Categorical data was presented in the form of frequencies and proportions. Continuous data was represented as mean and standard deviation. A Chi-square test was used as a test of significance for qualitative data. P-value (the probability that the result is true) of <0.05 was considered statistically significant.

RESULTS

Of the 50 patients included in our study, 35 were female and 15 were male, with a female preponderance and a female to male ratio of 7:3. Age of the patients ranged between 30-76 yrs with the mean age of 56.28±9.11yrs. (Table1 and Table 2).

Three morphological patterns of the pathology were recognized on CT. Focal or diffuse gall bladder wall thickening, polypoidal lesion and mass in the GB fossa. (Table 3 and 4)

Of the total 50 subjects, 25 (50%) cases were having a polypoidal lesions within GB, 15(30%) cases were of diffuse/focal thickening of the GB and 10 (20%) had a mass in the gallbladder fossa. Among the mass forming type of presentation, 80% of the mass was seen within the gall bladder and the mass replacement of gall bladder was found in 10 (20%) with complications. These finding has a significant association with T staging.

The morphological pattern of polypoidal thickening accounting for 4 (8%) cases in T2 stage and 12 (24%) were in stage T3. Diffuse wall thickening showed predominately in stage T3 (5 cases) and T4b stage (8 cases). The mass forming was promotingly in stage T4b (6 cases).

The liver was involved in 29 cases (58%) with isolated liver infiltration in 24 (48%) cases, liver with intrahepatic biliary radicles dilatation and involvement of CHD & CBD 21 (42%) cases.

liver and antrum of the stomach in one (2%) case, liver and D1, D2 segment of the duodenum in four (8%) cases and liver with hepatic flexure of transverse colon in 2(4%) cases. Additional invasion of the hepatic artery, liver hilum was noted in one case each.

The lymph nodal involvement was noted in 86% of the cases. 7 (14%) cases showed N0 with no locoregional lymph nodes, 22 (44%) cases in the N1 stage involving peri-duodenal and celiac axis nodes, 16 (32%) case in the N2 stage involving retroperitoneal lymph nodes.

Involvement of the biliary ductal system causing obstructive jaundice and intrahepatic biliary radicle dilatation was noted in 21 (42%) cases. The obstruction was predominantly noted at the hilum. Cholelithiasis was associated in 16 (32%) cases and one case was porcelain gall bladder. Local and distant spread and its associated complications were observed viz., ascites and liver metastasis 3 (6%) cases of ascites with omental caking 2%(1) case, ascites with pleural effusions 2% (1) case, peritoneal deposits in 3 (6%) cases. Synchronous Klatskin was noted in 3(6%) cases and Synchronous carcinoma rectum was noted in 2% (1) case. Portal vein and hepatic vein invasion were noted in one case each.

TNM staging was assigned to the CT findings. [6] T1 lesion when the tumor involves mucosa and submucosa, T2 when the tumor involves peri muscular connective tissue, T3 when the mass extends beyond serosa and less than 2 cm of the liver and T4 when the tumor invades beyond 2 cm of liver. The N1 nodes were pericholecystic and periportal nodes. N2 nodes are peripancreatic, para-aortic and superior mesenteric lymph nodes.

In the present study, 28% of subjects were in T2 stage, 62% were in the T3 stage and 10% were in the T4 stage. 14% were in the No stage, 54% were in the N1 stage and 32% were in the N2 stage.30% were in the M1 stage and 70% were in the Mx stage. (Table 4, Table 5)

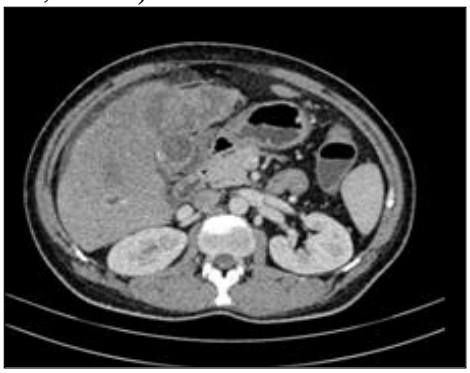


Figure 1: Diffuse thickening of the gall bladder wall infiltrating into liver in a case of porcelain gall bladder

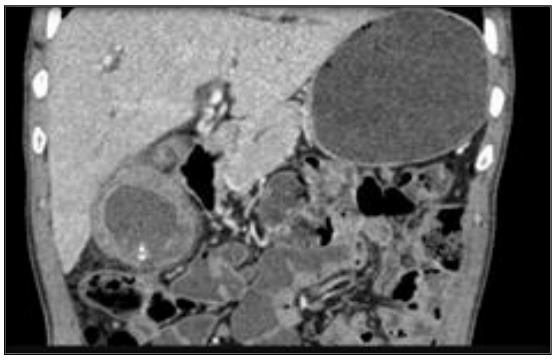


Figure 2: Diffuse gall bladder wall thickening with Cholelithiasis

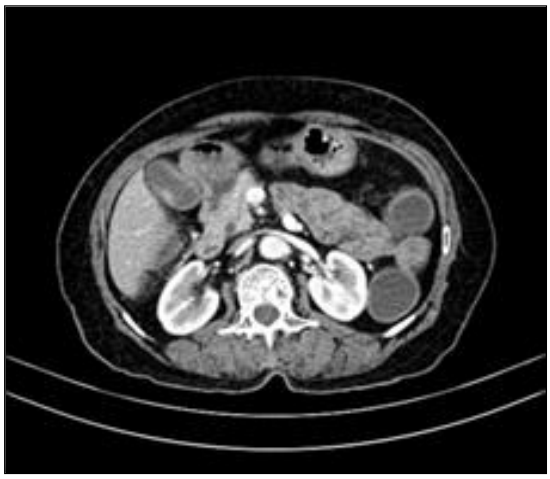


Figure 3: Focal asymmetrical thickening of gall bladder wall in the body

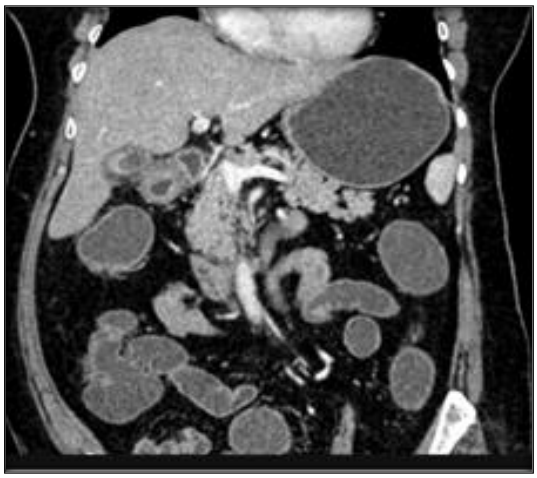


Figure 4: Polypoidal thickening of gall bladder wall in the fundus

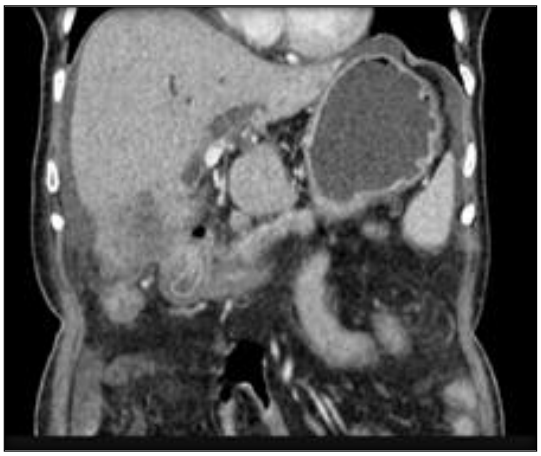
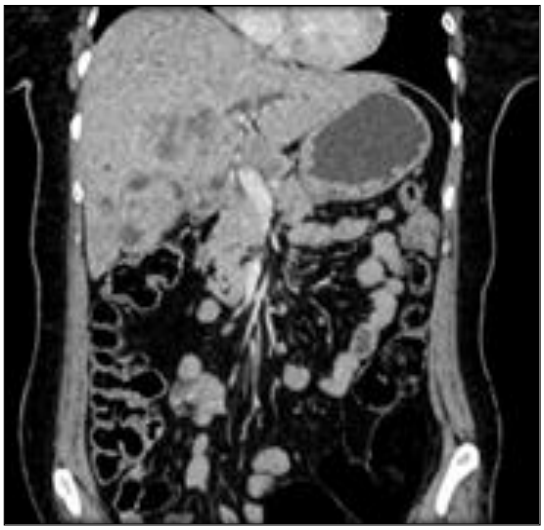


Figure 5: Mass replacing GB fossa, infiltrating liver with indistinct fat planes pyloric region of stomach and hepatic flexure



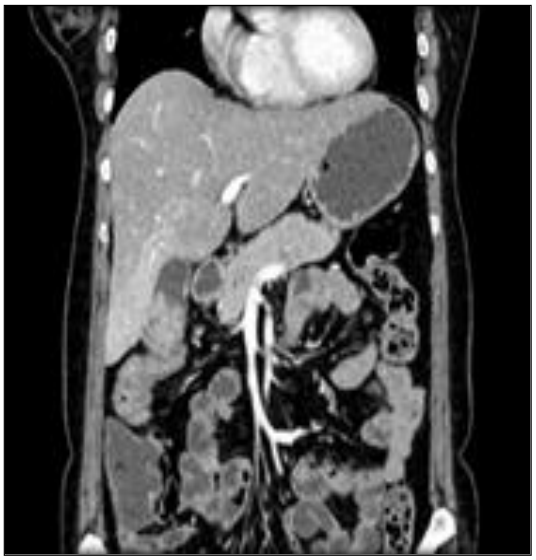


Figure 6: Polypoidal endophytic growth along the body and fundus of GB

Table 1: Mean age of study participants

Number	Minimum	Maximum	Mean	Std. Deviation
50	30	76	56.28	9.116

Table 2: Gender wise distribution of cases across age group

	Female	Male	Total
<30	0	1	1
31-40	1	1	2
41-50	6	2	8
51-60	15	5	20
61-70	11	6	17
>71	2	0	2
	35	15	50

Table 3: Mass and its position in relation to gall bladder

	Number	Percent
Mass Replacing gall bladder	10	20%
Mass not Replacing gall bladder	40	80%
	50	100

Table 4: Distribution of cases as per morphological pattern Carcinoma Gall bladder

Morphology	Frequency	Percentage
Polypoidal	25	50.0
Diffuse	15	30.0
Mass	10	20.0
Total	50	100.0

Table 5: Distribution of cases as per TNM staging

TNM Staging	Frequency	Percentage
2a	4	8.0
2b	2	4.0
3a	1	2.0
3b	20	40.0
4b	23	46.0
Total	50	100.0

Table 6: Distribution of cases as per TNM staging versus Morphological pattern

	Diffuse	Mass	Polypoidal	Total
2a	1	0	3	4
2b	1	0	1	2
3a	0	1	0	1
3b	5	3	12	20
4b	8	6	9	23
	15	10	25	50

DISCUSSION

In our study female: male ratio was 7:3, with a female preponderance. The age of the patients ranged between 30-76 yrs with the mean age of female patients were in the group of 51-60yrs (42.9%) and male subjects were in the group of 61-70yrs (40) %). similar experience was reported by Kumar et al. [7]

The cause of gall bladder carcinoma is unknown. However various associated risk factors are identified. The commonest association is gall stones.[2] It has been reported in 65 to 95 %cases of Carcinoma GB in various studies. 16 (32%) cases of cholelithiasis was reported in our study. The other risk factors are porcelain gall bladder one case (2%) was noted in our study. Chronic infections, genetic factors, anatomical variations of GB, and ductal system, and exposure to carcinogens. [2,8] According to a hypothesis, chronic inflammation caused due to recurrent irritation by gall stones leads to repetitive epithelial changes and malignant transformation. The process progression may take up to 15 years.[8]

The diagnosis of carcinoma is challenging, as it mimics more common conditions of acute or chronic inflammatory wall thickening of the gall bladder. Application of ultrasonography and CT scan have improved the diagnostic capability. Three morphological patterns are noted on CT scan viz., polypoidal lesion, diffuse/focal mural thickening, and mass at the GB fossa replacing gall bladder. Later infiltration to the adjacent seg IVb and V of the liver and distant metastatic spread. The mass replacing gall bladder (partial/complete non-visualization of GB) is most common among three patterns at the time of presentation.[6] According to an autopsy study the majority of the carcinomas of the gall bladder are diffusely infiltrating (68%) and the remaining 32 % of the cases were intraluminal polypoid growths. Histologically 90% of the Carcinoma gall bladder are adenocarcinomas.[8]

The propensity to infiltrate adjacent liver in segment IVb and V is due to anatomical characteristics of the GB wall having narrow lamina propria and a single muscle layer.[6] The infiltration of the liver is the most important indicator of the neoplastic nature of the disease.[10] In our study (29) 58% of the cases were noted infiltrating the liver.

Approximately 20 to 25 % of carcinomas are seen as intraluminal polypoidal lesions.[10-11] The size of

the polypoidal mass is also reported to be in close relation with tumor spread. The polypoidal mass of more than 1 cm (diameter) is more likely to be malignant whereas tumors less than 1 cm are more often benign and are commonly cholesterol polyps.[12] There were 25 (50%) cases of polypoidal mass in our study. These polypoidal masses showed homogenous post-contrast enhancement with no obvious necrosis or calcification.

However, Diffuse and focal wall thickening of the gall bladder was noted in 15 (30%) cases. predominately involving the fundus and body. The diffuse wall thickening exhibited homogenous enhancement on post-contrast study (Figure 2). The focal thickening or mass is the least common presentation of the gall bladder carcinoma. [2,10,11] Thickening of the GB wall can be seen in various conditions like chronic cholecystitis, xanthogranulomatous cholecystitis, adenomyomatosis, partial distension of GB, decompensated Chronic liver disease with ascites, acute hepatitis.[4,11] Asymmetric, nodular, brightly enhancing walls are more indicative of malignancy. Smooth iso-attenuating inner wall is more indicative of chronic cholecystitis.[13] The mural edema seen as the hypodense halo is a useful sign for cholecystitis than carcinoma.[2]

The differential diagnosis for an intraluminal polypoidal mass is adenomyomatosis, hyperplastic and cholesterol polys, carcinoids, metastatic melanoma, and hematoma within the gall bladder. Hepatocellular carcinoma, cholangiocarcinoma invading the gall bladder, metastatic disease of the GB fossa may mimic the mass replacing GB fossa.[4]

There is a need for accurate pre-operative diagnosis and staging for GB carcinoma for effective management. The ultrasound has limitations in localizing the extent of the mass lesion and lymph nodal staging. This is because of cholelithiasis and mural calcifications causing obscuration of the GB wall due to posterior acoustic shadowing.[4] The diagnostic accuracy, staging and the resectability of the tumor are determined in various studies. In a study by Yoshimitsu et al,[14] they found overall 71% accuracy in tumor staging for the local extent of the tumor in 100 cases. The accuracy varied from 79% for both T1 and T2, 46 % for T3 and 73% for T4. The accuracy was lowest (54%) for thickened GB wall and highest for GB mass (89%). In another study by Kim BS et al, in 100 cases of surgically proven carcinoma gall bladder found overall accuracy for carcinoma GB was 71 %, 79% for T1 and T2 tumors, and 73% for T4 tumors.[15]

With the advent of mutidetector row CT, limitations of conventional CT scans have been overcome. The role of CT scan in assessing the tumor extent and staging has improved. 93 % accuracy was reported in predicting non resectability using set criteria in a study by Kumaran et al.[16]

Ohtani et al,[17] in a study of 59 cases, found that the sensitivity of CT scan in detecting N1 and N2 nodes was 36% and 47%. The sensitivity to spread directly to the liver of <2 cm (65%) and >2cm, (100%) the extrahepatic bile duct (50%), gastrointestinal tract or pancreas (57%) respectively while positive predictive value (PPV) were 77, 100,90 and 100% respectively. The sensitivity in the detection of liver metastasis and involvement of inter aorto-caval nodes was 75% and 21%. They concluded that CT imaging has low to moderate sensitivity however, it can help in determining resectability and in treatment planning especially in the advanced stage of gall bladder carcinoma because of a high PPV.

CONCLUSION

This study observed the prevalent epidemiological pattern of the disease in terms of gender distribution, mean age at the time of diagnosis, associated risk factors, and presence of synchronous tumors. The corresponding changes in the morphological patterns from wall thickening to focal mass, and mass replacing the gall bladder in the GB fossa was observed. The commonest infiltration was to the adjacent liver. Spread of the disease also involved adjacent structures like duodenum, transverse colon, portal vein, hepatic artery, and distant metastasis. The contrast-enhanced dual phase CT scan was effective in identifying the lesion and helping for resectability criteria of the tumor and TNM staging.

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