Original Research Article

Gallbladder malignancy an old soul revisited-ultrasonography and contrast enhanced computed tomography evaluation in tertiary care center in South West Bihar

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ABSTRACT

Background: Gallbladder (GB) malignancy is the commonest biliary tract carcinoma. It ranks fifth among the malignancies of the gastrointestinal tract and in all encompasses about 1-3% of all malignancies. Its peak occurrence is in the 5th decade or older with a female predilection. The most cases of GB malignancy are seen along the Ganga river delta region in India. The median survival rate in GB malignancy is approximately 6 months.
Methods: A cross-sectional observational study was conducted in the Department of Radiology, Narayan Medical College and Hospital Sasaram over a period of 12 months from August 2022 to September 2023. A total of 40 patients were included on the basis of signs and symptoms of gallbladder carcinoma and underwent USG and CT scan for preoperative radiological diagnosis, following operation all the resected specimens were sent for histopathological evaluation. The diagnostic accuracies of USG and CT scan were then compared against histopathological diagnosis by using Kappa statistics.
Results: In the present study, the mean age of the patients was 60 (range: 40-80 years) with female preponderance. About 40% of the gall-bladder were contracted and reduced in size and 35% large and distended on USG examination, while 45% of the gall-bladder were contracted and reduced in size and 37.5% distended and large on CT examination. Approximately 37.5% had irregularly thickened wall and 25% diffusely thickened wall on USG and 25% of gallbladder wall were diffusely thickened and 45% irregularly thickened on CT scan. The present study showed hepatic parenchymal invasion to be 25% on USG and 37.5% on CT scan. The sensitivity and specificity of USG in diagnosing GB carcinoma were 94.2% and 71.4% respectively. Similarly, the sensitivity and specificity of CT scan in detecting GB carcinoma were 97.1% and 83.3% respectively. The test of agreement (Kappa test) revealed an almost 90% agreement between the two procedures meaning that the two diagnostic modalities are almost comparable in diagnosing gall bladder carcinoma.
Conclusions: As the histopathological diagnosis of the present study correlated well with USG and CT scan findings in the diagnosis of gallbladder carcinoma; it can be concluded that both USG and CT scan are useful imaging modalities for diagnosing this disease. However, CT scan is more sensitive and specific in predicting gall bladder carcinoma as compared to USG.

Keywords: Ultrasound, Accuracy, Gallbladder carcinoma, Histopathological

INTRODUCTION

Gallbladder (GB) malignancy is the commonest biliary tract carcinoma. It ranks fifth among the malignancies of the gastrointestinal tract and in all encompasses about 1-3% of all malignancies. Its peak occurrence is in the 5th decade or older with a female predilection of 3-4:1 Gallbladder malignancy, although rare in Caucasian

population, is among the most frequently observed malignancy in the population of Indian subcontinent. The most cases of GB malignancy are seen along the Ganga river delta region in India.[1] The median survival rate in GB malignancy is approximately 6 months, indicating that the most of patients present to hospitals with advanced stage of disease with local spread and metastasis.[2]

The etiology of carcinoma of the gallbladder remains unknown and the incidence varies greatly in different areas of the world. The patients may be asymptomatic or may present with symptoms and signs (upper quadrant pain, jaundice and weight loss with nausea, vomiting, loss of appetite, fatty food- intolerance, dark urine etc.) mimicking cholecystitis or cholelithiasis.[3] Trans abdominal sonography and CT have been found to be useful in suggesting the preoperative diagnosis of carcinoma gallbladder.

Abdominal ultrasound is the examination of choice in the diagnosis of gallbladder and biliary duct lesion, but several diagnostic problems may arise in the differentiation from the polyps and acute inflammatory disease. CT scan better demonstrates gastrointestinal tract invasion and lymphadenopathy which can be a valuable finding for staging and treatment planning. Although the overall prognosis for this tumor remains poor, ultrasonogram may facilitate early treatment of curable carcinomas by the fortuitous detection of tumor in patients who are asymptomatic and who have symptoms attributable to coexistent stones. The typical CT scan findings of gallbladder carcinoma include three patterns- a mass replacing the gallbladder fossa, intraluminal mass and gallbladder wall thickening. The mass replacing the gallbladder fossa is the most common appearance. CT scan can differentiate between complicated cholecystitis and advanced gallbladder carcinoma by few specific findings.[4]

Ultrasonography and CT scan are two important diagnostic tools available in our country to evaluate the hepatobiliary system. By utilization of these advanced imaging modalities, carcinoma gallbladder can be detected early when these tumors are still localized. Thus, survival time of the patients can be increased by early removal of tumors.

METHODS

This cross-sectional observational study was conducted in the Department of Radiology Narayan Medical College and Hospital Sasaram over a period of 12 months from August 2022 to September 2023. A complete history was taken, and detailed clinical examination was performed in all cases. Routine laboratory investigations like hemoglobin, total leucocyte count, differential leucocyte count were carried out in all patients. Biochemical investigations relevant to the diagnosis of GB carcinoma, such as liver function tests, were done. Ultrasonography of abdomen was performed using Phillips Affinity 70 in 40 cases with signs and symptom of gallbladder carcinoma

(such as upper abdominal pain, jaundice, itching, weight loss and upper abdominal mass) referred from Department of Surgery and Department of Medicine. CECT abdomen was then performed using 1.5 mm section thickness, 16 slice CT scanner (Siemens, Sommatom emotion) in some cases.

Patients fasted for at least 6-8 hours before USG examination was performed and findings were duly recorded. For CECT abdomen, patients fasted for at least 6-8 hours before the examination. CT examinations were performed using oral and I/V contrast agents. Test dose of non- ionic contrast was given to lower the risk of adverse contrast reactions.

Multiplanar coronal and sagittal sections were taken. Thin Axial CT sections and multiplanar reconstructed sections at intervals of 1.5 mm were studied in detail. Findings such as mass replacing GB, intraluminal polypoid lesions, focal or diffuse asymmetric wall thickening of the gallbladder, associated GB calculi and lesions in the hepatic area, any lymphadenopathy or associated lesions were noted. Based on detailed CT findings, the staging of the GB carcinoma was established. The data was entered in Microsoft excel sheet and was analysed using appropriate SPSS software (Trial version-21). Descriptive statics of patients like demographic details, CT scan and Ultrasonography findings were mentioned in number and percentage. The findings were then correlated with histopathology report.

RESULTS

The present study was conducted in the Department of Radiodiagnosis Narayan Medical College and hospital, among 40 patients suspected of having gallbladder malignancy. Out of 40 patients, 15 (37.5%) were males and 25(62.5%) were females (Table 1 and Figure 1). The mean age of the study subjects was 60.1 years. Maximum subjects were in the age groups of 51-60 years (37.5 %) followed by 61-70 years (27.5%) (Table 2 and Figure 2). In the present study, upper abdominal pain and jaundice was reported among all the subjects, while weight loss was found in 95% (38) of the subjects (Table 3).

Assessment of hepato-biliary system at USG and CT scan (Table 4)

Ultrasonographic evaluation shows that about 40% of the gall-bladder were contracted and reduced in size and 35% large and distended. Approximately 37.5% had irregularly thickened wall and 25% diffusely thickened wall. The direct invasion of hepatic parenchyma was observed in 25% of cases and metastases in 17.5% cases. Enlarged lymph nodes were found in few cases. CT examination revealed 45% of the gall-bladder to be contracted and reduced in size and 27.5% distended and large. 25% of gallbladder wall were diffusely thickened and 45% irregularly thickened. Direct invasion of hepatic parenchyma was observed in 37.5% and metastasis in 22.5%. Over half (55%) of the biliary tree was found

dilated by both USG and CT scan. Gall stone was detected in 62.5% of the cases on USG and in 50% of the cases on CT examination. CT scan detected lymph node enlargement in 37.5% of the cases and the common site of enlarged lymph nodes were the porta hepatic, peripancreatic, superior pancreaticoduodenal nodes and coeliac axis region nodes.

Table 1: Gender distribution among the study subjects.

Gender	Frequency	Percentage
Male	15	37.5
Female	25	62.5
Total	40	100

Table 2: Age distribution among study subjects.

Age (year)	Frequency	Percentage
41-50	10	25
51-60	15	37.5
61-70	11	27.5
>70	4	10

Table 3: Frequency of clinical features among the study subjects.

Clinical feautures	Frequency	Percentage
Upper abdominal pain	40	10
Nausea/vomiting	20	50
Jaundice	40	100
Weight loss	38	95

Note: *- Total will not correspond to 40 because of multiple responses.

Table 4: Comparative findings of gall-bladder at USG and CT scan (N=40).

Radiological findings of GB	USG N (%)	CECT N (%)
GB size		
Normal	10 (25)	11 (27.5)
Contracted	16 (40)	18 (45)
Distended	14 (35)	11 (27.5)
GB wall thickness		
Normal	15 (37.5)	10 (25)
Circumferentially thickened	10 (25)	10 (25)
Irregularly thickened	15 (37.5)	18 (45)
Mass filling the lumen	20 (50)	22 (55)
IHBR dilatation	22 (55)	22 (55)
Other findings		
Direct invasion	10 (25)	15 (37.5)
Metastasis	7 (17.5)	9 (22.5)
Gall stones	25 (62.5)	18 (45)
Lymph nodes	5 (12.5)	15 (37.5)

Accuracy of USG and CT scan in the diagnosis of carcinoma gall-bladder

Table 5 shows the accuracy of abdominal USG in diagnosing carcinoma gallbladder.

The sensitivity of USG in differentiating GB carcinoma from inflammatory lesion was 33/35 (100=94.2%), while the specificity of the test incorrectly differentiating those who did not have the disease was 5/7 (100=71.4%). The positive and negative predictive values of the test were 94.2% and 71.4% respectively.

The diagnostic accuracy of USG was 95%.

Table 5: Accuracy of abdominal USG in diagnosing carcinoma gall-bladder (N=40).

USG	Histo-pathological diagnosis	
	Carcinoma	Inflammatory lesions
Carcinoma	33	2
Inflammatory lesions	2	5

Similarly, Table 6 shows the sensitivity of CT in differentiating GB carcinoma from inflammatory lesion was 34/35 (100=97.1%), while the specificity of the test in correctly differentiating those who did not have the disease was 5/6 (100=83.3%).

The positive and negative predictive values of the test were 97.1% and 83.3% respectively.

The diagnostic accuracy of CT was 97.5% in the present study. The Kappa test revealed an excellent agreement (88%) between the two procedures suggesting that the two diagnostic modalities are almost comparable in diagnosing gall bladder carcinoma (p<0.001) (Table 7).

Table 6: Accuracy of abdominal CECT in diagnosing carcinoma gall-bladder (N=40).

USG	Histo-pathological diagnosis	
	Carcinoma	Inflammatory lesions
Carcinoma	34	1
Inflammatory lesions	1	5

Table 7: Strength of agreement between USG and CECT scan in detecting Gall bladder carcinoma.

Disease studied	Diagnostic modalities	K value	Strength of agreement
Gall bladder carcinoma	USG CECT	0.88	Excellent

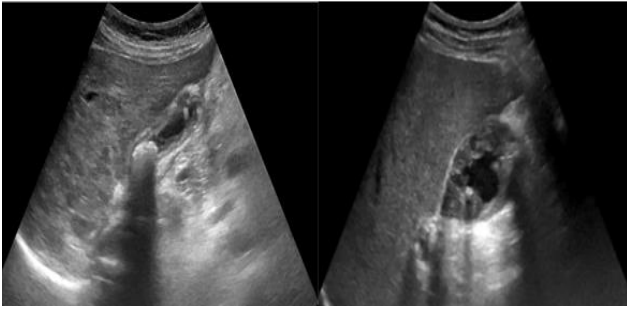**Figure 1: Diffuse circumferential thickening of GB wall with a calculus.**

Figure 2: Distended gallbladder with irregular thickening of GB wall.
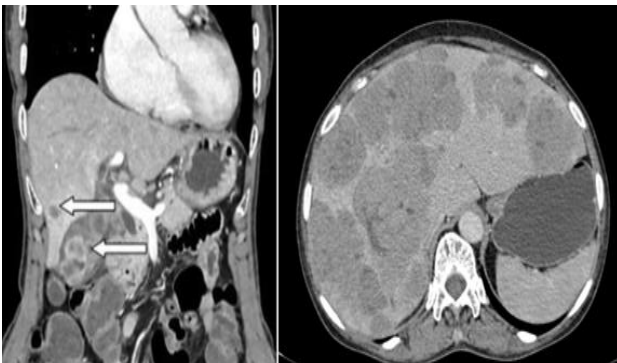

Figure 3: Mass replacing gallbladder with hepatic metastasis.

DISCUSSION

At one time gallbladder carcinoma was regarded as an uncommon disease. However, reports within the last few decades showed that it is not as rare as was previously supposed. Rather it is the most common malignant tumor of the biliary tract. But early diagnosis of carcinoma gallbladder is difficult as there are no specific signs and symptoms.

Recent improvement in the hepatobiliary imaging techniques has been increasingly promising with respect to accurate preoperative diagnosis and assessment of the extent of gallbladder carcinoma. As the clinical presentation is confusing, these modern imaging modalities can play an important role in the diagnosis of the disease. However, the imaging appearance of gallbladder carcinoma in USG and in CT scan and their sensitivity, specificity and accuracy in the correct diagnosis are not yet evaluated in our country.[5]

In the present study, the mean age of the patients was 60 years, Similarly, Yeh et al reported similar mean age of patients with carcinoma of gallbladder (62.3 years respectively). In terms of sex distribution of gallbladder carcinoma, a female preponderance was observed in our series, which compares well with the findings of Paraskevopulos et al, and Yeh et al.[6, 16]

About 40% of the gall-bladder were contracted and reduced in size and 35% large and distended on USG examination, while 45% of the gall-bladder were contracted and reduced in size and 37.5% distended (Figure 2) and large on CT examination. Approximately 37.5 % had irregularly thickened wall and 25% diffusely thickened wall at USG and 25% of gallbladder wall were diffusely thickened and 45% irregularly thickened on CT scan (Figure 1).

Several studies demonstrated that focal or diffuse wall thickening of gallbladder is one of the imaging findings on CT and USG in patients having gallbladder carcinoma. Gallbladder carcinoma may appear as a mass lesion on imaging study.[7-9] Mass may protrude into the lumen or large enough to occupy whole of the gallbladder, which is the most common appearance. In this study a mass was present in (50%) patients on USG and (55%) patients on CT scan. These findings in the present study are strengthened by similar observation made by several studies.[9-12]

Cholelithiasis is a well-established risk factor for the development of gallbladder carcinoma. Gall stones cause chronic irritation and inflammation of gallbladder leading to mucosal dysplasia and subsequent carcinoma. In the present study gallstones were found in 62.5% of patients on USG examination. This finding was quite lower on CT evaluation (45%). Probably this is due to presence gallbladder cholesterol stone in those patients, because cholesterol stone shows almost similar density of gallbladder content at CT.

The present study showed hepatic parenchymal invasion to be 25% on USG and 37.5% on CT scan (Figure 3). This is in close agreement with the study of Ohtani et al where hepatic parenchymal involvement was found in 65% patients.[13] Bach et al described that ultrasonography is reliable in the detection of primary gallbladder mass. However, sonographic findings do not accurately reflect

the full extent of disease and sonography is particularly limited in the diagnosis of invasion to the liver, lymph nodes, peritoneum etc. CT scan more readily depicts subtle extension of tumor beyond the wall of the gallbladder and into the surrounding structures and lymph nodes.[14]

The sensitivity of USG in differentiating GB carcinoma from inflammatory lesion was 33/35 (100=94.2%), while the specificity of the test in correctly differentiating those who did not have the disease was 5/7 (100=71.4%). The positive and negative predictive values of the test were 92.4% and 71.4% respectively. The diagnostic accuracy of USG was 95% in the present study. The sensitivity of CT in differentiating GB carcinoma from inflammatory lesion was 34/35 (100=97.1%), while the specificity of the test in correctly differentiating those who did not have the disease was 5/6 (100=83.3%). The positive and negative predictive values of the test were 97.1% and 83.3% respectively. The diagnostic accuracy of CT was 97.5% in the present study.

The Kappa test revealed an excellent agreement (88%) between the two procedures suggesting that the two diagnostic modalities are almost comparable in diagnosing gall bladder carcinoma (p<0.001) in the present study.

However, previous studies reported a low sensitivity of CT scan (from 69-80%) in the diagnosis of gallbladder carcinoma which might be that the previous CT technologies were low sensitive to diagnose gallbladder carcinoma compared to the present ones.[15, 16]

From the result of the present finings as well as findings obtained from a number of other investigators, it is conceivable that both Ultrasonography and CT scan are ideal and accurate diagnostic imaging modalities for diagnosis of gallbladder carcinoma. However, CT scan is of greater value in the evaluation of extent of involvement to surrounding structures and thus determining its resectability.

CONCLUSION

As the histopathological diagnosis of the present study correlated well with USG and CT scan findings in the diagnosis of gallbladder carcinoma; it can be concluded that Ultrasonography and CT are useful non-invasive imaging modalities to detect gall bladder tumors and to define their character. Computed Tomography is highly useful, non-invasive imaging modality in preoperative diagnosis of gall bladder carcinomas, thus contributing to the adequate management and prognosis. As the histopathological diagnosis of the present study correlated well with USG and CT scan findings in the diagnosis of gallbladder carcinoma; it can be concluded that both USG and CT scan are useful imaging modalities for diagnosing this disease. However, CT scan is more sensitive and specific in predicting gall bladder carcinoma as compared to USG.

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