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Ultrasonography and computed tomography evaluation of gall bladder malignancy

Sunil Kumar Agrawal[1], Ankush Malik[2*], Rajesh Arora[3], M Arun Prasad[2], Amritanshu Agarwal[2], Sakshi Agarwal[2]

[1]Professor and Hod, Department of Radiodiagnosis, Muzaffarnagar Medical College, Muzaffarnagar, Uttar Pradesh, India

[2]P.G. J.R, Department of Radiodiagnosis, Muzaffarnagar Medical College, Muzaffarnagar, Uttar Pradesh, India

[3]Assistant Professor, Department of Radiodiagnosis, Muzaffarnagar Medical College, Muzaffarnagar, Uttar Pradesh, India

Abstract

Introduction: Gallbladder 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.

Aims and Objectives: To establish the role of USG and CT in diagnosis of gallbladder malignancies. To see sensitivity and specificity of the USG and CT findings.

Materials and Methods: This was an observational study that was carried out on thirty patients with Gall Bladder Malignancy over a period of eighteen months. Ultrasonography of abdomen with subsequent CECT abdomen was then performed in same cases. The patients who presented with complaints of pain, jaundice, itching, weight loss and upper abdominal mass were assessed. For CECT abdomen, patients fasted for at least 6-8 hours before the examination. The findings were then correlated with Histopathology report.

Results: Out of 30 patients, 6 (20%) were males and 24 (80%) were females. The mean age of the study subjects was 56.17±11.01 years. Maximum subjects were in the age groups of 51-60 years (40%) followed by >60 years (23.33%). The sensitivity of USG in differentiating GB carcinoma from inflammatory lesion was 23/25 (100 = 92%), while the specificity of the test in correctly differentiating those who did not have the disease was 3/5 (100 = 60%). The positive and negative predictive values of the test were 92% and 60% respectively. The diagnostic accuracy of USG was 86.67%. The sensitivity of CT in differentiating GB carcinoma from inflammatory lesion was 26/27 (100 = 96.69%), while the specificity of the test in correctly differentiating those who did not have the disease was 3/4 (100 = 75%).

Summary and 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 both USG and CT scan are useful imaging modalities for diagnosing this disease. However, CT scan has some is more sensitive and specific in predicting gall bladder carcinoma as compared to USG.

Keywords: Ultrasonography, computed tomography evaluation, gall bladder malignancy

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 patients may be asymptomatic or may come with signs and symptoms like

- Pain in right upper quadrant
- Jaundice
- Loss of weight
- Nausea
- Vomiting
- Anorexia
- Intolerance to fatty food
- Dark urine etc.

Clinical diagnosis and radiologic investigations of Gallbladder (GB) malignancy show similar picture with those of in cholelithiasis and cholecystitis, which often results in delay of diagnosis until the disease is in the advanced stage. Ultrasound (USG) is the first modality of imaging investigation for all such symptoms.

Risk Factors

- Studies have shown that female sex, older age, postmenopausal status, and smoking are the potential risk factors for gall bladder malignancy [3].
- Different artistic and cultural variations suggest that there are major influences of location, rendering the etiology of Gall bladder malignancy incomprehensible and hazy [4].
- It is also hypothesized that chronic S. Typhi infection is also associated with biliary carcinogens and contributes to an increased risk of hepatobiliary carcinoma and

gallbladder carcinoma [5].

- Chemical exposure as in the rubber industry, automobile factories, wood finishing, and metal fabricating have been associated with an increased risk of gallbladder malignancy [6, 7].
- Gall bladder stone disease is a well-documented risk factor for the development of gallbladder carcinoma [8]. Gallstones are present in 74%–92% of affected individuals [9]. Gallstone disease cause chronic irritation and inflammation of the gallbladder, which tends to mucosal dysplasia and subsequent carcinoma [10].
- Porcelain gallbladder is not much common condition in which there is diffuse calcification of the gallbladder wall, and 10%–25% of patients with this condition have gallbladder malignancy [11].
- Mirizzi's syndrome has also been associated with an increased risk of GB malignancy.

The four most important factors thought to be associated with the development of gallbladder carcinoma are genetics, cholelithiasis, congenital abnormal pancreaticobiliary ductal mallformation and porcelain gallbladder [12].

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, gallbladder malignancy can be detected early when these tumors are still localized. Thus survival time of the patients can be increased by early removal of tumors if diagnosed early. To our knowledge, no such published data are available in our country in the field Ultrasonography and Computed Tomography Evaluation of Gall Bladder Malignancy. The Present study is an attempt to fulfil this gap and an to establish the role of USG and CT in diagnosis and evaluation of carcinoma gallbladder.

Materials & Methods

- Ultrasonography of abdomen was performed in 30 cases referred from Department of Surgery. CECT abdomen was then performed in same cases.
- This was an observational study that was carried out on thirty selected patients with Gall Bladder Malignancy over a period of eighteen months.
- A complete history, detailed clinical examination was performed in all cases.
- Routine laboratory investigations like haemoglobin, 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.
- Patients fasted for at least 6-8 hours before the examination and USG examination was performed in all patients whenever required 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 3-7 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 findings were then correlated with Histopathology report.

Observations and Results

Table 1: Gender distribution among the study subjects

Gender	N	%
Male	6	20
Female	24	80
Total	30	100

The present study was conducted in the Department of Radiodiagnosis & Imaging, Muzaffarnagar Medical College, among 30 patients suspected of having gallbladder malignancy. Out of 30 patients, 6 (20%) were males and 24 (80%) were females (table 1, graph 1).

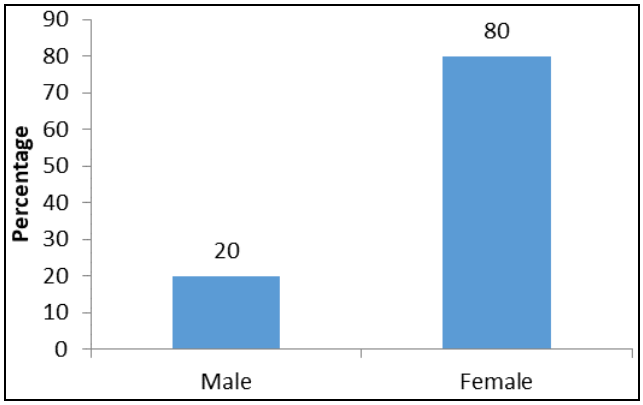

Fig 1: Gender distribution among the study subjects

Table 2: Age distribution among the study subjects

Age Group (in years)	N	%
21-30	1	3.33
31-40	2	6.67
41-50	7	23.33
51-60	12	40
>60	8	26.67
Age, Mean±SD	56.17±11.01	

Table 2, graph 2 shows the age distribution among the study subjects. The mean age of the study subjects was 56.17±11.01 years. Maximum subjects were in the age groups of 51-60 years (40%) followed by >60 years (23.33%). Minimum subjects were in the age group of 21-40 years (10%).

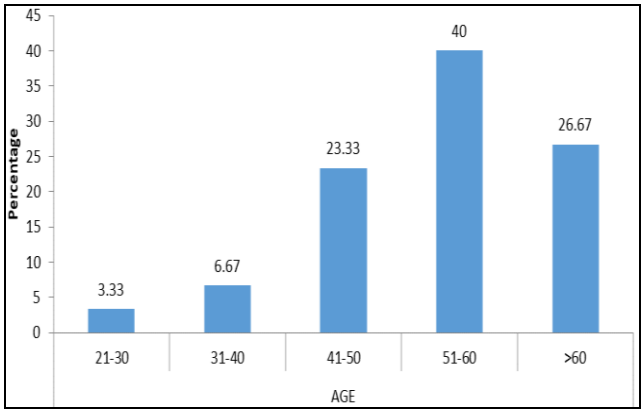

Fig 2: Age distribution among the study subjects

Table 3: Distribution of respondents by their clinical features

Features	N	%
Abdominal Pain	23	76.67
Fever	0	0
Jaundice	30	100
Weight Loss	30	100

In the present study, jaundice and weight loss was reported among all the subjects, while pain in right upper quadrant was found in 76.67% (23) of the subjects (table 3, graph 3).

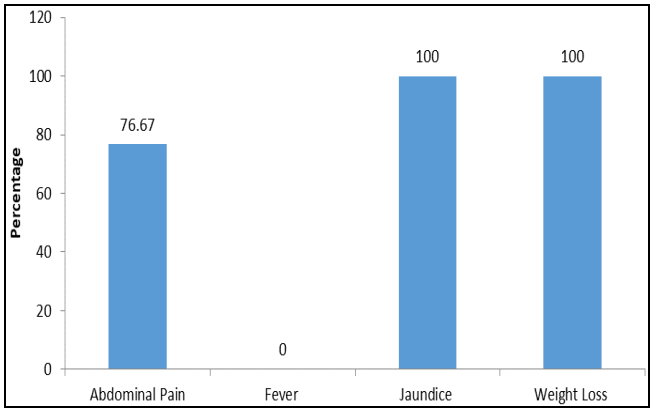

Fig 3: Distribution of respondents by their clinical features

Table 4: Comparison of gall bladder findings among USG and CT

Variables	USG		CT		p value
	N	%	N	%	
Distention	30	100	30	100	1
Stone	15	50	19	63.33	0.23
Irregularity	24	80	28	93.33	0.18
Pericholic Fluid	8	26.67	13	43.33	0.11

Table 4, graph 4 shows the comparison of gall bladder findings among USG and CT. According to USG as well as CT finding, distention was reported among all the subjects (p=1). Stone, irregularity and peri cholic fluid was revealed among 63.33%, 93.33%, 43.33% and 50%, 80%, 26.67% of the subjects as mentioned in CT and USG findings respectively. Hence CT revealed comparatively more findings as compared to USG, though statistically insignificant.

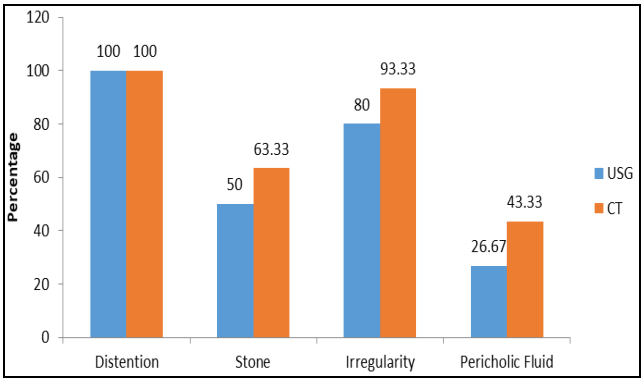

Fig 4: Comparison of gall bladder findings among USG and CT

Table 5: Involvement of liver and ascites among USG and CT

Variables	USG		CT		p value
	N	%	N	%	
Involvement of liver	29	96.67	30	100	0.83
Ascites	14	50	17	56.67	0.38

According to USG and CT findings, involvement of liver and ascites was reported among 96.67%, 50% and 100%, 56.67% of the subjects respectively with statistically insignificant difference (table 5, graph 5).

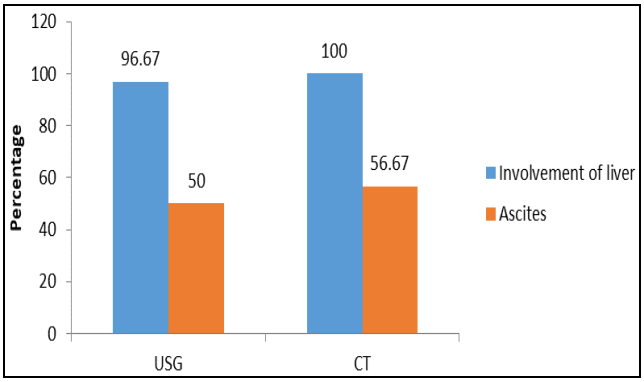

Fig 5: Involvement of liver and ascites among USG and CT

Table 6: Accuracy of abdominal USG in diagnosing carcinoma gall-bladder

USG	Histopathological diagnosis		Total
	Carcinoma	Inflammatory Lesion	
Carcinoma	23	2	25
Inflammatory Lesion	2	3	5
Total	25	5	30
Chi Square Test		13.1	
p value		0.002*	
Sensitivity		92%	
Specificity		60%	
+ve predictive value		92%	
–ve predictive value		60%	

*: statistically significant

Table 6, graph 6 shows the accuracy of abdominal USG in diagnosing carcinoma gall-bladder. The sensitivity of USG in differentiating GB carcinoma from inflammatory lesion was 23/25 (100 = 92%), while the specificity of the test in correctly differentiating those who did not have the disease was 3/5 (100 = 60%). The positive and negative predictive values of the test were 92% and 60% respectively. The diagnostic accuracy of USG was 86.67%.

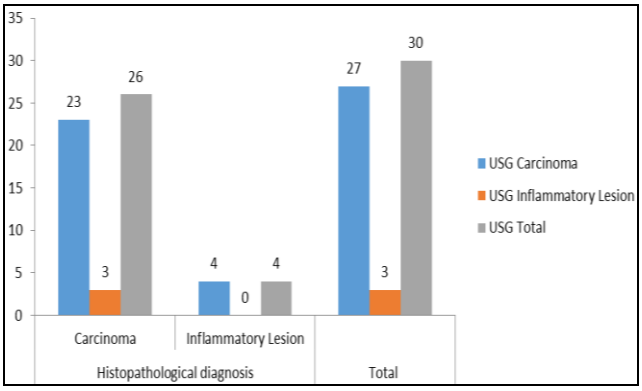

Fig 6: Accuracy of abdominal USG in diagnosing carcinoma gall-bladder

Table 7: Accuracy of abdominal CT scan in diagnosing carcinoma gall-bladder

CT Scan	Histopathological diagnosis		Total
	Carcinoma	Inflammatory Lesion	
Carcinoma	26	1	27
Inflammatory Lesion	0	3	3
Total	26	4	30
Chi Square Test		17.81	
p value		<0.01*	
Sensitivity		96.69%	
Specificity		75%	
+ve predictive value		96.69%	
–ve predictive value		75%	

*: statistically significant

The sensitivity of CT in differentiating GB carcinoma from inflammatory lesion was 26/27 (100 = 96.69%), while the specificity of the test in correctly differentiating those who did not have the disease was 3/4 (100 = 75%). The positive and negative predictive values of the test were 96.69% and 75% respectively. The diagnostic accuracy of CT was 96.67% in the present study (table 7, graph 7).

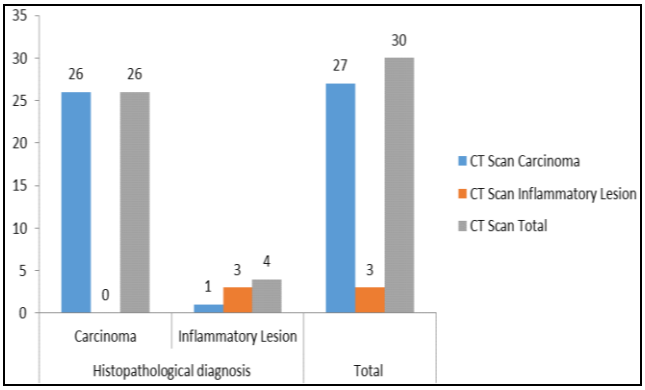

Fig 7: Accuracy of abdominal CT scan in diagnosing carcinoma gall-bladder

Table 8: Strength of agreement between USG and CT scan in detecting gall bladder carcinoma

Disease Studied	k- value	Strength of Agreement
Gall Bladder Carcinoma USG and CT Scan	0.84	Excellent

The Kappa test revealed an excellent agreement (84%) between the two procedures suggesting that the two diagnostic modalities are almost comparable in diagnosing gall bladder carcinoma ($p < 0.001$) as shown in table 8.

Table 9: Comparison of diagnostic efficacy of USG and CT scan

Variables	USG	CT Scan
Sensitivity	92%	96.69%
Specificity	60%	75%
+ve predictive value	92%	96.69%
–ve predictive value	60%	75%

Table 9, graph 8 shows the comparison of diagnostic efficacy of USG and CT scan.

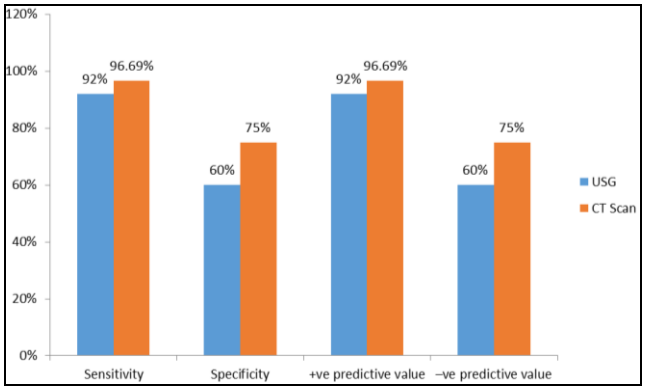

Fig 8: Diagnostic efficacy of USG and CT scan

Discussion

Gallbladder cancer was first described in 1777. More than 200 years later, late diagnosis and absence of effective treatment for many patients remain typical features of this disease. Gall bladder carcinoma is the most common malignant tumor of the gall bladder, adenocarcinoma is the most common histological type, in 90% of cases. However squamous carcinoma, mixed type carcinoma and sarcoma have also been described in the gall bladder. Many benign neoplasms of gall bladder also have been described such as adenoma, fibroma, lipoma, myxoma, hemangioma and neurofibroma.

Early-stage carcinoma is typically diagnosed incidentally because of inflammatory symptoms related to coexistent cholelithiasis or cholecystitis. Jaundice occurs more frequently as a result of malignant obstruction of the biliary tree rather than hepatic metastasis or coexistent choledocholithiasis. In addition, there is a number of no neoplastic tumors like lesions that should be considered in the differential diagnosis of gall bladder carcinoma like polyp, focal wall thickening or stricture. Ultrasonography and computed tomography have revolutionized the diagnosis and management of gall bladder carcinoma.

Ultrasonography and CT scan are two important diagnostic tools available in our country to evaluate the hepatobilliary 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. To the best of our knowledge, scarce published data are available in this country in the field of radiologic evaluation (USG and CT scan) of carcinoma gallbladder in correlation with histopathological report and the superiority of one modality over the other. The present study is an attempt to fulfil this gap. Hence the present study was conducted to establish the role of USG and CT in diagnosis and evaluation of carcinoma gallbladder.

Gender
Out of 30 patients, 6 (20%) were males and 24 (80%) were females in the present study. Hence female dominancy was found in our study.

Age
In our study, the mean age of the study subjects was 56.17±11.01 years. Maximum subjects were in the age groups of 51-60 years (40%) followed by >60 years (23.33%). Minimum subjects were in the age group of 21-40 years (10%).
Maximum numbers of cases were in the 5th decade of life followed by 6th.

Clinical Features
In the present study, jaundice and weight loss was reported among all the subjects, while abdominal pain was found in 76.67% (23) of the subjects.

Gall Bladder Findings
According to USG as well as CT finding, distention was reported among all the subjects (p=1). Stone, irregularity and pericholic fluid was revealed among 63.33%, 93.33%, 43.33% and 50%, 80%, 26.67% of the subjects as mentioned in CT and USG findings respectively. Hence CT revealed comparatively more findings as compared to USG, though statistically insignificant in the present study.

Liver Involvement
According to USG and CT findings, liver involvement was reported among 96.67% and 100% of the subjects respectively with statistically insignificant difference in our study.

Accuracy of abdominal USG and CT in diagnosing carcinoma gall-bladder
The sensitivity of USG in differentiating GB carcinoma from inflammatory lesion was 23/25 (100 = 92%), while the specificity of the test in correctly differentiating those who did not have the disease was 3/5 (100 = 60%). The positive and negative predictive values of the test were 92% and 60% respectively. The diagnostic accuracy of USG was 86.67% in the present study. The sensitivity of CT in differentiating GB carcinoma from inflammatory lesion was 26/27 (100 = 96.69%), while the specificity of the test in correctly differentiating those who did not have the disease was 3/4 (100 = 75%). The positive and negative predictive values of the test were 96.69% and 75% respectively. The diagnostic accuracy of CT was 96.67% in the present study. The Kappa test revealed an excellent agreement (84%) 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 [13, 14].
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 resect ability.

Conclusion
From our present study, the following conclusions can be drawn: Maximum number of cases was seen occurring between the 5th to 7th decades. Female: male ratio was 4:1. Ultrasonography and Computed Tomography 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 has some is more sensitive and specific in predicting gall bladder carcinoma as compared to USG.

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