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EVALUATION OF GALL BLADDER CARCINOMA BY ULTRASONOGRAPHY AND COMPUTED TOMOGRAPHY & ITS COMPARISON: A STUDY OF 50 CASES

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ABSTRACT: OBJECTIVE: Gall bladder carcinoma is the fifth most common tumor of gastrointestinal tract. 70 to 80% of gall bladder carcinomas are associated with gall stones. Adenocarcinoma is the most common histological type of gall bladder carcinoma. Ultrasonography and Computed tomography have revolutionized the diagnosis and management of gall bladder carcinoma. **METHODS:** The cases were selected based on all patients referred to the Department of Radiology, Gauhati Medical College with clinically suspected Gallbladder carcinoma. Ultrasonography and Computed Tomography were done. Histopathological study was done either by fine needle aspiration cytology or from post-operative specimen. Only the FNAC/histologically proven gall bladder carcinoma cases were included in our study. The age group of the patients ranged from 20 years to 90 yrs. **RESULTS:** 50 cases of gall bladder carcinoma were studied and among 50 cases, 41 were female and 9 were male. Other parameters like type of tumours, pattern of tumours, adjacent organ involvement etc. was evaluated and tabulated. **CONCLUSION:** Various findings like female predominance with female to male ratio 3:1, 4th-6th decade was the age group with maximum number of cases etc. can be obtained from the present study. Computed Tomography is more sensitive than ultrasonography in detecting adjacent organ involvement, lymph node involvement and distant metastasis especially lung.

KEYWORDS: Gall bladder carcinoma, Ultrasonography, Computed Tomography.

INTRODUCTION: Gall bladder carcinoma is the fifth most common tumor of gastrointestinal tract. It is more common in women than men by a ratio of 3:1. This sex predilection is thought to be related to the higher incidence of cholelithiasis in women, since 70 to 80% of gall bladder carcinomas are associated with gall stones. Another predisposing condition is the porcelain gall bladder; up to 25% of the cases are complicated by carcinoma. Other less frequent associations include inflammatory bowel disease and familial polyposis coli.^{1,2} The clinical presentation of gall bladder carcinoma includes right upper quadrant pain, anorexia, weight loss and jaundice.³ Often the patients' condition is clinically indistinguishable from that seen in acute or chronic cholecystitis.

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.⁴ Gall bladder carcinoma is the most common malignant tumor of the gall bladder, adenocarcinoma is the most common histological type, in 90% of cases.⁴ However squamous carcinoma, mixed type carcinoma and sarcoma have also been described in the gall bladder.⁵ Many benign neoplasms of gall bladder also have been described such as adenoma, fibroma, lipoma, myxoma, hemangioma and neurofibroma.²

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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.⁶ despite the availability of ultrasonography and computed tomography; a significant number of cases of gall bladder carcinoma are still misdiagnosed preoperatively.

AIMS AND OBJECTIVES:

1. To characterize the gall bladder carcinoma by ultrasonography.
2. To characterize the gall bladder carcinoma by computed tomography.
3. The correlate ultrasonography and computed tomographic findings.
4. To confirm the diagnosis pathologically wherever possible.

MATERIALS AND METHODS: The present study was conducted in the Department of Radiology, Gauhati Medical College & Hospital from June 2012 to December 2013. Initially 60 patients who were referred to the Department of Radiology from both indoor and outdoor units presenting with symptoms suspicious of gall bladder carcinoma were included. Out of these initial 60 patients, no gall bladder carcinoma could be found in 10 patients after FNAC/histopathological examination. Those patients were of complicated cholecystitis, cholangiocarcinoma and hepatic masses mimicking gallbladder carcinoma and were excluded from our study.

The remaining 50 patients constituted our study. Post- operative already diagnosed cases were also included in this study. The age group of the patients ranged from 20yrs to 90 yrs. Both male and female sexes were studied. The common symptoms of these patients were pain abdomen, nausea/vomiting, jaundice, lump abdomen, loss of appetite etc. None of these were asymptomatic.

METHODS: Brief clinical history of the patients referred to the Department of Radiology with symptoms suggestive of or already diagnosed case of gall bladder carcinoma was taken. The history comprised of mode of onset, duration of illness, chief complaints, occupational history, personal history and past history. Both general, systemic and laboratory examinations of the patients were done.

IMAGING: The patients were kept on empty stomach for at least 6 hours before the ultrasonographic examination. Real time B-mode ultrasonography was done with ANTARES COLOUR DOPPLER ULTRASOUND SYSTEM (MAKE: SIEMENS) real time scanner with a 3-5 MHz transducer. The gall bladder is scanned through its long axis from a lower intercostal or preferably subcostal approach. The plane of section is swept back and forth medially and laterally.

For computed tomographic examinations, patients were again kept on empty stomach for at least 6 hrs. Written consent of the patient and attendants were taken for contrast examination. Before performing the scan the procedure and objective were explained to the patient. The machine used is PHILIPS MX16 (16 SLICE CT) scanner. The small and large bowel loops were pacified with oral contrast. CT scan was performed using the following protocols:

1. **Positioning:** Patients were scanned in the supine position with their arms above their heads. Scans were performed in the axial axis from cephalic to caudal levels.

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2. **Scanning:** After positioning the patient, the topogram or scannogram was taken. Spiral scanning were done. The upper abdomen scan were obtained contiguous 5mm slice. Both plain and contrast enhanced CT scans were obtained. About 100 ml of a non-ionic water soluble contrast medium were injected intravenously as a bolus dose to image the abdomen. Delayed sections through the upper abdomen were obtained to see the delayed enhancement pattern of the mass, excretion of both kidneys and through the pelvis to delineate contrast filled urinary bladder and pelvic ureters.

HISTOPATHOLOGICAL EXAMINATION: These were performed either by fine needle aspiration cytology or biopsy from post-operative specimen.

RESULTS AND OBSERVATIONS:

SEX DISTRIBUTION: In our present series, 50 patients with gall bladder masses were evaluated out of which 41 were female and 9 were male. Female accounted for 82% and male accounted for 18% of the total number of cases.

AGE DISTRIBUTION: The age distribution was as per table below:

Age groups	No. of cases	Percentage
20-30	4	8%
31-40	6	12%
41-50	23	46%
51-60	14	28%
61-70	3	6%
71-80	Nil	
81-90	Nil	

Table 1

Maximum numbers of cases were in the 5th decade of life followed by 6th decade.

ASSOCIATED RISK FACTORS: The associated risk factors are:

Risk factors	No. of cases
GB calculus	40 (80%)
Porcelain GB	2(4%)
Unknown	8(16%)

Table 2

The major risk factors associated were presence of gall bladder calculus.

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CLINICAL PRESENTATIONS: The clinical presentations were as per table below:

Symptoms	No. of cases	Percentage (%)
Pain abdomen	50	100
Vomiting	29	58
Jaundice	27	54
Lump abdomen	15	30%
Loss of appetite	45	90
Weight loss	33	66
Table 3		

In our study, pain abdomen was complained by all the patients (100%), loss of appetite in 90% and weight loss were found in 66% of patients.

TYPES OF TUMORS: The types of tumors were as per table below:

Types of tumors	No. of cases	Percentage (%)
Adenocarcinoma	49	98
Squamous carcinoma	1	2
Table 4		

In our study adenocarcinoma accounted for 49 (98%) cases.

PATTERNS OF TUMORS: The patterns of tumors were as per table below:

Patterns of tumor	No. of cases
Intraluminal polypoidal mass	9(18%)
Focal/diffuse wall thickening	14(28%)
Mass replacing GB	27(54%)
Table 5	

In our study, mass replacing GB were found in maximum no. of cases (54%)

INVOLVEMENT OF ADJACENT ORGANS: Out of 50 cases of carcinoma GB in our study, the involvement of adjacent organs was detected by USG and CT is as follows:

Adjacent organs	No. of cases detected	
	USG	CT
Liver	38	45
Duodenum	10	15
Colon	4	10
Pancreas	2	4
Table 6		

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Hence the most common adjacent organs involved by carcinoma gall bladder were liver (90%) followed by duodenum (30%). In our study, the involvement of liver was under staged by USG in 7 cases (14 %), duodenum in 5 cases (10 %), colon 6 cases (12%) and pancreas in 2 cases (4%).

Out of 50 cases of gall bladder carcinoma, 23 cases were taken for surgical resection. Adjacent hepatic parenchymal infiltration was reported in 18 cases on CT scan and 11 cases on ultrasound. However post-operative HPE revealed hepatic parenchymal infiltration in 15 cases. CT failed to determine hepatic parenchymal infiltration in 2 cases.

LYMPH NODE INVOLVEMENT: Out of 50 cases of gall bladder carcinoma, lymph node involvement were detected by CT in 35(70%) cases and USG in 27(54%) cases.

Lymph node groups	No. of cases detected	
	USG	CT
Porta	11	28
Peripancreatic	11	15
Celiac	11	15
Para aortic	13	15
Table 7		

The enlarged lymph nodes were seen as is to hypo attenuated round to oval soft tissue densities with peripheral rim enhancement on post contrast study. In our study, the most common group of lymph node involved were porta followed by per pancreatic, celiac & para aortic. The largest node detected by CT in our study was 3.8 cm sized portal node.

BILIARY OBSTRUCTION: In our present study, out of 50 cases of gall bladder carcinoma biliary obstruction was found in 27 cases (54%).

DISTANT METASTASIS, ASCITES AND PLEURAL EFFUSION: In our study the involvement of distant organs and ascites & pleural effusion were found as follows:

	No. of cases
Liver metastasis	15(30%)
Lung metastasis	5(10%)
Ascites	15(30%)
Pleural effusion	11(22%)
Table 8	

Metastasis to liver, presence of ascites and pleural effusion were accurately detected by both USG and CT. Metastasis to lung is only detected by CT.

GRADE OF TUMORS IN RELATION TO EXTENT OF INVOLVEMENT: In our study, out of 50 cases of gall bladder carcinoma, Grade II cases were 5, Grade III cases were 17 and Grade IV cases were 28.

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Out of 50 cases lung metastasis was found in 5 cases and liver metastasis was found in 15 cases which also include the 5 cases of lung metastasis. So in our study Grade IV cases are 15 (30%). Pleural effusion was found in 11 of these 15 cases. Ascites present in all these 15 cases. Of these 15 cases liver and duodenum involvement were also noted.

Adjacent organ and lymph node involvement was noted to be Grade III and IV cases. Distant metastasis, ascites and pleural effusion were present only in Grade IV cases.

Fig 1: (A) Image showing focal wall thickening of GB on USG (white arrows). (B) Showing GB wall thickening on CT (in white arrow) in same patient. Nodal metastasis is also seen (shown as black thin arrow).

Fig 2: (A) diffuse wall thickening on USG. (B) Same patient on CT showing diffuse pattern of wall thickening (white arrow). Adjacent hepatic metastasis seen both on USG and CT (thin arrows).

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Fig 3: (A) USG showing intraluminal heteroechoic mass with calculi. (B) CT reveals heterogeneously enhancing intraluminal GB mass in the same patient. (White arrow)

Fig 4: (A) USG showing irregular GB wall thickening with calculi.(white arrow) (B) CT of the same patient showing irregular mass in the GB with hepatic infiltration(white arrows).

Fig 5: (A) Heteroechoic mass replacing gall bladder seen on ultrasound (white arrows).(B) Same patient on CT seen as heterogeneous mass replacing the gallbladder.(white arrows).

Fig 6: (A) and (B) CT in two different patients reveals multiple hypodense lesions in the liver suggestive of metastases (thick white arrows) and biliary obstruction (thin white arrows) in carcinoma gallbladder.

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Fig. 7: (A) and (B) in two different patients of gallbladder carcinoma showing multiple hypoechoic lesions in liver suggestive of metastases. (white arrows)

Fig. 8: (A) Ultrasound image showing multiple enlarged hypoechoic periaortic nodes in a case of gallbladder carcinoma. (B) CT of the same patient reveals multiple enlarged heterogeneous nodes in the periaortic and interaortocaval location. (C) Enlarged nodes in the porta and portocaval region on CT in a different patient of carcinoma GB. (Nodes shown in arrows).

DISCUSSION: In our present study the number of female patients was 41 (82%) and male were 9 (18%). The age of youngest patient was 28 years and the oldest patient was 70 years. Maximum numbers of cases were in the 5th decade of life followed by 6th decade. Gall bladder carcinoma primarily affects elderly, with more than 85% of cases occurring in 6th decade of life. The major risk factors associated were presence of gall bladder calculus as reported in different series. In our study, pain abdomen was complained by all the patients (100%), loss of appetite in 90% and weight loss were found in 66% of patients.^{3,4}

Adenocarcinoma is the most common histological type.⁵ Studies by Alessandro Furlan et al, 2008⁸ stated that there are three primary tumor pattern of gall bladder carcinoma as follows: intraluminal mass, focal/diffuse thickening of gall bladder wall and mass replacing the gall bladder. Mass replacing the gall bladder is the most common form of gall bladder carcinoma and represents 40-65 % of all tumors. Focal/diffuse wall thickening of the gall bladder represents 20-30% of gall bladder carcinoma. Intraluminal mass is the least common form of gall bladder carcinoma, representing 15-25% of tumors. These correlate well with our study.

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Focal wall thickening type of GB carcinoma was difficult to diagnosed by ultrasonography and computed tomography alone as a wide range of clinical settings such as chronic cholecystitis, adenomyomatosis, inadequate GB distension, hepatitis and low protein states also showed similar findings.⁹ The wall is usually 4 -13 mm in thickness and is often asymmetrically thickened and nodular in case of carcinoma.²

Xantho-granulomatous cholecystitis may mimic the appearances of a mass replacing the GB fossa with spread of inflammation into liver, duodenum and colon. The presence of intramural hypoattenuated nodules occupying a large area of the thickened GB wall is considered diagnostic of xantho-granulomatous cholecystitis.¹⁰ Hepato-cellular carcinoma invading the GB fossa may mimic carcinoma of the GB. Visualizing a normal GB on CT scan, suggests a hepatic primary rather than a GB carcinoma.²

The most common adjacent organs involved by carcinoma gall bladder were liver (90%) followed by duodenum. (30%)¹⁴ The involvement of liver was under staged by USG in 7 cases (14 %), duodenum in 5 cases (10 %), colon 6 cases (12%) and pancreas in 2 cases (4%). This agree with the study by Alan P. Venook, et al,¹¹ that CT can determine extent of tumor and possible other organ involvement accurately.

The most common group of lymph node involved were porta followed by peri pancreatic and celiac & para aortic in our study¹². In our present study, biliary obstruction was found in 27 cases (54%).² This may due to direct invasion into porta hepatis, obstructive lymphadenopathy or intra ductal spread of tumors.

Metastasis to liver, presence of ascites and pleural effusion were accurately detected by both USG and CT. Metastasis to lung is only detected by CT.⁷ Michael K McLeod, et al, 2006¹² also stated that later stage gall bladder carcinoma presents with more significant symptoms, such as weight loss, hepatomegaly, ascites and right upper quadrant mass.

CT is better than ultrasound for detecting local spread of the disease and detecting lymphadenopathy¹³. The diagnostic accuracy of CT scan in staging of the disease has been reported in various studies. In our study, the most common adjacent organ involved was liver. Sensitivity in detecting liver involvement on CT is 88% and on ultrasonography it was 78% in our study.

This correlates well with the study by Yoshimitsu et al,¹⁴ who reported an accuracy of 83-86% in diagnosing the local extent of carcinoma GB. Out of 50 cases of gall bladder carcinoma in our study, lymph node involvement was detected by CT in 35(70%) cases and USG in 27(54%) cases. So sensitivity of ultrasonography is 81% in detection of lymph node involvement in our study. Advanced stage tumor has spread to distant lymph nodes and other parts of the body such as duodenum or pancreas.⁵

CONCLUSION: From our present study of 50 cases of gall bladder carcinoma the following conclusions can be drawn: Maximum number of cases was seen occurring between the 4th to 6th decades. Female: male ratio was 3:1. Major risk factor was presence of gall stones, most common type of tumour was mass replacing GB and adenocarcinoma was the most common histological type.

Metastasis to liver, presence of ascites and pleural effusion were accurately detected by both USG and CT. Metastasis to lung is only detected by CT. Ultrasonography and Computed Tomography are useful non-invasive imaging modalities to detect gall bladder tumors and to define their character. However, Computed Tomography is more sensitive than ultrasonography in detecting

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adjacent organ involvement, lymph node involvement and distant metastasis especially lung. Computed Tomography is highly informative, non-invasive imaging modality in preoperative staging of gall bladder carcinomas, thus contributing to their adequate management and prognosis.

REFERENCES:

1. Lane J. Primary Carcinoma of the Gall bladder: A pictorial essay. *Radiographics* 1988; 9: 209-228.
2. Textbook of John R Haaga, 5th ed 2009. Chapter 31; p 1439-1445.
3. Tahir Uddin Qazi et al. Carcinoma of gall bladder: its frequency and clinical presentations in two hundred cases of cholelithiasis. *Gomal Journal of Medical Sciences* 2013; 11: 37-41.
4. Eduardo C. Lazcano. Epidemiology and molecular pathology of gall bladder cancer. *CA Cancer J Clin* 2001; 51: 349-364.
5. Cancer Research UK. Types of gall bladder carcinoma; updated June 2014.
6. Lt Col R A George et al. Computed tomographic findings in 50 cases of gall bladder carcinoma. *MJAFI* 2007; 63:215-219.
7. Rooholamini S A. Imaging of gall bladder carcinoma. *Radiographics* 1994 Mar; 14 (2): 291-306.
8. Alessandro Furlan, James V Ferris, Keyanoosh Hosseinzadeh et al. Gallbladder Carcinoma update: Multimodality Imaging Evaluation, Staging, and Treatment Options. *American Journal of Roentgenology*. 2008; 191: 1440-1447.
9. Levy AD, Murakata LA, Rohrmawm CA. Gall bladder carcinoma: radiologic – pathologic correlation. *Radiographics* 2001; 21: 295-314.
10. Chun KA, Ha HK, Yu ES, Shinn KS et al. Xantho-granulomatous cholecystitis: CT features with emphasis on differentiation from gallbladder carcinoma. *Radiology* 1997 Apr; 203 (1):93-7.
11. Venook A P. Cancer of gall bladder. *Cancer J Clin* 2002; 52:23-47.
12. Michael K McLeod. Gall bladder tumors. *E medicine* Jan 2006; 139 (1): 33-8.
13. Fong Y, Kemeny N, Lawrence TS. Cancer of the liver and biliary tree. In: De Vita VT, Hellman S, Rosenberg SA editor. *Cancer: principles and practice of oncology*. Philadelphia: JB Lippincott; 2001;p. 1162–1203.
14. Yoshimitsu K, Honda H, Shinoraki K, Aibe H. Helical CT of the local spread of carcinoma of the gallbladder: evaluation according to the TNM system in patients who underwent surgical resection. *Amer J Roentgen* 2002; 179: 423-8.

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