Original Research Paper

Volume-8 | Issue-7 | July-2018 | PRINT ISSN No 2249-555X

Radiology

SPECTRUM OF MULTIDETECTOR COMPUTED TOMOGRAPHIC FINDINGS IN GALLBLADDER CARCINOMA

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ABSTRACT

Background: Carcinoma gallbladder is a major problem in India. In this retrospective study from the tertiary care centre of the north-east India, we aim to review the various Multidetector Computed Tomography (MDCT) imaging findings of gallbladder carcinoma.

Methods: We retrospectively analysed MDCT findings in 65 biopsy proven cases of gallbladder carcinoma. After administration of oral contrast for bowel opacification, all patients were subjected to non-contrast scan of the upper abdomen followed by contrast enhanced study of the abdomen and pelvis in the portal venous phase.

Results: Focal mass lesion arising from gallbladder was the predominant pattern of growth seen in 31(48%) patients followed by focal or asymmetric diffuse wall thickening in 28(43%) patients. Twelve (18%) patients had mass in gallbladder fossa replacing the gall bladder. Adjacent hepatic infiltration was seen in 48(74%) patients.

Conclusion: Our study highlights the importance of MDCT for the diagnosis, characterisation and staging of gallbladder carcinoma.

KEYWORDS : Gallbladder carcinoma, Multidetector computed tomography, Cholelithiasis.

Introduction:

Worldwide gallbladder cancer is the sixth most common malignancy of the gastro-intestinal tract and the most common malignancy of the biliary tract with age standardised rate of 2.2 per 100,000 for both sexes. [1] However, there is significant geographical variability with high incidence of gallbladder cancer in Chile, Japan and India.

In India, gallbladder cancer remains a major problem, particularly in north and north-east states of Uttar Pradesh, Bihar, Orissa, West Bengal and Assam.[2] The incidence of gallbladder cancer increases after the age of 45 years and is two to six times more common in females than males. Other predisposing factors for gallbladder cancer include gall stones, chronic cholecystitis, porcelain gallbladder, chronic infections (salmonella typhi, liver flukes), gallbladder polyps, choledochal cysts and anomalous junction of pancreatico-biliary ducts.

Clinical presentation of gallbladder cancer is vague and many patients present with advanced disease. The median life expectancy is 6 months. It is an aggressive tumor with propensity to invade liver and other surrounding structures.

Ultrasonography (USG) is usually an initial imaging modality in suspected gallbladder cancer. It can detect primary tumor and adjacent liver invasion, although full extent of the spread cannot be reliably depicted by USG. Multidetector contrast enhanced Computed Tomography (CECT) provides comprehensive information about the tumor, invasion of liver and adjacent structures including bile ducts, vascular structures at porta, loco-regional and retroperitoneal lymphadenopathy and distant metastases. Magnetic resonance imaging (MRI) exquisitely depicts involvement of biliary ducts which helps for the planning of palliative stenting.

The purpose of our study is to analyze retrospectively the spectrum of MDCT findings in 65 histopathologically proven cases of carcinoma gallbladder evaluated at our tertiary care centre from the north-east India.

Materials and Methods:

This retrospective study included 65 patients with histopathologically proven gallbladder carcinoma who had presented from September 2015 to May 2018. These patients presented with a wide range of complaints like pain abdomen, dyspepsia, anorexia, weight loss, lump in right hypochondrium and obstructive jaundice. Ultrasonography of abdomen preceded the MDCT examination.

Computed tomographic examination was performed using a 16-slice MDCT scanner (Philips, Brilliance16). Pre-contrast (NCCT) scan was performed for the upper abdomen after asking the patient to drink 750 ml of 5% iodinated oral contrast over 45-60 minutes and 250 ml of oral contrast was administered on the gantry table just prior to the study to distend the stomach and duodenum adequately. Contrast enhanced CT scan of abdomen and pelvis was performed during portal venous phase after the intravenous injection of 80 ml of non-ionic iodinated contrast Iohexol 300 mg Iodine/ml (Omnipaque 300; GE Healthcare) with the pressure injector at the rate of 3.5 ml/s and scan delay of 45 sec. From the axial data set, coronal and sagittal multiplanar reformats were generated directly at the scanner and sent to the workstation for review. In few patients, triple phase CECT was carried out when the possibility of hepatocellular carcinoma (HCC) could not be reliably ruled out on USG.

The images were analyzed for the morphologic features (focal or diffuse wall thickening, focal or polypoidal mass, mass replacing the gall bladder), presence of gall stones, loco-regional lymphadenopathy, vascular involvement at porta, infiltration into the liver or other adjacent organs, involvement of Common hepatic duct (CHD) and/or common bile duct (CBD), intrahepatic biliary radicle dilatation, peritoneal or omental deposits and distant metastases. The suspected metastases were confirmed with histopathology by trucut biopsy / fine needle aspiration cytology (FNAC) of the one of the accessible lesion. The cut-off size criterion for significant porta hepatis lymph node was 6mm in maximum short axis diameter (MSAD) and 10 mm for retroperitoneal lymph nodes.[3]

Results:

There were 12(18%) male and 53(82%) females in the study. The average age was 60 years. The youngest patient was 28 year old female and the oldest patient was 76 year old female. Cholelithiasis was identified in 30(46%) patients. Focal or asymmetric diffuse wall thickening was noted in 28(43%) patients (Fig.1). Thirty one (48%) patients presented with focal or polypoidal mass arising from gall bladder (Fig.2a) while 12(18%) patients had mass in gallbladder fossa replacing the gall bladder (Fig.3a).

Contiguous hepatic infiltration was noted in 48(74%) patients (Fig.2a). Hepatic flexure / proximal transverse colon, duodenum, pancreas were involved by contiguous spread in 14(21.5%), 26(40%) and 6(9%) cases (Fig.3a). CHD and/or CBD was infiltrated in 39(60%) patients (Fig 3b) resulting in communicating (patent confluence of right and left main hepatic ducts) bilobar intrahepatic biliary radicle dilatation in 27 patients and non-communicating (loss of confluence patency) bilobar biliary radicle dilatation in 12 patients. In four patients, enlarged periportal lymph nodes were causing extrinsic compression on the proximal CBD resulting into intrahepatic biliary radicle

dilatation. Vascular involvement (T4 stage of TNM classification) in the form in encasement or stenosis/occlusion of main portal vein, its main branches or hepatic artery was noted in 11(17%) patients. Anterior abdominal wall was involved by contiguous spread of the mass in 7 patients.

Hilar or periportal lymphadenopathy was seen in 52(80%) patients (Fig. 1) while 21(32%) patients had retroperitoneal lymphadenopathy (Fig.2b). Twenty four (37%) patients had hepatic metastases. Peritoneal or omental deposits were noted in 7(11%) cases (Fig.1 and Fig.4a). Two patients had adrenal and one patient had splenic metastases (Fig 4b). One patient had bilateral heterogeneously enhancing solid-cystic adnexal mass (Fig 5) consistent with ovarian metastases (Krukenberg's tumor) along with multiple nodular peritoneal deposits and ascites. Eight patients had lung metastases in the visualised lung bases. The results are summarised in the Table 1.

Discussion:

Gallbladder carcinoma is a highly fatal disease. Most of the patients present as unresectable or metastatic disease. The reported sensitivity of CT scan for the detection of gallbladder carcinoma is over 90%.[4] The usual morphologic patterns of gallbladder carcinoma on imaging are mass replacing gall bladder (40-65%), focal or diffuse wall thickening (20-30%) and intraluminal polypoidal growth (15-25%).[5,6] In our study, the most common pattern was focal / polypoidal gallbladder mass which was seen in 31(48%) patients. Mass replacing gallbladder was seen in 12(18%) patients while focal or diffuse wall thickening was observed in 28(43%) patients. Cholelithiasis, a known risk factor for gallbladder cancer was seen in 30(46%) patients though CT scan is inferior to USG and MRI as noncalcified gallstones are not reliably visualised on CT scan.

T1 (tumor invading lamina propria or muscle layer) and T2 (tumor invading perimuscular connective tissue, but not extended beyond the serosa or into the liver) stages are difficult to differentiate reliably on CT scan. Endoscopic ultrasound (EUS) can be helpful to assess the depth of invasion of Gallbladder carcinoma with added advantage of EUS guided FNAC from the suspicious area or the lymph node in the same sitting.[7-9]

Gallbladder carcinoma has propensity to invade liver and other adjacent organs due to absence of muscularis mucosa and submucosa in the wall of gallbladder. Along the liver surface, the perimuscular connective tissue of gallbladder wall is continuous with the hepatic interlobular connective tissue. Sons et al in their autopsy series of 287 patients demonstrated direct extension to the liver in 65% of cases.[10]

In our study, hepatic invasion (T3 stage of TNM classification) was noted in 48(74%) patients. This may reflect regional variation as the disease is much more common and more aggressive in the north and north-east states (Gangetic belt) of India. George RA et al have also reported hepatic infiltration in 72% patients in their experience of 50 cases from north-east region of India.[11]

Bile duct infiltration causing stricture due to spread along the cystic duct occured in 54% cases in one series.[12] In our study, infiltration of the CHD and/or CBD was seen in 60% cases. Sometimes, the tumor infiltrates along the wall of the common duct proximally to involve the confluence with resultant non-communicating intrahepatic biliary radicle dilatation which was observed in our 12 patients. Minimum Intensity projection (MinIP) images, particularly in coronal plane were beneficial in the assessment of level of biliary obstruction. Most of the patients with bile duct infiltration are inoperable with curative intent resection possible only in 30% cases.[13]

Lymph node involvement in gallbladder carcinoma is common and predicts poor prognosis.[14] In our study, hilar or periportal lymphadenopathy was noted in 80% cases and distant retroperitoneal nodes were involved in 32% cases. Endo et al in 2006 and Sakata et al in 2010 reported that the number of positive nodes is a better predictor of the outcome after resection rather than topographical location of the positive nodes.[15,16] Subsequently, AJCC 8th edition has also modified N stage of TNM classification as N1 having metastases to one to three regional lymph nodes and N2 having metastases to four or more regional lymph nodes.[17]

Hematogenous metastases to the liver are common in gallbladder carcinoma. Lung, adrenal, osseous and cerebral metastases are infrequent.[10] CT scan reliably detects distant metastases. One of our patient had splenic metastases which is extremely rare in gallbladder carcinoma. To the best of our knowledge, there are only two published case reports of splenic metastasis in gallbladder cancer.[18,19]

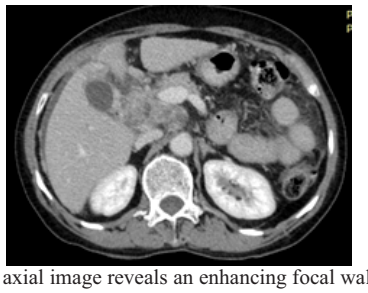

Fig.1: CECT axial image reveals an enhancing focal wall thickening (black arrow) of the medial wall of the Gallbladder (GB) along with necrotic pancreatico-duodenal lymph nodes (white broad arrows). Also note enhancing small nodular peritoneal deposits (white arrows) and ascites in the perihepatic region

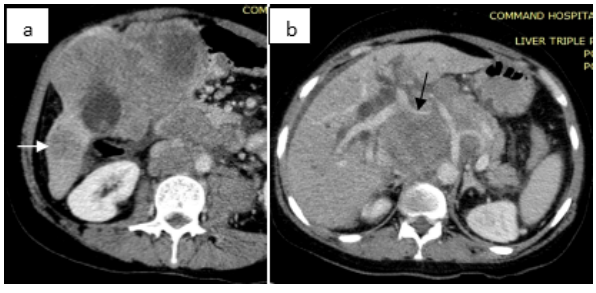

Fig.2a CECT axial image shows a large heterogeneously enhancing GB mass invading the liver. There is also metastasis (white arrow) in segment VI of liver. Fig.2b CECT axial image of the same patient shows conglomerate nodal mass encasing main portal vein (black arrow) causing its stenosis. There is also encasement of the celiac axis, proximal splenic artery and common hepatic artery by the nodal mass. Also note presence of intrahepatic biliary radicle dilatation.

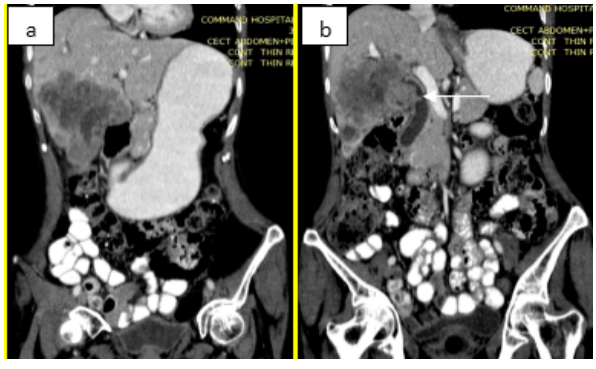

Fig.3a CECT coronal image shows a large mass replacing the Gallbladder with contiguous infiltration of the liver, duodenum and hepatic flexure. Fig.3b CECT coronal image of the same patient also shows mass infiltrating into the dilated CBD (white arrow).

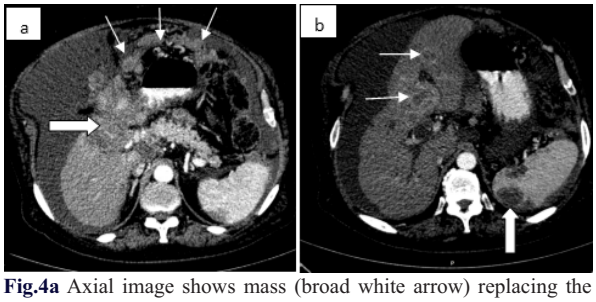

Fig.4a Axial image shows mass (broad white arrow) replacing the Gallbladder with contiguous infiltration of the duodenum and multiple enhancing omental deposits (white arrows). Fig.4b axial image of the same patient at higher level reveals shows hepatic metastases (white arrows) and hypodense splenic metastases (white broad arrow). There is also gross ascites.

Fig.5: Same patient as in Fig.1. There is a heterogeneously enhancing solid-cystic mass (white broad arrow) in the left adnexa. There is also brightly enhancing smaller mass (white arrow) in the right adnexa and free fluid in the pelvis.

Table 1: Imaging findings in 65 Histopathology proven cases of Gallbladder Carcinoma

Tumor Morphology	No. (Percent)
Focal or polypoidal mass	31(48%)
\Mass replacing Gallbladder	12(18%)
Focal or diffuse asymmetric Gallbladder wall thickening	28(43%)
Associated Cholelithiasis	30(46%)
Contiguous infiltration of Liver	48(74%)
Hepatic flexure / proximal transverse colon	14(21.5%)
Duodenum	26(40%)
Pancreas	6(9%)
Infiltration of CHD and/or CBD	39(60%)
Vascular involvement at hepatic hilum	11(17%)
Hilar or periportal lymphadenopathy	52(80%)
Retroperitoneal lymphadenopathy	21(32%)
Hematogenous and peritoneal metastases	43(66%)

Conclusions: Our study reveals that MDCT along with its multiplanar capability provides comprehensive information regarding the local extent of the disease, lymphatic, peritoneal and hematogenous metastases and thus, helps to assess the operability of the gallbladder carcinoma.

Disclosure: Authors report no competing interests in this work.

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