IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 17, Issue 9 Ver. 7 (September. 2018), PP 18-26
www.iosrjournals.org

Role of Multi-Phasic Contrast Enhanced Computed Tomography Scan In The Evaluation of Malignant Obstructive Jaundice

Nishant Yadav[1], Nihar Ranjan Mohanty[2], Madhusmita Mohanty[3]
1-Senior resident ,Department of Radiology, Apollo hospital, Bhubaneswar
2- Assistant professor,Department of Radiology, Kalinga institute of medical sciences, Bhubaneswar
3- Assistant professor,Department of Pathology, Kalinga institute of medical sciences, Bhubaneswar
Corresponding author: Nihar Ranjan Mohanty

Abstract
Introduction-*Multi phasic Multi detector computed tomography (MDCT) is an ideal method for evaluation of malignant obstructive jaundice due to its superb ability to visualise the biliary and vascular architecture of liver and pancreaticobilliary system . Aim of the study is to find out the role of MDCT scan in the evaluation of malignant obstructive jaundice with respect to nature, cause and level of the obstruction.*
Methods- *This was a prospective study conducted over period of 18 months. MDCT evaluation of 44 cases with suspected malignant obstructive jaundice with respect to nature ,cause and level of obstruction was performed.*
Results- *Mean age of patients 66±10.75 years. MDCT findings on the basis of level of obstruction(p=0.018) , with respect to nature of obstruction (p=0.001), to radiological TNM staging(p=0.018) showed significant association. There was 100% correlation between the MDCT diagnosis and the final diagnosis regarding the level and nature of obstruction. MDCT was able to determine the cause of obstruction with a sensitivity of 100 % and accuracy of 91.9% with only four cases being wrongly diagnosed. Most of the cases were in advanced stage of disease progression and their resectability was accurately assessed by MDCT scan with high sensitivity (94.12%) and specificity (88.89%) while correlating with final outcome i.e operative or palliative management. Most nonresectable tumours (Gall bladder and Cholangio carcinoma) involving the proximal intrahepatic or perihilar biliary channels were managed with Percutaneous stenting by interventional radiologists while most of the nonresectable distal pancreaticobilary tumours were managed with ERCP guided stenting by gastroenterology department.*
Conclusion- *MDCT with good reformatting techniques has excellent accuracy in the evaluation of malignant obstructive jaundice.*
key words: *Obstructive jaundice, Multi detector computed tomography (MDCT), Malignant.*

Date of Submission: 02-09-2018 Date of acceptance: 18-09-2018

I. Introduction

Obstructive jaundice is a type of jaundice in which there is blockage of flow of bile from the liver to the intestine resulting in redirection of excess bile and it's by-products like bilirubin into the blood. The most common causes of obstructive jaundice in adults other than choledocholithiasis are neoplasms of the pancreas, ampulla of Vater, or biliary tract and malignant biliary strictures.

Both non-invasive and invasive diagnostic tools are used for obstructive jaundice-ERCP (endoscopic retrograde cholangio-pancreatography) is the invasive method and noninvasive imaging methods used include ultrasound , Computed Tomography and, Magnetic resonance cholangio-pancreatography (MRCP). 64 SLICE Multiphasic CT has ability to obtain volume dataset with sub-millimetre spatial resolution allowing the optimal display of bile duct by using multiplanar reconstruction (MPR) and minimal intensity projection (MinIP) and axial CT significantly improves the visualization of the biliary ducts and their site of confluence .[1,2] In cases of jaundice with high likelihood of malignant biliary obstruction,a MDCT scan is recommended as the first line imaging method in this category. A contrast-enhanced multiphase spiral CT examination with multiplanar reformation has high sensitivity to lesion detection and 70% accuracy in discrimination of resectable and unrespectable disease and tumour staging.[3]

The purpose of the present study is to evaluate the accuracy of MDCT in evaluating level , nature and cause of obstruction of malignant obstructive jundice by comparing with ERCP, surgical or histopathological findings.

II. Material and methods

The present study was conducted in the Department of Radiology, Apollo hospital and KIMS Bhubaneswar and in the Department of Pathology, KIMS, Bhubaneswar .It is hospital based prospective study extending from January 2015 to June 2016.It included 44 patients referred for evaluation with complaints of persistent jaundice after fulfilling the inclusion and exclusion criteria and taking written /verbal informed consent .

Inclusion criteria were patients with gradually increasing progressive jaundice, USG finding of dilated intra hepatic billiary ducts, previously diagnosed cases of malignancy with history of chemo/radiotherapy treatment with fresh symptoms, patients with isolated conjugated hyperbilirubinemia or severely deranged liver function test. Exclusion criteria were patients with various benign ,infectious or inflammatory causes of jaundice like choledocholithiasis, cirrhosis, pancreatitis etc. ,known contraindications for contrast imaging i.e renal insufficiency, allergy to contrast and pregnancy, patients not giving consent for test.

Multi–phasic 64 slice computed tomography: Toshiba aquilion 64 at Apollo hospital, Bhubaneswar were used . Patients with atleast 6 hours of empty stomach underwent contrast enhanced CT scan abdomen with informed consent about possible contrast reaction. Axial scans were taken from level of lung bases to ischeal tuberosities followed by IV dynamic contrast scan with injection of contrast material (omnipaque,iohexol;360mg iodine/ml) .Sections were taken in non-contrast phase, Hepatic arterial phase(HAP-10s), Portal venous phase(PVP-40-50s), Hepatic venous phase(HVP-60-70s) and delayed phase(3-5mins) in cranio-caudal direction from superior margin to inferior border of liver. Post contrast reconstructions were done with sagittal and coronal reconstructions and newer techniques in Multi –slice CT like 3D volume rendering.

Statistical analysis was done from data collected from 44 cases of malignant obstructive jaundice were analysed with the help of SPSS 16.0 software. Frequencies and relative frequencies were computed for categorical variables and cross variables. Chi-square test of independence was used for test of association. Mean, standard deviation of scale variable, sensitivity, specificity, PPV, NPV and diagnostic accuracy were computed.

III. Results and discussions

In this study 44 cases of malignant obstructive jaundice were observed . The age composition revealed that majority of cases were reported in older age group (p=0.000).In the 35-39 age group ,only two cases were seen and remaining 42 were in the age group of 50-79.The mean age of patients was 66±10.75. Male to female ratio was found to be 1.3:1 . The difference was not statistically significant(p=0.450). In our study all cases presented with signs of jaundice. Loss of appetite and hyperbilirubinemia each found in 90.9% cases .

3.1-Case distribution of MDCT findings [Table-1]—Gallbladder carcinoma was the one which contributed half of the cases i.e among 22 (50%) cases .Out of which 17 cases presented with mass replacing GB fossa and remaining 5 cases presented with wall thickening (focal/diffuse). Cholangiocarcinoma was reported in 7 cases (15.9%) . These were subclassified into four groups. Two with exophytic porta hepatis delayed enhancing mass. Three with infiltrating periductal /intramural annular stenosing growth. One each with intrahepatic mass forming & intraductal polypoidal lesion. Pancreatic carcinoma was found in 4 cases. Primary liver malignancy i.e.hepato cellular carcinoma (HCC) detected in 3 cases(6.8%). Liver secondaries were reported in 4 case(9.1%). In our study carcinoma of gall bladder is most common cause of malignant obstructive jaundice as in India GB carcinoma is more prevalent in northern and north eastern states of Uttar Pradesh ,Bihar, Odisha(place of study),West Bengal and Assam which could be the reason commonest cause here surpassing the pancreatic carcinoma which is the most common cause worldwide. Sang Heum Bang et al [4] showed similar results.

3.2- MDCT findings with respect to level of obstruction[Table-2]- In our study majority of cases(33 cases or 75%) had extrahepatic obstruction.Out of 33 cases of extrahepatic obstruction,GB carcinoma(19 cases), cholangiocarcinoma (2 cases), pancreatic carcinoma(4 cases), periampullary lesion(4 cases), hepato cellular carcinoma(2 cases), liver secondaries(2 cases).Out of 11 cases of intrahepatic obstruction cholangiocarcinoma has highest i.e. 5 cases, GB carcinoma (3 cases), liver secondaries(2 cases), HCC(1 case). The evaluation of MDCT findings on the basis of level of obstruction showed significant association (p=0.018). GB carcinoma, pancreatic and periampullary malignant lesions have higher association with extrahepatic obstruction. Cholangiocarcinoma showing higher association with intrahepatic obstruction. Results of this study regarding level of obstruction correlates well with Rishi M et al [2],Pedrosa CS et al [5,6],Bhargava SK et al [7] and Upadhyaya V et al[8].

3.3- MDCT findings with respect to nature of obstruction[Table-3]-. The nature of obstruction was classified into 4 categories mainly i)Malignant stricture(13.6%), ii)Direct invasion by Mass lesion(40.9%), iii)Focal disease(15.9%) and iv)Extrinsic compression by lymph nodes(29.5%).“Direct invasion by mass lesion” was

predominant nature of obstruction in 18 cases, out of which 8 cases were GB carcinoma,4 with pancreatic malignancy, 3 with cholangiocarcinoma and 1 with HCC and other 2 with secondaries."Extrinsic compression by lymphnodes'' was second highest nature of obstruction with 13 cases, of which majority were GB carcinoma(9cases). Remaining 4 were HCC(2cases) and liver secondaries (2cases). "Focal disease'' was reported among 7 cases of which 4 were pancreatic carcinoma, 2 GB carcinoma and 1 cholangiocarcinoma. "Malignant stricture'' was reported in 6 cases of which 3 cases each with GB carcinoma and Cholangiocarcinoma. Chi square finds significant association of MDCT findings with Nature of obstruction(p=0.001).The results of this study regarding nature of obstruction correlates well with Reiman TH et al [9],Nesbit GM et al[10] and Rishi M et al[2].

3.4-Distribution of MDCT findings with respect to radiological TNM staging [Table-4] - There were no cases in TNM stage 0 and I . Cases with carcinoma of Gall bladder presented in advanced stages of disease i.e.in Stage III and IV- Stage III (7 cases) and Stage IV(12 cases) .Cases with cholangiocarcinoma also presented in advanced disease(Stage IV- 4 cases). All the periampullary lesions were in Stage III. All cases with primary liver malignancy (HCC) and liver metastasis were TNM Stage IV disease. Only 7 cases were in Stage II i.e. 3 cases of carcinoma gall bladder,2 cases of cholangiocarcinoma and 2 case of pancreatic carcinoma. MDCT findings showed significant association with reference to radiological TNM Staging(p=0.018).

3.5-Diagnostic efficacy of MDCT findings with respect to final diagnosis(Gold standard) i.e. cause of obstruction [Table-5]- All the MDCT findings matched with Final Diagnosis ,except 4 cases which showed GB carcinoma on MDCT evaluation but were found to be other causes on Gold standard test including 2 cases each of XGC(Xanthogranulomatous cholecystitis) and ADM (Adenomyomatosis) as found on post surgery specimen biopsy. These four cases are false positive cases. This concludes that MDCT may have lowest sensitivity (50%) and accuracy for the differentiation of ADM from carcinoma of Gall bladder in comparison to MRI(80.8%) and High Resolution Ultrasound HRUS(73.1%) (p>0.05).This finding correlates with study by Sang Heum Bang et al[4]. Diagnostic evaluation of MDCT with reference to Final Diagnosis-MDCT test results were compared with final diagnosis derived from Gold standard(MDCT guided biopsy/ERCP/ Peroperative findings with specimen biopsy).The sensitivity was 100% with 95% confidence interval as all positive cases came out to be True positive. Specificity was 0% as true negative were 0.The reason might be our study being based on the cases with high suspicion of malignant jaundice either clinically or biochemically or both. Diagnostic accuracy (91.9%) and positive predictive value (90.9%) were quite high.[Table-6] The above analysis indicated that MDCT is a good tool for evaluation of cause of malignant jaundice . Results of the study regarding nature of obstruction correlates well with Rishi M et al[2],Havrilla TR et al[29],Pedrosa CS et al[5,6],Baron RL et al[30] and Tillich M et al[17].

3.6-Diagnostic efficacy of MDCT scan in predicting resectability with reference to final outcome and management-Cross tabulation of respectability with radiological TNM staging [Table-7] - shows out of 44 cases ,19 were assumed to be resectable and 25 non- resectable. Out of resectable cases ,12(63.2%) were in Stage III and 7(36.8%) in Stage II. All the nonresectable cases were in Stage IV. Resectability and TNM Staging had a significant association(p=0.000).

3.7-Cross tabulation of Resectabilty with Final outcome [Table-8] –Out of 19 assumed to be resectable cases on MDCT evaluation ,16(84.2%) were operated. Out of 25 assumed to be nonresectable cases ,24(96%) were given palliative treatment. Final outcome has a significant association with resectability (p=0.000). MDCT evaluation shows quite high sensitivity and specificity with reference to Final outcome. Positive and negative likelihood were very high. Accuracy was very high of the order of 91%. These results indicate MDCT as a good tool for predicting resectability of malignant jaundice. Our study correlates well with House MG et al [31] ,Schwarz M et al[32] and Lee HY et al [33] with respect to efficacy of MDCT in predicting resectability.

Final outcome of patients in terms of operative (curative) and palliative treatment-Patients who had biliary obstruction either due to periampullary or pancreatic carcinoma underwent curative treatment in the form of whipple's pancreaticoduodenectomy or ERCP guided palliative stenting . Most of patients who were given palliative treatment correlated well with unresectability on MDCT assessment as demonstrated above.

Patients with perihilar , proximal or intrahepatic biliary obstruction in the form of Gall bladder malignancy, cholangiocarcinoma, hepatocellular carcinoma or liver malignancy underwent percutaneous stenting in unresectable cases[34] while most of nonresectable distal pancreaticobiliary tumours were managed with ERCP guided stenting by gastroenterology department[35,36]. Few cases of hepatocellular carcinoma underwent TACE(transarteial chemoembolization) which is a recent curative form of treatment in advanced cases[37]. Resectable cases were operated with simple or radical excision of involved organ systems. Most of the patients also underwent adjuvant chemotherapy besides the above management.

3.8-MDCT findings of malignant obstructive jaundice-

3.8.1-Gallbladder Carcinoma- Gallbladder carcinoma have three major imaging presentations: i) focal or diffuse enhancing thickening(>2.5mm) or irregularity of the gallbladder wall;ii)polypoidal enhancing mass originating in the gallbladder wall projecting into the lumen; and most commonly, iii)infiltrative irregularly enhancing mass obscuring or replacing gallbladder with scattered areas of necrosis[11,12] often invading the adjacent liver

3.8.2-Cholangiocarcinoma- Cholangiocarcinoma is classified anatomically into three groups :i) intrahepatic and peripheral to liver hilum, ii)hilar ,iii) extrahepatic. Cholangiocarcinomas are also divided into three types on the basis of their morphology which reflects biologic behaviour and mode of spread of tumour: i) mass forming ii)periductal infiltrating causing stricture; and iii)intraductal growing**.** MDCT has become the noninvasive diagnostic test of choice for detailed evaluation and staging of Cholangiocarcinoma.[13,14]Intrahepatic type cholangiocarcinoma shows a hypoattenuating mass either solitary or with satellite lesions on unenhanced CT. After the administration of contrast medium there is irregular peripheral and patchy enhancement in the tumour. The dense fibrotic nature of tumour often produces capsular retraction .Small necrotic intralesional areas and focal intra hepatic biliary duct dilatation around the mass are common.[15]On delayed (10-15 minutes) scans, there is progressive and concentric filling of the contrast material. Intrahepatic cholangiocarcinoma may also be polypoid or focally stenotic. Focally stenotic or papillary cholangiocarcinomas often cause segmental bile duct dilatation and may induce lobar atrophy if the tumour is central in location. Hilar type cholangiocarcinomas(Klatskin'tumour) most often occur at the confluence of the right and left bile ducts and proximal common hepatic ducts are usually periductal infiltrating types.[16] The mass is hypodense to liver on unenhanced CT. On contrast enhanced CT ,infiltrating tumours are seen as focal thickening of duct wall, obliterating the lumen, showing hyperattenuation on arterial and portal venous phase with delayed (8-15 minutes) contrast enhancement .[17 ,18]

3.8.3-Pancreatic carcinoma- On dynamic contrast enhanced MDCT the tumour is seen as a focal area of poor enhancement in densely enhancing normal pancreatic tissue and this is classical direct sign for tumour detection. For diagnosis of this lesion there are six indirect signs : the presence of (1) biliary duct dilatation,(2) pancreatic duct dilatation,(3) double duct sign which may lead to ,(iv) focal atrophy of the gland. If mass is sufficiently large it will (5) distort contour of the gland , and (6)loss of pancreatic lobulation is a subtle , but often early sign[19]. MDCT findings that indicate arterial invasion include soft tissue infiltration obscuring vessel margin, calibre change, or contour deformity. Li et al [20] assessed presence of circumferential vessel contact with tumor to define vascular infiltration(either arterial or venous) and opined that a tumor-vessel contact $>180^0$ indicate invasion and $<90^0$ indicate low probability of infiltration.

3.8.4-Ampullary carcinoma-includes carcinomas of the duodenum, distal bile duct ,ampulla of vater, and adjoining pancreas. Morphologically , Ampullary carcinomas are classified into following three types:(1) intramural protruding(intra-ampullary),(2) extra mural protruding (periampullary), and (3) ulcerating ampullary. The most common site of cellular atypia is found in the area of the common pancreaticobiliary channel,followed by pancreatic duct,duodenal epithelium ,and brunner's glands .[21]

3.8.5-Hepatocellular Carcinoma(HCC)- Venous invasion is commonly seen in high grade and large tumours with poorer prognosis.[22] Arterioportal shunting, mosaic pattern (confluent small nodules with interspersed septa and areas of necrosis) , central scar, tumor capsule and fatty metamorphosis are few of the important features of HCC that can be appreciated on diagnostic imaging.[23]Small overt HCC on unenhanced CT scan appear iso to hypodense to liver parenchyma, show typical hypervascular pattern with clear-cut enhancement in HAP (arterial phase)and rapid wash-out in PVP(portal venous phase).[24]

3.8.6-Liver metastasis- The liver is the most common site of metastasis from the gastrointestinal tract, pancreas ,breast and lung.[25] On NCCT hypovascular metastasis appear hypodense, show peripheral enhancement in HAP and PVP contrast enhanced scans[26,27]. Hypervascular metastasis are detected best in HAP which shows strong contrast enhancement , become isodense to liver parenchyma on PVP.[28]

IV. Conclusion

MDCT with reformatting techniques was very accurate in picking the nature, cause and level of obstruction and assessing the resectability of tumor, evaluation of malignant obstructive jaundice and guiding further management. The major limitation of our study was the small sample size which led to a very low specificity in assessing the cause of malignant obstructive jaundice.

Conflict of interest -Nil.

Reference

[1]. Ferrari FS, Fantozzi F, Tasciotti L, Vigni F, Scotto F, Frasci P. US, MRCP, CCT and ERCP: a comparative study in 131 patients with suspected biliary obstruction. Med Sci Monit. 2005; 11: MT8-18.

[2]. Rishi M, Suresh H, Moorkath abdunnisar. Value and accuracy of multidetector computed tomography in obstructive jaundice.Panacea journal of medical sciences. September - December 2015 : 5(3);137 - 144.

[3]. Tongdee T, Amornvittayachan O, Tongdee R. Accuracy of multidetector computed tomography cholangiography in evaluation of cause of biliary tract obstruction. J Med Assoc Thai 2010; 93:566-73.

[4]. Bang SH1, Lee JY1, Woo H1, Joo I1, Lee ES1, Han JK1, Choi BI1 Differentiating between adenomyomatosis and gallbladder cancer: revisiting a comparative study of high-resolution ultrasound, multidetector CT, and MR imaging. Korean J Radiol. 2014 Mar-Apr;15(2):226-34.

[5]. Pedrosa CS, Casanova R and Rodriguez R. Computed Tomography in Obstructive Jaundice -PartI: The level of Obstruction Radiology.1981June; 139:627-634.

[6]. Pedrosa CS, Casanova R, Lezana AH and Fernandez MC. Computed Tomography in Obstructive Jaundice - Part II: The cause of Obstruction. Radiology. 1981 June; 139:635-645.

[7]. Bhargava SK, Usha T, Bhatt S et al. Imaging in Obstructive Jaundice: A Review with Our Experience. JIMSA. JanuaryMarch 2013;.26:12-14.

[8]. Upadhyaya V, 126..Upadhyaya DN, Ansari MA, Shukla VK. Comparative Assessment of Imaging Modalities in Biliary Obstruction. Indian J Radiology Imaging. 2006November; 16:577-582.

[9]. Reiman TH, Balfe DM, Weyman PJ. Suprapancreatic biliary obstruction: CT evaluation. Radiology. 1987 Apr;163(1):49-56.

[10]. Nesbit GM, Johnson CD, James EM, Mac Carty RL, Nagorney DM, Bender CE. Cholangiocarcinoma: diagnosis and evaluation of resect ability by CT and sonography as procedures complementary to cholangiography. AJR Am J Roentgenol. 1988 Nov;151(5):933-8.

[11]. Wilbur AC, Sagireddy PB, Aizenstein RI: Carcinoma of the gallbladder: Color Doppler ultrasound and CT findings. Abdom Imaging 22:187-190 1997.

[12]. Levy AD, Murakata LA, Rohrmann CA, Jr: Gallbladder carcinoma: Radiologic-pathologic correlation. Radiographics 21:295-314, 2001.

[13]. Lim JH: Cholangiocarcinoma: Morphologic classification according to growth pattern and imaging findings. AJR Am J Roentgenol 181:819-827, 2003.

[14]. Sainani NI, Catalano OA, Holakere NS, et al: Cholangiocarcinoma: Current and novel imaging techniques. Radiographics 28:1263-1287, 2008.

[15]. Choi BI, Lee JM, Han JK: Imaging of intrahepatic and hilar cholangiocarcinoma. Abdom Imaging 29:548-557, 2004.

[16]. Klatskin G: Adenocarcinoma of the hepatic duct at its bifurcation with the porta hepatis. Am J Med 38:241-256, 1965.

[17]. Tillich M, Mischinger H-J, Preisengger K-H, et al: Multiphasic helical CT in diagnosis and staging of hilar cholangiocarcinoma. AJR Am J Roentgenol 171:651-656, 1998.

[18]. Soyer P, Bluemke DA, Reichle R, et al: Imaging of intrahepatic cholangiocarcinoma. 2. Hilar cholangiocarcinoma. AJR Am J Roentgenol 165:1433-1436, 1995.

[19]. The Pancreas.Wolfgang Schima, E. Jane Adam, Robert A. Morgan. Grainger & Allison's diagnostic radiology.6TH Edition.

[20]. Li H, Zeng MS, Zhou KR, et al. Pancreatic adenocarcinoma. The different CT criteria for peripancreatic major arterial and venous invasion. J Comput Assist Tomogr 2005;29:170-5.

[21]. Kimura W, Ohtsubo K. Incidence, sites of origin, and immunohistochemical and histochemical characteristics of atypical epithelium and minute carcinoma of the papilla of Vater. Cancer 1988; 61:1394-402.

[22]. Stevens WR, Johnson CD, Stephens DH, et al. CT findings in hepatocellular carcinoma: correlation of tumor characteristics with causative factors, tumor size, and histologic tumor grade. Radiology. 1994; 191:531-37.

[23]. Stevens WR, Gulino SP, Batts KP, et al. Mosaic pattern of hepatocellular carcinoma: histologic basis for a characteristic CT appearance. J Comput Assist Tomogr. 1996; 20:337-42.

[24]. Ichikawa T, Kitamura T, Nakajima H, et al .Hyper vascular hepatocellular carcinoma: can double arterial phase imaging with multidetector CT improve tumor depiction in the cirrhotic liver. AJR Am J Roentgenol 2002;179:751-58.

[25]. Edmunson H, Craig J. Neoplasms of the liver. In: Schiff L (ed) Diseases of the liver, 8th edn. Philadelphia: Lippincott; 1987(p 1109).

[26]. Yoshikawa J, Matsui O, Kadoya M, et al: Delayed enhancement of fibrotic areas in hepatic masses: CT-pathologic correlation. J Comput Assist Tomogr 16:206-211, 1992.

[27]. Terayama N, Matsui O, Ueda K, et al: Peritumoral rim enhancement of liver Metastasis: Hemodynamics observed on single-level dynamic CT during hepatic arteriography and histopathologic correlation. J Comput Assist Tomogr 26:975-980, 2002.

[28]. Namasivayam S, Martin DR, Saini S: Imaging of liver metastases: MRI.Cancer Imaging 7:2-9, 2007.

[29]. Havrilla TR, Haaga JR,Alfidi RJ,Reich NE.Computed tomography and obstructive biliary disease AJR,1977;128(5):765-768.

[30]. Baron RL, Stanley RJ, Lee JK, Koehler RE, Levitt RG. Computed tomographic features of biliary obstruction. AJR Am J Roentgenol.1983 Jun;140:1173-8.

[31]. House MG, Yeo CJ, Cameron JL, Campbell KA, Schulick RD, Leach SD, et al.Predicting resectability of periampullary carcinoma using three dimensional computed tomography. J Gastrointest Surg.2004;Mar-Apr;8(3):280-8.

[32]. Schwartz M1,Pauls S,Sokiranski R,Brambs HJ,Glasbrenner B,Adler G, Deiderichs CG, Reske SN, Moller P,Beger HG. Is a preoperative multidiagnostic approach to predict surgical resectability of periampullary tumors still effective? Am J Surg.2001 Sep;182(3):243-9.

[33]. Lee HY,Kim SH, Lee JM, et al.Preoperative assessment of resectability of hepatic hilar cholangiocarcinoma: combined CT and cholangiography with revised criteria.Radiology 2006;239:113-121.

[34]. Van Delden OM, Lameris JS. Percutaneous drainage and stenting for palliation of malignant bile duct obstruction.Eur Radiol 2008;18:448-456.

[35]. Singhal D,Van Gulik TM,Gouma DJ(2005) Palliative management of hilar cholangiocarcinoma.Surg Oncol 14:59-74.

[36]. Ramulla A,Baron TH(1999) :Evaluation and endoscopic palliation of cholangiocarcinoma.Dig Dis 17:194-200.

[37]. Yamada R,Kishi K, Sato M, Sonamura T,Nishida N, Tanaka K,Shioyama Y,Terada M, Kimura M. Transcatheter arterial chemoembolization (TACE) in the treatment of unresectable liver cancer. World J Surg.1995 Nov-Dec ;19(6):795-800.

Table 1 -Distribution of cases by MDCT findings

MDCT Finding (Broadly Classified)	MDCT Findings (Sub classified)	No.	%
Gall Bladder Carcinoma	Wall Thickening (Focal/Diffuse)	5	11.4
	Mass Replacing GB Fossa	17	38.6
	Sub-Total	22	50
Cholangiocarcinoma	Exophytic Porta Hepatis Delayed Enhancing Mass	2	4.5
	Infiltrating Periductal/Intramural Annular Stenoting Growth	3	6.8
	Intrahepatic Mass Forming	1	2.3
	Intraductal Polypoidal Lesion	1	2.3
	Sub-Total	7	15.9
Pancreatic Carcinoma	Ill Defined Early Arterial Hypoenhancing Lesion in Head/Uncinate Process	4	9.1
	Sub-Total	4	9.1
Periampullary Lesion	Periampullary Lesion	4	9.1
	Sub-Total	4	9.1
Focal /Multifocal Strong Arterial Enhancing Liver Mass With Venous Washout (HCC)	Focal /Multifocal Strong Arterial Enhancing Liver Mass with Venous Washout (HCC)	3	6.8
	Sub-Total	3	6.8
Liver Secondaries	Liver Secondaries	4	9.1
	Sub-Total	4	9.1
Total		*44*	*100*

Table -2 Distribution of MDCT findings on the basis of level of obstruction

MDCT Finding (Broadly Classified)	Level of Obstruction						'p' value
	Intrahepatic		Extrahepatic		Total		
	No.	%	No.	%	No.	%	
Gall Bladder Carcinoma	3	13.60	19	86.40	22	100	p=0.018
Cholangiocarcinoma	5	71.40	2	28.60	7	100	
Pancreatic Carcinoma	0	0.00	4	100.00	4	100	
Periampullary Lesion	0	0.00	4	100.00	4	100	
Focal /Multifocal Strong Arterial Enhancing Liver Mass With Venous Washout (HCC)	1	33.30	2	66.70	3	100	
Liver Secondaries	2	50.00	2	50.00	4	100	
Total	11	25.00	33	75.00	44	100	

Table-3 Distribution of cases by MDCT findings by Nature of obstruction

MDCT Finding (Broadly Classified)	Nature of Obstruction								'p' value
	Malignant Stricture		Direct Invasion by Mass lesion		Focal Disease		Extrinsic Compression by lymph nodes		
	No	%	No	%	No	%	No	%	
Gall Bladder Carcinoma	3	6.8	8	18.2	2	4.5	9	20.5	p=0.001
Cholangiocarcinoma	3	6.8	3	6.8	1	2.3	0	0.0	
Pancreatic Carcinoma	0	0.0	4	9.1	0	0.0	0	0.0	
Periampullary Lesion	0	0.0	0	0.0	4	9.1	0	0.0	
Focal /Multifocal Strong Arterial Enhancing Liver Mass With Venous Washout (HCC)	0	0.0	1	2.3	0	0.0	2	4.5	
Liver Secondaries	0	0.0	2	4.5	0	0.0	2	4.5	
Total	6	13.6	18	40.9	7	15.9	13	29.5	

Table 4 Distribution of MDCT findings on the basis of radiological staging

MDCT Finding (Broadly Classified)	Radiological TNM Staging						'p' value
	STAGE 0	STAGE I	STAGE II	STAGE III	STAGE IV	Total	

	No/%	No/%	No./%	No./%	No./%	No./%	
Gall Bladder Carcinoma	0(0%)	0(0%)	3(6.8%)	7(15.9%)	12(27.3%)	22(50%)	p=0.018
Cholangiocarcinoma	0(0%)	0(0%)	2(4.5%)	1(2.3%)	4(9.1%)	7(15.9%)	
Pancreatic Carcinoma	0(0%)	0(0%)	2(4.5%)	0(0%)	2(4.5%)	4(9.1%)	
Periampullary Lesion	0(0%)	0(0%)	0(0%)	4(9.1%)	0(0%)	4(9.1%)	
Biliary Compression by Extrahepatic Malignant Nodes	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	
Focal /Multifocal Strong Arterial Enhancing Liver Mass With Venous Washout (HCC)	0(0%)	0(0%)	0(0%)	0(0%)	3(6.8%)	3(6.8%)	
Liver Secondaries	0(0%)	0(0%)	0(0%)	0(0%)	4(9.1%)	4(9.1%)	
Total	0(0%)	0(0%)	7(15.9%)	12(27.3%)	25(56.8%)	44(100%)	

Table 5 MDCT findings vis-a-vis final diagnosis

Etiology of Malignant obstructive Jaundice	**MDCT Finding (Broadly Classified)**		**Final Diagnosis**	
	No.	**%**	**No.**	**%**
Gall Bladder Carcinoma	22	50	18	40.9
Cholangiocarcinoma	7	15.9	7	15.9
Pancreatic Carcinoma	4	9.1	4	9.1
Periampullary Lesion	4	9.1	4	9.1
Focal /Multifocal Strong Arterial Enhancing Liver Mass With Venous Washout (HCC)	3	6.8	3	6.8
Liver Secondaries	4	9.1	4	9.1
Others	0	0	4	9.1
Total	44	100	44	100

Table 6 Results of evaluation : Cause of obstruction

Statistic	**value**	**95% CI**
Sensitivity	100.00%	91.19% to 100.00%
Specificity	0.00 %	0.00% to 60.24%
Positive Likelihood Ratio	1.00	1.00 to 1.00
Diagnostic Accuracy	91.9%	
Positive Predictive Value	90.91%	90.91% to 90.91%

Table 7 Comparison of resectability by radiological TNM staging

Radiological TNM Staging	**Resectability**						**'p' value**
	Resectable		**Nonresectable**		**Total**		
	No.	**%**	**No.**	**%**	**No.**	**%**	
STAGE 0	0	0.0	0	0.0	0	0.0	p=0.000
STAGE I	0	0.0	0	0.0	0	0.0	
STAGE II	7	36.8	0	0.0	7	15.9	
STAGE III	12	63.2	0	0.0	12	27.3	
STAGE IV	0	0.0	25	100	25	56.8	
Total	19	100	25	100	44	100	

Table 8 Comparison of Resectability with final outcome

Resectability	**Final Outcome**						**'p' value**
	Operated		**Palliative**		**Total**		
	No.	**%**	**No.**	**%**	**No.**	**%**	
Resectable	16	84.2	3	15.8	19	100	p=0.000
Nonresectable	1	4	24	96	25	100	
Total	17	38.6	27	61.4	44	100	

Figures

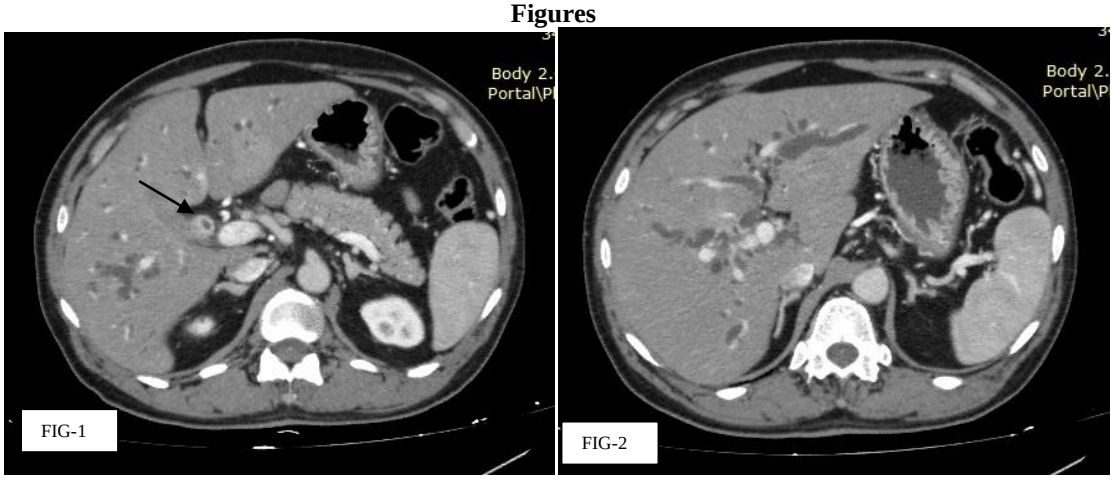

Fig-1-Extra hepatic cholangiocarcinoma of common hepatic duct .**Fig-2** same case as fig -1with IHBR dilatation

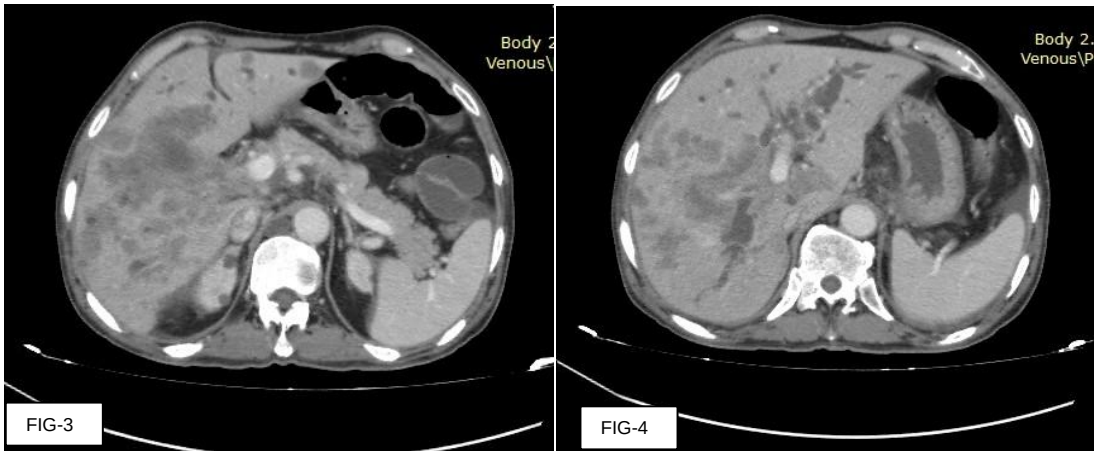

Fig-3 infiltrative carcinoma Gall bladder(GB) **Fig-4** Carcinoma GB with IHBR dilatation

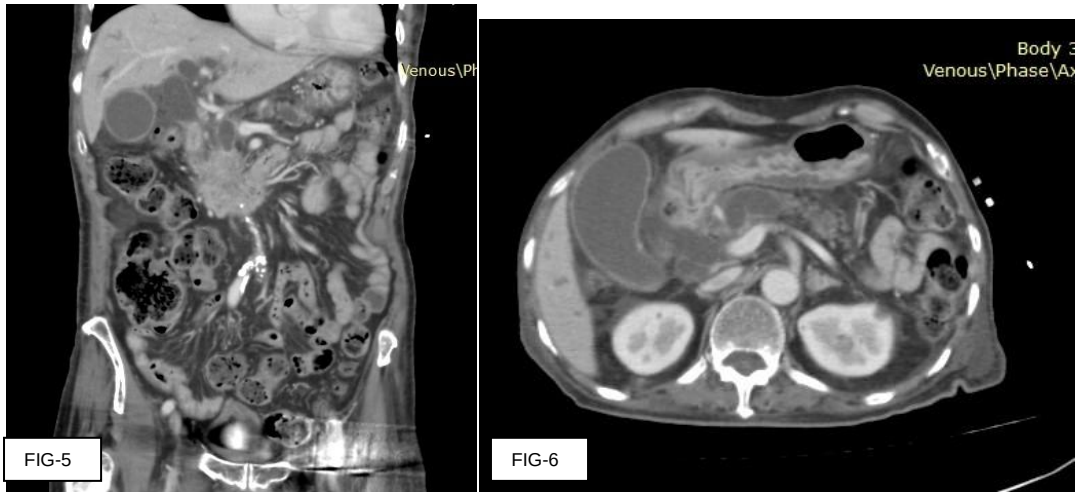

FIg-5 Carcinoma head of Pancrease **Fig-6** Double duct sign in Carcinoma head of Pancrease

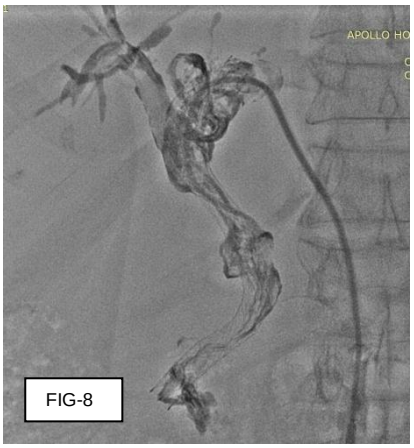

Fig 7 Dilated IHBRs before PercutaneousTranshepatic Billary Drainage(PTBD) procedure in malignant stricture
Fig-8 Normal appearing IHBRs post PTBD procedure

Nishant Yadav" Role of Multi-Phasic Contrast Enhanced Computed Tomography Scan In The Evaluation of Malignant Obstructive Jaundice ."IOSR Journal of Dental and Medical Sciences (IOSR-JDMS), vol. 17, no. 9, 2018, pp 18-26.