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ROLE OF MDCT IN THE EVALUATION OF FOCAL PANCREATIC MASS LESIONS

Radiology

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ABSTRACT

Background: Pancreatic lesions, both benign and malignant, present diagnostic challenges due to overlapping imaging features. Multidetector computed tomography (MDCT) is now the preferred modality for comprehensive assessment, characterisation and surgical planning of various lesions and future mangement options (Sahani et al., 2004). **Aims & Objectives:** The study evaluates the diagnostic role of MDCT in the assessment of focal pancreatic mass lesions. The objectives are to analyze the imaging characteristics of these lesions, their differential diagnosis, complications and extent of involvement of the surrounding structures, determine MDCT's sensitivity and specificity, and assess its concordance with histopathological, surgical, and clinical reference standards. **Materials And Methods:** This prospective observational study included 50 patients with clinically suspected or incidentally detected pancreatic lesions who underwent contrast-enhanced MDCT. Imaging features were analyzed and correlated with histopathological/surgical findings or clinical/radiological follow-up. **Results:** Out of 50 lesions evaluated, 31 were malignant and 19 benign. MDCT showed high diagnostic concordance with the composite reference standard, with a sensitivity of 93.55% and specificity of 63.16%. **Conclusion:** MDCT provides reliable morphological and functional assessment of pancreatic lesions. It is a highly sensitive modality for differentiating benign from malignant lesions and plays a crucial role in staging, planning resection, and guiding clinical management.

KEYWORDS

Multidetector Computed Tomograhy (MDCT); pancreatic mass lesions; resectability assessment; diagnostic accuracy

INTRODUCTION

Pancreatic lesions vary from benign pseudocysts to aggressive malignancies, with pancreatic adenocarcinoma being the most lethal (McGuigan et al., 2018). The deep retroperitoneal location of the pancreas complicates early diagnosis. MDCT, with high spatial resolution and multiplanar capability, allows accurate evaluation of morphology, ductal involvement, and vascular invasion (Sahani et al., 2004). However, overlapping features between benign and malignant lesions remain a diagnostic hurdle (Elta et al., 2017). This study evaluates MDCT's diagnostic accuracy and staging performance in pancreatic lesions, correlating findings with histopathology, surgical exploration, and clinical/radiological follow-up to assess real-world utility.

MATERIALS AND METHODS

This prospective study was conducted in the Department of Radiodiagnosis and Imaging, Government Medical College, Amritsar. Fifty patients with clinically suspected or incidentally detected pancreatic lesions were consecutively enrolled over the study period after obtaining informed written consent. Inclusion criteria comprised adult patients with relevant clinical, biochemical, or ultrasonographic evidence of pancreatic abnormalities who were eligible to undergo contrast-enhanced MDCT. Exclusion criteria included contrast allergy, renal insufficiency (eGFR <30 mL/min/1.73 m²), pregnancy, acute pancreatitis, or loss to follow-up. All patients underwent contrast-enhanced MDCT on a 64-slice scanner using a triple-phase protocol: arterial (20–25 s), pancreatic parenchymal (40–45 s), and portal venous (65–70 s) phases (Catalano et al., 2000). A non-ionic iodinated contrast agent was administered at 1.5 mL/kg via power injector. Multiplanar reconstructions were analyzed for lesion characteristics, ductal involvement, vascular encasement, lymphadenopathy, and metastases. Final diagnosis was based on histopathology (when available), surgical findings, or clinical/imaging follow-up over 3–6 months. Diagnostic metrics and ROC analysis were calculated using standard statistical tools.

RESULTS

A total of 50 patients were included in the study, comprising 31 males (62%) and 19 females (38%), with a mean age of 52 ± 16.75 years. The predominant clinical symptom was abdominal pain (72%), followed by loss of appetite (36%) and jaundice (28%). Less frequent symptoms included pruritus and generalized weakness.

Lesions were most commonly located in the head (40%) and body (30%) of the pancreas, followed by the tail (18%) and uncinate process (12%). Malignant lesions predominantly involved the pancreatic head and body, whereas benign lesions exhibited a more variable distribution. However, no statistically significant correlation was observed between lesion location and malignancy ($p = 0.23$).

Assessment of imaging features revealed that ill-defined margins were significantly associated with malignant lesions (48% vs. 11% in benign lesions; $p = 0.006$). Homogeneously enhancing hypodense lesions were more frequently malignant ($p = 0.0028$), while cystic lesions were predominantly benign (15 out of 17; $p < 0.001$). Conversely, solid lesions demonstrated a strong correlation with malignancy (24 out of 27; $p < 0.001$). Mixed lesions did not show a statistically significant association with malignancy ($p = 0.77$). Necrosis was more frequently noted in malignant lesions (78%), though it did not achieve statistical significance ($p = 0.054$).

Main pancreatic duct (MPD) dilatation was observed in a significantly greater proportion of malignant cases ($p = 0.02$), supporting the diagnostic utility of the "double duct sign." (Rajan, Sinha, & Misra, 2021) Vascular involvement was identified exclusively in malignant lesions, yielding a specificity of 100% ($p < 0.001$). Regional lymphadenopathy and hepatic metastasis were also strongly associated with malignancy ($p < 0.001$ for both) (Granata et al., 2020).

Ancillary findings such as ascites and pleural effusion did not demonstrate significant discriminatory value ($p = 0.264$ and $p = 0.16$, respectively). Biochemical analysis revealed that elevated serum alkaline phosphatase (ALP) levels were significantly correlated with malignant lesions ($p < 0.001$), whereas serum bilirubin levels were not

(p = 0.90).

The diagnostic performance of MDCT was evaluated by comparing imaging findings against the composite reference standard, which included histopathology, intraoperative findings, and follow-up imaging. MDCT accurately identified 29 true positives and 12 true negatives, with 2 false negatives and 7 false positives. The diagnostic metrics were as follows: sensitivity 93.55%, specificity 63.16%, positive predictive value (PPV) 80.56%, negative predictive value (NPV) 85.71%, and overall diagnostic accuracy 82%. The area under the receiver operating characteristic (ROC) curve was 0.78.

Figures:

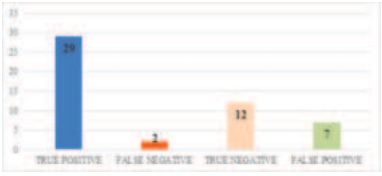

Figure 1: Bar chart showing concordance between MDCT diagnosis and composite reference standard.

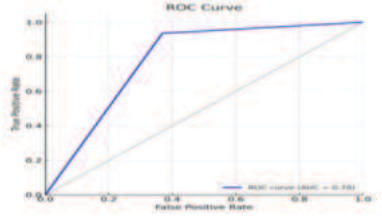

Figure 2: ROC curve demonstrating diagnostic accuracy of MDCT in differentiating malignant from benign pancreatic lesions.

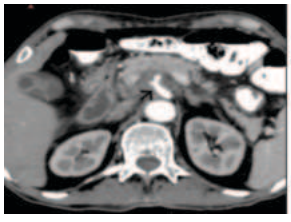

Figure 3(a)

Figure 3(b)

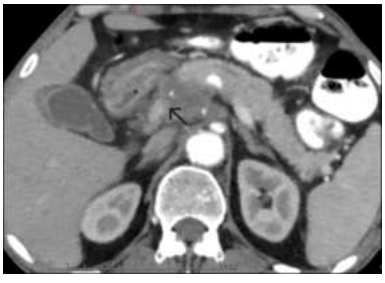

Figure 3(c)

Figure 3 (a), (b) & (c): CECT abdomen images show an ill-defined heterogenously enhancing hypodense lesion in the pancreatic head demonstrating >180° encasement of the celiac trunk, proximal common hepatic, and splenic arteries, without aortic involvement. The mass also involved the proximal portal vein with contour irregularity. Diagnosis of unresectable pancreatic adenocarcinoma (NCCN criteria) was made based on MDCT findings, confirmed on surgery, thus aiding the accurate pre-operative assessment of resectability.

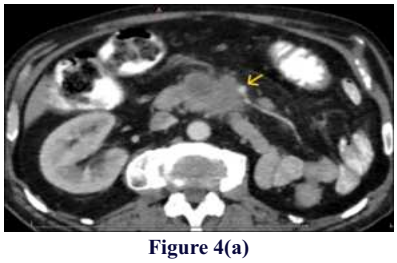

Figure 4(a)

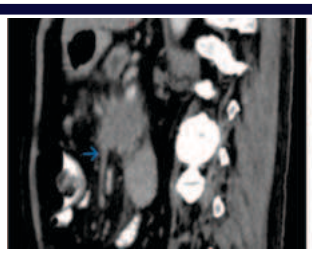

Figure 4(b)

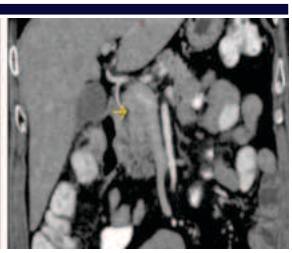

Figure 4(c)

Figure 4(a), 4(b) & 4(c): CECT abdomen images revealed a heterogeneously enhancing hypodense mass in the pancreatic head and uncinate process. The lesion abutted the superior mesenteric artery (SMA) with <180° contact and encased the superior mesenteric vein (SMV) >180° without luminal invasion or contour irregularity. These MDCT wfindings are consistent with borderline resectable pancreatic adenocarcinoma per NCCN criteria, confirmed on surgery, thus supporting the excellent staging performance of MDCT in pancreatic mass lesions.

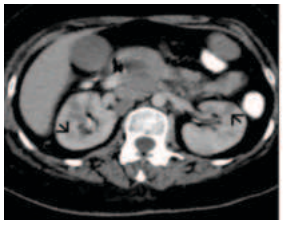

Figure 5(a)

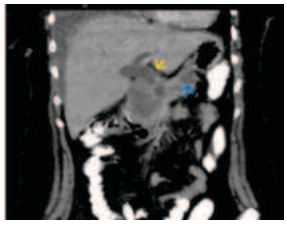

Figure 5(b)

Figure 5(a) & 5(b): CECT abdomen findings revealed a bulky pancreas with multiple hypodense solid-cystic lesions across the head, body, and tail. Associated findings included renal granulomas, biliary obstruction, dilated pancreatic duct, and right-sided pleural effusion with lung collapse. The pancreatic pathology was characterized benign based on MDCT findings, and on histopathology, it was found to be granulomatous pathology indicating pancreatic tuberculosis, thus demonstrating high concordance between MDCT interpretations and the composite reference standard.

DISCUSSION

This study reaffirms MDCT's utility in evaluating focal pancreatic lesions, consistent with prior findings (Scaglione et al., 2019; Zamboni et al., 2014). The observed diagnostic accuracy of 82% and sensitivity of 93.5%, demonstrate the utility of MDCT in detecting malignant pancreatic lesions and predicting vascular invasion.

Ill-defined lesion margins, solid consistency, and homogeneous enhancement in hypodense lesions emerged as key predictors of malignancy, consistent with typical imaging characteristics of pancreatic adenocarcinoma. Vascular encasement (Rajan et al., 2021) and hepatic metastases were exclusive to malignant lesions in this study, which further confirms MDCT's efficacy in preoperative staging and surgical decision-making.

Cystic morphology and non-enhancing hypodense lesions were strongly associated with benignity, such as pseudocysts or cystadenomas, as described by Keogan et al. (2002). The elevated ALP levels in malignancy cases add biochemical corroboration to the radiological diagnosis, though bilirubin levels lacked discriminatory value.

False positives were mostly due to inflammatory masses like autoimmune pancreatitis or tuberculous involvement mimicking neoplasia. False negatives occurred in cases of isoattenuating or small-volume tumors (<2 cm), highlighting a recognized limitation of MDCT. (Elbanna et al., 2016), often requiring adjunct EUS or MRI. The study also highlights MDCT's role in detecting pancreatic tuberculosis and chronic pancreatitis masquerading as neoplasm

The AUC of 0.78 suggests a good overall discriminatory ability. However, moderate specificity (63.1%) indicates that benign lesions with atypical features may still be misclassified, warranting careful correlation with clinical data and, where possible, histopathological confirmation.

The use of a composite reference standard, although necessary in real-

world settings, introduces potential bias, particularly in non-operated patients. Furthermore, our single-center design and moderate sample size may limit generalizability. Despite these constraints, the findings demonstrated high concordance between MDCT interpretations and the composite reference standard, reinforcing MDCT's role in guiding surgical planning and treatment decisions. The study supports the growing clinical practice of integrating imaging, pathology, and follow-up for accurate diagnostic conclusions.

CONCLUSION

MDCT is a powerful and accessible imaging tool for evaluating focal pancreatic masses. Its ability to accurately differentiate benign from malignant lesions, assess local invasion, and determine surgical resectability makes it indispensable in modern pancreatic cancer management. When integrated with clinical, laboratory, and follow-up data, it offers robust performance in guiding diagnosis, evaluating resectability, and planning appropriate management strategies.

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