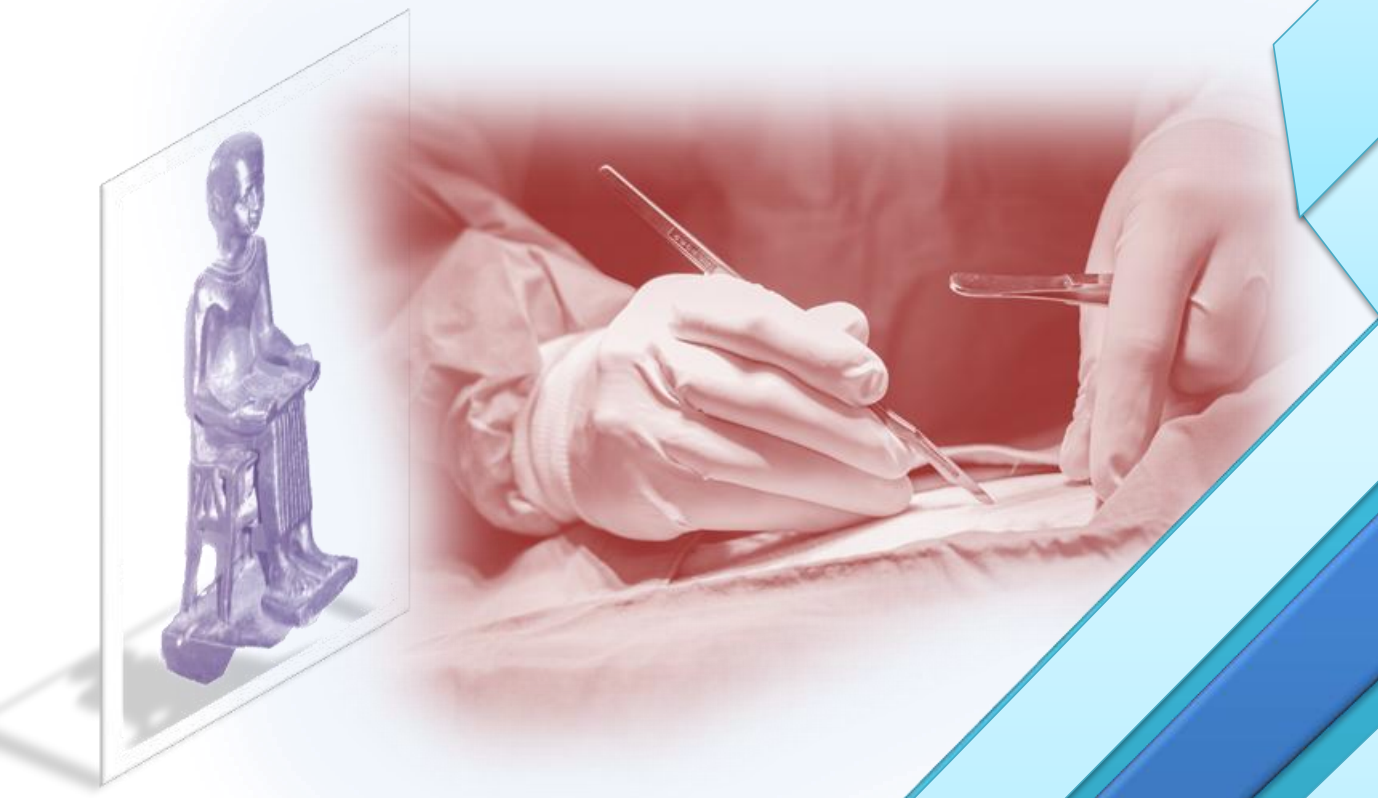
IJMA

International Journal of Medical Arts

Volume 7, Issue 9 (September 2025)



http://ijma.journals.ekb.eg/

P-ISSN: 2636-4174

E-ISSN: 2682-3780

Available online on Journal Website
https://ijma.journals.ekb.eg
Main Subject [Radiology]

Original Article

Assessment of Resectability of Pancreatic Carcinoma by Computed Tomography

Rasha Abdelhafiz Aly[1]; Hany Abdel Maguid Shoreem[2]; Sarah Ali Mohammed Nounou[1]*; Enas Mohammed Koryem[1]; Hazem Metwaly Omar[1]

[1] Department of Diagnostic and Interventional Radiology, National Liver Institute, Menoufia University, Shebin El-Kom, Menoufia, Egypt.

[2] Department of Hepatopancreatic Biliary Surgery, National Liver Institute, Menoufia University, Shebin El-Kom, Menoufia, Egypt.

Article information

Received: 05-05-2025

Accepted: 30-06-2025

DOI: 10.21608/ijma.2025.382096.2178

*Corresponding author

Email: sarah.aly355@gmail.com

Citation: Aly RA, Shoreem HAM, Nounou SAM, Koryem EM, Omar HM. Assessment of Resectability of Pancreatic Carcinoma by Computed Tomography. IJMA 2025 Sept; 7 [9]: 6075-6083. doi: 10.21608/ijma.2025.382096.2178.

Abstract

Background: Pancreatic cancer is the fourth leading cause of cancer-related deaths and is on of aggressive malignant tumors. Accurate staging and early diagnosis are essential for suitable therapeutic approaches, which should minimize surgical morbidity and mortality in patients with a high risk of residual disease following the intervention and improve survival in patients for whom complete resection is acceptable.

Aim of the work: To evaluate the accuracy of multi-detector computed tomography [MDCT] with a pancreatic protocol in determining the resectability of pancreatic cancer by comparing imaging findings with surgical outcomes, based on the National Comprehensive Cancer Network [NCCN] criteria.

Patients and methods: The 50 included patients [ages 25 to 78] in this prospective hospital-based study had pancreatic neoplasms confirmed by abdominal computed tomography [CT] or ultrasound imaging. Every patient involved underwent a clinical evaluation, laboratory testing, abdomen triphasic CT with pancreatic protocol, and consent taking.

Results: According to NCCN, location and size have a significant impact on the respectability of pancreatic tumors with a p value < 0.05, however gender, age group, and effect on the biliary tree had no significant effect. The respectability of pancreatic tumors according to NCCN and the type of surgical interference is significantly impacted by the degree of arterial, venous, and lymphatic spread involvement, respectively [P value < 0.05]. MDCT has 100% sensitivity, 76.92% specificity, 80% positive predictive value [PPV], 100% negative predictive value [NPV], and 88% accuracy in diagnosing and evaluating the resectability of the patient's pancreatic tumor.

Conclusion: MDCT with a pancreatic protocol is a highly accurate, non-invasive imaging tool to assess the resectability of pancreatic cancer. It showed excellent sensitivity and negative predictive value, making it reliable for surgical planning. Its effectiveness in evaluating vascular involvement, lymph node status and distant metastases supports its role as a standard preoperative assessment tool.

Keywords: Pancreatic Cancer; Multidetector; Computed Tomography; Resectability; Surgical findings.

INTRODUCTION

One of the deadliest tumors, pancreatic cancer, is predicted to become the second most common cause of cancer-related deaths by 2030 due to its rising occurrence. The aggressive nature of the illness and the delayed diagnosis as symptoms are typically unclear and only manifest once the disease has progressed are the causes of the high death rate [1].

Currently, the only treatment for these tumors that may be curative is total surgical resection. However, surgery only helps in the early stages, which only affects 10–20% of people [2].

With 10% survival rates for pancreatic body and tail tumors and 19% survival rates for pancreatic head tumors, pancreatic cancer respectability and five-year survival rates are still rather poor. Nearly forty percent of pancreatic surgeries result in issues [3]. Therefore, it is critical to accurately recognize cases that would benefit most from surgery, i.e., those with potentially curable resectable lesions, and to minimize the number of avoidable laparotomies as much as possible. Additionally, as their existence could prevent resection, pancreatic cancer diagnoses and staging need to be carefully assessed [4].

Because of its better spatial resolution, ultra-fast coverage of a large anatomical area required for evaluating the pancreatic tumor, and broad availability, multi-detector computed tomography [MDCT] is the most favored modality for the initial diagnosis and staging of pancreatic adenocarcinoma. Furthermore, the application of MDCT and processing improvements have improved MDCT's efficiency in comparison to previous generations of single detector computed tomography [CT] [5].

THE AIM OF THE WORK

This work was designed to evaluate the accuracy of MDCT with a pancreatic protocol in determining the resectability of pancreatic cancer by comparing imaging findings with surgical outcomes, based on National Comprehensive Cancer Network [NCCN] criteria.

PATIENTS AND METHODS

Between January 2024 and January 2025, 50 patients with pancreatic neoplasms confirmed by ultrasound [US] or CT abdominal imaging at the National Liver Institute at Menoufia University participated in this prospective hospital-based trial.

We included patients with pancreatic neoplasm that were proved by US or CT abdominal imaging. However, we excluded from the study: patients with proven pancreatitis or benign pancreatic lesions, impaired renal functions, pregnant females, a known history of sensitivity to contrast medium [Known history of sensitivity to contrast medium means that the patient has previously had an adverse reaction ranging from mild like itching or rash to sever like cardiac arrest or cardiogenic shock when the contrast medium was administrated].

After being fully informed of the procedure's risks advantages, and assurance of their rights, all eligible patients signed an informed consent form. All patient data confidentiality and privacy were ensured.

All information provided has been recorded and utilized exclusively for research purposes. Furthermore, the National Liver Institute Ethics Committee [REC] [N-00700-2025] [Menoufia University] and medical research examined and approved the study protocol.

A consent form, clinical evaluation, laboratory testing [complete blood count, renal function tests, bilirubin "total & direct," tumor marker [Carbohydrate antigen 19-9 [CA 19-9]] and abdominal triphasic CT with pancreatic protocol] were performed on all included patients.

Abdominal Triphasic CT with pancreatic protocol:

The pancreatic protocol is designed to optimize visualization and assessment of the pancreas through a series of CT imaging phases. It begins with a pre-contrast phase, which helps identify calcifications, fat, cysts, or hemorrhage that may be obscured by contrast and serves as a clean baseline for comparison.

This was followed by several post-contrast phases: the arterial phase [20–25 sec post-injection], which enhances arterial structures and aids in evaluating tumor resectability and hypervascular lesions; the pancreatic phase [35–45 sec], during which the pancreas is maximally enhanced, making hypodense tumors more visible; the venous phase [65–80 sec], optimal for detecting liver metastases and assessing venous involvement; and the delayed phase [2–5 min], useful for evaluating contrast washout patterns and identifying fibrotic [desmoplastic] tissue around tumors.

A] Imaging Techniques: The cases were examined by Multidetector computed tomography [MDCT], Simens definition 128 slice spiral CT scanner. 1] patient preparation: The patient advised to be fasting for at least 6 hours before the examination. 2] Oral contrast material: Negative contrast media [water 750 to 1000ml] 20 to 30 minutes before the examination to demarcate the duodenum and delineate the pancreatic head region. 3] Position: supine position, both arms elevated. 4]scout: lower chest cuts to iliac crest. 5] scan direction: craniocaudal. 6] Intravenous contrast material: iodinated contrast material [Omnipaque intravenous contrast medium with concentration 300 mgI/ml] 1.5-2 ml/kg will be used by using double-syringe power injector [Medrad company, USA]. at flow rate 4-5ml/sec. 7] Phases: After triggering the bolus tracking threshold of 120 H.U. of the aorta at the corresponding celiac axis level: Non contrast phase, Post contrast phases, Arterial phase: 20-25 sec post injection, Pancreatic phase: 35-45 sec post injection, Venous phase: 65-80 sec post injection, Delayed phase: 2-5 minutes post injection.7] scan extent: Non contrast, portovenous phase: lower chest and extend to pelvis. Early arterial, pancreatic and delayed phase: lower chest cuts to iliac crest. 8] scan parameters: A. Cutting thickness: 0.5 to 1mm. B. Section interval: equal to cutting thickness.

B] Image interpretation: Images were reconstructed at 0.8 mm thickness in the axial plane; Images were interpreted on Philips intellispace portal workstation. Multiplanar reconstruction [MPR], Curved multiplanar reconstruction [cMPR], Maximum intensity projection [MIP], Minimum intensity projections [MinIP] and Volume rendering technique.

Vascular affection: The degree of tumor–vascular contact was classified as no contact, tumor –vascular contact less than 180, tumor-vascular contact more than 180, total occlusion/invasion.

Degrees of tumor contact with variant vascular anatomy also were evaluated.

Lymph node affection: Lymph nodes greater than 1 cm in short-axis diameter, round morphology, heterogeneity, or central necrosis are criteria for suspicion of lymph node tumors infiltration. Lymph node was classified into two groups: 1-Regional lymph nodes [a] lymph nodes along the common bile duct, common hepatic artery, Porto mesenteric vein, and pancreaticoduodenal arcades for pancreas head cancer and [b] lymph nodes along the common hepatic artery, celiac axis, splenic artery, and splenic hilum for pancreas body or tail cancer. [Not contraindication for surgery since LNS that are located in the tumor drainage area will be resected with the primary tumor]. 2- Non regional lymph nodes: the aortocaval or para-aortic nodes and those impacted outside the tumor drainage area [considered distant metastatic disease].

Distant metastasis: Hepatic lesion, Peritoneal nodules, Bone Metastasis, Pulmonary Nodules. Then, our patients were classified according to NCCN criteria for CT Resectability of Pancreatic Cancer into 3 categories [Resectable, borderline resectable, irrresectable].

Resectable disease

Tumors that do not have distant metastases or lymphovascular invasion.

- Arteries: tumor-artery contact absence [SMA, CTr, and CHA].
- Veins: absence of contact between the tumor and the PV or SMV, or tumor-vein contact ≤180◦ of the venous circumference without vascular edge irregularities.

Borderline disease

Tumors that do not have distant metastases or lymphovascular invasion.

Arterial affectation:

- **Head neoplasms and uncinate process:** Complete resection and vascular reconstruction are made possible by tumor contact with the CHA that has not extended to its bifurcation or the celiac trunk. Tumor contact that has SMA ≤180°.
- **Body and tail neoplasms:** Celiac trunk tumor contact ≤180◦. Celiac trunk tumor contact >180◦ with an intact gastroduodenal artery and no aortic involvement [some centers include these criteria in the category of unresectable].

Venous affection:

- Tumor contact with the portal vein or SMV >180◦.
- Venous thrombosis or tumor contact with the portal vein or SMV ≤180◦ while the venous margins are irregular
- Complete resection and venous reconstruction are made possible by the presence of one unaffected distal and proximal vascular segment.
- IVC tumor contact.

Unresectable disease

The presence of non-regional lymph adenopathy; distant metastasis; or tumor vascular affectation which include:

- **Head neoplasms/uncinate process:** Tumor contact with the CTr or the SMA >180◦. First SMA jejunal branch tumor contact. Tumor [tumor or thrombotic] occlusion or affectation of the SMV/PV without potential for surgical reconstruction. Contact with the SMV branch of the most proximal jejunal drainage.
- **Body and tail tumors:** Tumor contact with the SMA or the CTr >180◦. Tumor contacts with the celiac trunk and aortic affection. Tumor [tumor or thrombotic] occlusion or affectation of the SMV/PV without the potential for surgical reconstruction.

Standard reference results were correlated with surgical intraoperative data.

Statistical Analysis of data: SPSS v26 was used for statistical analysis [IBM Inc., Chicago, IL, USA]. The two groups were compared using the unpaired Student's t-test, and quantitative variables were displayed as mean and standard deviation [SD]. The Chi-square test was used to analyze the qualitative variables, which were displayed as frequency and percentage [%]. Statistical significance was defined as a two-tailed P value < 0.05. For MDCT, diagnostic indices such as sensitivity, specificity, positive predictive value [PPV], and negative predictive value [NPV] were calculated.

RESULTS

The study began with the initial eligibility screening of 70 patients, 20 excluded [8 declined to participate and 12 did not meet the inclusion criteria]. The included 50 participants underwent standardized clinical and radiological evaluation using triphasic MDCT, ensuring consistency in imaging protocols.

The diagram effectively follows the STROBE guidelines by detailing the steps from enrollment through diagnostic stratification [based on NCCN criteria] and final correlation with surgical findings, reinforcing both the methodological rigor and diagnostic validity of the study [Figure 1]. This study consisted of fifty patients with pancreatic carcinoma; the mean age of the studied patients ranged from 25 to 78 years with a mean age value [± SD] of 60.04 [± 10.33] years. There were 32 [64%] males and 18 [36%] females.

In our results, surgical outcome regarding NCCN staging showed that there was 20 resectable tumor; 16 of them underwent successful resection [14 of them underwent Whipple operation with free surgical margins; 2 of them underwent successful distal pancreatectomy operation]; 4 show failed surgical resection [two due to liver metastasis and underwent double by pass with three anastomoses; the other two underwent exploration as mass was adherent to PV]. In addition, we reach diagnosis of borderline resectable tumor in ten cases, 8 of them underwent successful

resection [six of them underwent successful Whipple operation with free surgical margins, two cases underwent distal pancreatectomy], Two cases failed surgical resection as mass adherent to PV and SMV on exploration. We reached a diagnosis of an irresectable tumor in 20 cases, 18 of them had no surgery; two cases underwent palliative surgery [palliative bypass] [Table 1].

In our study the most common causes of unresectability were distant metastasis in 8 cases [40%] and mixed causes in 8 cases [40%] including 2 cases with distant metastasis and non-regional LNS affection, 4 cases with distant metastasis and vascular invasion, and 2 cases with distant metastasis and non-regional LNS affection and vascular invasion. Vascular invasion alone was in 4 cases [20%] [Table 2].

In this study, we found that the gender and age group of the patients have no significant effect on the respectability of pancreatic cancers; however, location and size of the lesion have a significant effect with p value < 0.05. Also, the degree of involvement of arterial, venous, and degree of lymphatic spread has a significant effect on the resectability of pancreatic cancers according to NCCN [P value < 0.05] [Table 3].

Regarding the accuracy in our results, MDCT can predict the diagnosis and assess the resectability of pancreatic tumor of the studied patient with 100% Sensitivity, 76.92% specificity, 80 % PPV, 100% NPV and 88 % Accuracy [Table 4].

Case 1: A 75-year-old male patient with a previous US showing a pancreatic head mass.

MDCT findings:

***Morphological appearance**: Pancreatic head/uncinate process mass lesion measures about 4x4.4x3.8 cm, CBD dilated [12mm] with applied stent noted in place. Figure 2 A, B

***Vascular contact**: Tumor-venous contact [SMV] less than 180 degrees. Tumor –arterial contact [SMA]less than 180 degree. Figure 2 C, D, E, F

***Lymph node**: No LNS affection

***Local and distant spread**: The lesion was Inseparable from the second part of the duodenum, No Hepatic metastasis, no pulmonary nodules.

According to the NCCN guideline, the tumor is borderline resectable. Regarding surgery, the patient was prepared for Whipple but failed surgical resection as the mass intraoperative appeared adherent to SMV on exploration [Figure 2].

Case 2: A 58-year-old male patient with pathologically proven pancreatic adenocarcinoma. The patient was referred to the radiology department for assessment of the resectability state.

MDCT findings

***Morphological appearance**: pancreatic head lesion measures about 2.5x3.5x2.2 cm, MPD mildly dilated [6mm], CBD dilated [19 mm] ... [double duct sign] with associated mild to moderate IHBRDS. Figure 3 A, B, C

***Vascular contact:** Tumor -venous contact [SMV]less than 180 degrees. No tumor–arterial contact. Figure 3 F, G

* **Lymph node** showed prepancreatic [largest 1x1 cm] and porta hepatis LN [2x1.1 cm[reactive] Figure 3 D, E

***Local and distant spread**: The lesion is seen as inseparable from the second part of the duodenum, No Hepatic metastasis, no pulmonary nodules,

According to the NCCN guideline, the tumor is considered resectable, regarding surgery and pathology. The patient underwent a successful Whipple operation [Intraoperative resectability state: Resectable]. Pathology samples found moderately differentiated adenocarcinoma with free surgical margins. Figure 3 H

Case 3: A 68-year-old female patient with a previous US showing a pancreatic head mass.

MDCT findings:

***Morphological appearance** pancreatic head/unicinate process lesion measures 4.5X5.5X4.2 cm, CBD dilated [10 mm] with associated Minimal IHBRDS. Figure 3 A, B

***Vascular contact:** Tumor-venous contact [SMV]less than 180 degrees. Tumor–arterial contact [SMA] less than 180 degrees. Figure 3 C, D

***LNS**: No LNS affection,

***Local and distant spread**: The lesion is seen as inseparable from the second part of the duodenum. Hepatic metastasis: Multiple bilobar hypodense focal lesions .Few bilateral scattered subcentimetric nodules[metastatic]. Figure 3 E, F. According to the NCCN guideline, the tumor is considered irresectable, with no role for surgical intervention.

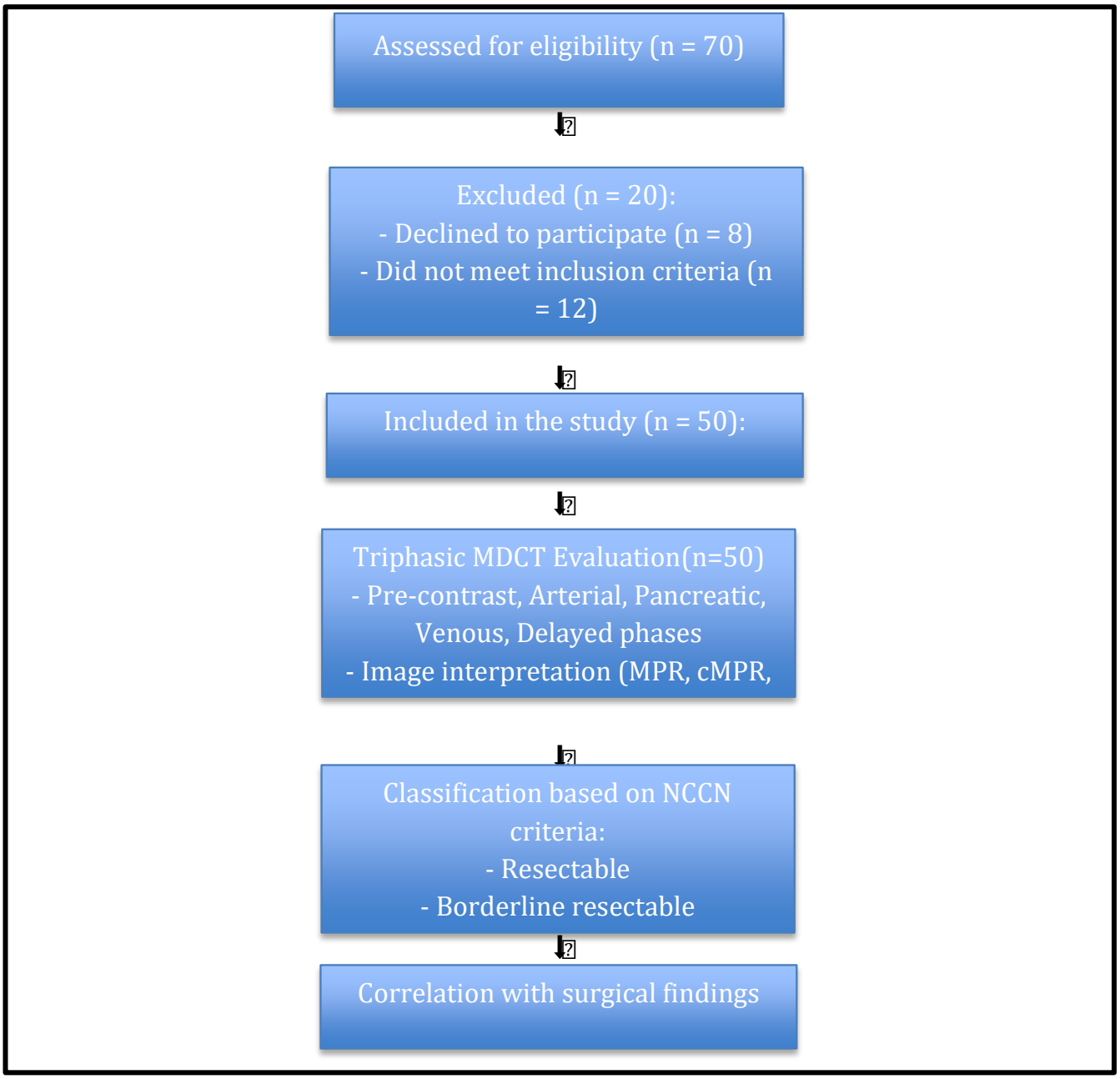


Figure [1]: STROPE flow chart of the studied cases.

Table [1]: Surgical outcome regarding NCCN staging**.**

		No surgery	Bypass	Exploration	Reselection	Count
CT	Respectable	0	2	2	16	20
	Border line respectable	0	0	2	8	10
	Irresectable	18	2	0	0	20
Count		18	4	4	24	50

Table [2]: Causes of unrespectability.

Causes of unrespectability	Number	Percent
Vascular invasion	4	20%
Mixed causes:	8	40%
Distant metastasis + non-regional LNS affection [LNS metastasis]	2	
Distant metastasis + vascular invasion	4	
Distant metastasis + non-regional LNS affection + vascular invasion	2	
Distant metastasis	8	40%

Table [3]: Degree of arterial, venous and lymphatic involvement in comparison to MDCT respectability criteria.

		MDCT						
		Resectable		Border line resectable		Irresectable		P value
		Count	%	Count	%	Count	%	
Arteries	0.002*							
	No contact	20	40%	6	12%	12	24%	
	Tumour-artery contact less than 180	0	0%	3	6%	0	0%	
	Total encasement of CHA	0	0%	0	0%	4	8%	
	Total encasement of SMA	0	0%	0	0%	2	4%	
	Totally encasing [SMA+CHA]	0	0%	0	0%	2	4%	
	SA involvement	0	0%	1	2%	0	0%	
Veins	< 0.001*							
	No contact	10	20%	0	0%	8	16%	
	Tumour-venous contact less than 180	10	20%	3	6%	4	8%	
	Tumour-venous contact more than 180	0	0%	5	10%	0	0%	
	Total occlusion- invasion	0	0%	0	0%	2	4%	
	Mixed contact [PV + SMV]	0	0%	2	4%	6	12%	
Lymphatic	0.0934							
	Regional lymph nodes affection	8	16%	2	4%	10	20%	
	Non regional lymph nodes affection	0	0%	0	0%	4	8%	
	No enlarged lymph nodes	12	24%	8	16%	10	20%	

Table [4]: Validity of MDCT in prediction of diagnosis and assessment of resectability of pancreatic tumour in correlation with surgical outcome

Resectability by CT	Surgical findings				
	Positive [24]		Negative [26]		P value
	No	%	No	%	
Positive	24	100	6	23	< 0.001*
Negative	0	0	20	77	
Sensitivity	100%				
Specificity	76.92%				
PPV	80%				
NPV	100%				
Accuracy	88%				

*: Significant as P value <0.05, PPV: Positive predictive value, NPV: Negative predictive value.

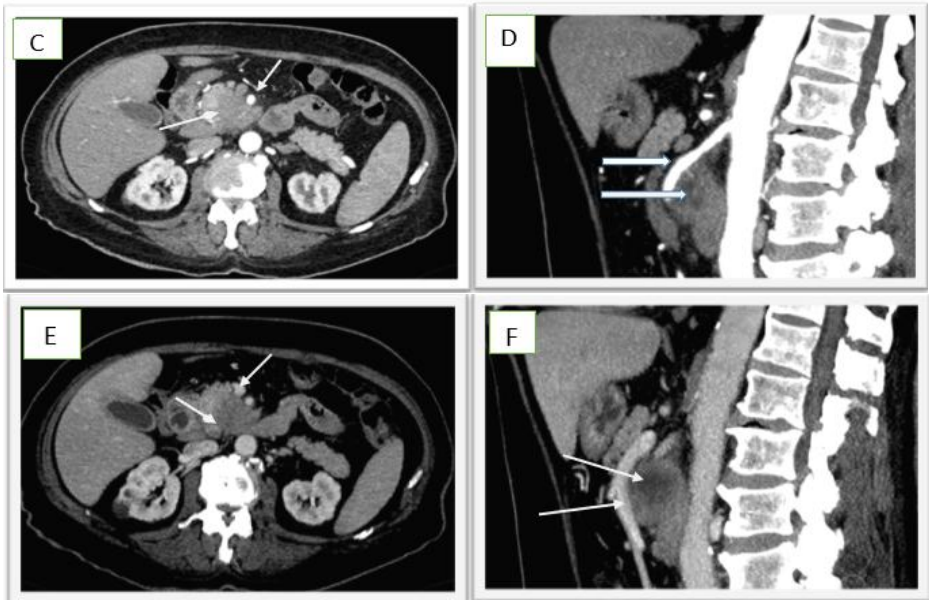


Figure [2]: A. Axial post-contrast image shows a pancreatic head mass with adjacent SMV and SMA [arrows]; B. Coronal portovenous phase [MinIP] reveals a CBD stent in situ; C/D. Axial and sagittal arterial phase MIP images demonstrate tumor–SMA contact of less than 180° [arrows]; E/F. Axial and sagittal portovenous phase MIP images show tumor–SMV contact of less than 180° [arrows].

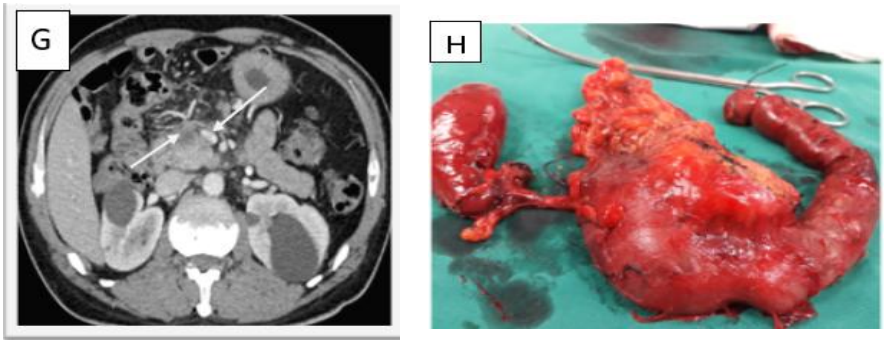


Figure 3: A. Axial portovenous phase shows a pancreatic head mass with adjacent SMV and SMA [arrows]; B–C. Coronal portovenous MinIP images reveal a dilated CBD, dilated pancreatic duct, and mild intrahepatic biliary radicle dilatation [arrows]; D–E. Axial portovenous phase images show reactive porta hepatis and prepancreatic lymph nodes; F. Axial arterial phase MIP image shows no contact between the lesion and SMA [arrows]; G. Axial portovenous phase MIP image demonstrates tumor–SMV contact of less than 180° [arrows], H. Whipple specimen showing resected pancreatic head tumor, duodenum, proximal jejunum, and gallbladder.

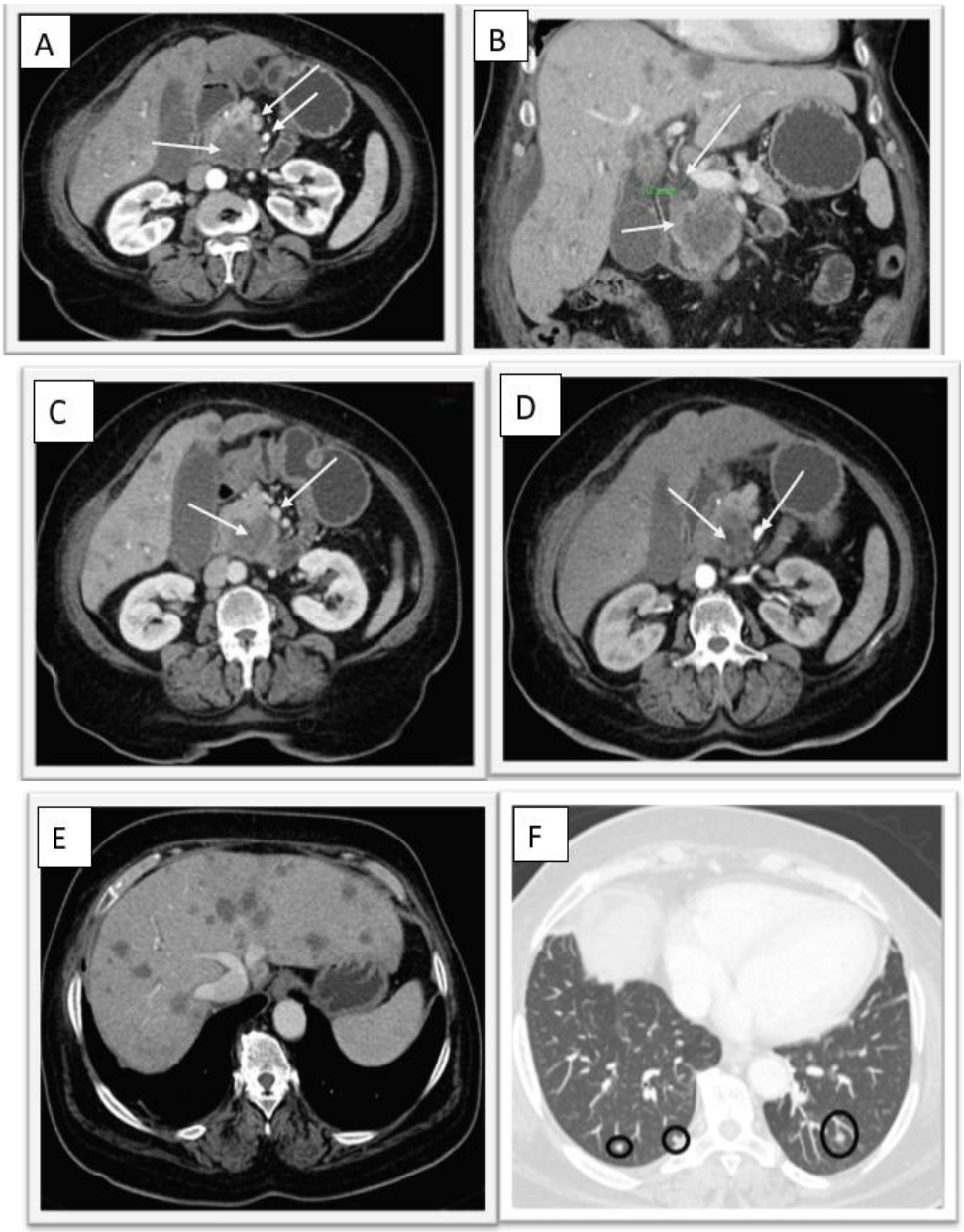


Figure [4]: A. Axial post-contrast phase shows the lesion with adjacent SMV and SMA [arrows]; B. Coronal portovenous phase reveals a dilated CBD and a lesion inseparable from the second part of the duodenum; C. Axial portovenous phase image demonstrates tumor–SMV contact of less than 180° [arrows at lesion and SMV]; D. Axial arterial phase image shows tumor–SMA contact of less than 180° [arrows at lesion and SMA]; E. Axial portovenous phase image reveals multiple bilobar hepatic focal lesions; F. Axial chest MIP image shows a few pulmonary nodules.

DISCUSSION

The current study was designed to compare the effectiveness of MDCT with surgical findings in determining the resectability of pancreatic cancer. This prospective study included 50 patients of both sexes; the most affected age group was between 60-70 years. Our study showed that the unresectable cases were 20 cases [40 %], while resectable cases were 20 cases [40%] and border-line resectable were 10 cases [20%]. The most common causes of unresectability were distant metastasis in 8 cases [40%] and mixed causes in 8 cases [40%] including 2 cases with distant metastasis and non-regional LNS affection, 4 cases with distant metastasis and vascular invasion, and 2 cases with distant metastasis and non-regional LNS affection and vascular invasion. Vascular invasion alone was in 4 cases [20%]. In agreement with our results, **Azzaz *et al.*** [6] showed that most cases were unresectable, 24 cases [57 %], while resectable cases were 18 cases [43%]; the result is approximately agreeing with **Low *et al.*** [7] who found that in his study the non-resectable disease is seen at 75% of patients while **Freelove and Walling** [8] found that about only 15 to 20% of patients with pancreatic adenocarcinoma have resectable disease at the time of diagnosis. Khattab et al. [9] found that only 15 to 20% of the patients have resectable disease at the time of presentation. The reason why our study had a comparatively higher incidence of resectable tumours than both **Low *et al.*** [7] and **Freelove and Walling** [8] studies indicate that the advancement of MDCT is crucial for early pancreatic tumour diagnosis, which increases its use for upcoming surgical intervention. **Azzaz *et al.*** [6] showed that one of the most frequent reasons for unresectability in non-resectable group [24 cases] was vascular invasion which was seen in 62.5% of cases [15 cases], and lymph node metastases also seen in 25% of cases [6 cases] followed by distant metastases in 75% of cases [18 cases]. This agrees with **Zakharova *et al.*** [10] who stated the significant vascular involvement, manifested as partial or complete encasement or obliteration of the fat planes between the mass and the vessels, renders most pancreatic lesions unresectable.

Our results are also in agreement with **Freelove and Walling** [8] who explained that due to infiltration of the major arteries posterior to the pancreas and metastases, most tumours cannot be surgically resectable. **Khattab *et al.*** [9] stated that when there is local vascular invasion or metastatic illness, the tumour is regarded as unresectable. They also stated that the blood vessels that are most frequently affected are the portal vein, the superior mesenteric vein, the hepatic artery, the coeliac trunk, and the superior mesenteric artery. **Zakharova *et al.*** [10] revealed that vascular invasion is a crucial metric for assessing the resectability of pancreatic cancer when there is no metastatic disease, which would prohibit resection.

In **Azzaz *et al.*** [6] investigation, 18 cases had multiple causes of unresectability. There were 48 sites of involvement in all, with vascular invasion accounting for 50%, lymph node metastases for 12.5%, and distant metastases for 37.5%. Most pancreatic lesions are unresectable in **Zakharova *et al.*** [10] study because of vascular involvement. Patent portal vein [PV], a fat plane between the tumor and the superior mesenteric and celiac arteries, and superior mesenteric vein [SMV] without distant metastasis are proposed resectable.

Regarding this study, the location, size of tumour, degree of involvement of arterial, venous and degree of lymphatic spread have significant effect on respectability of pancreatic cancers according to NCCN with p value < 0.05. Also in our results, the frequency of venous invasion by pancreatic tumours is significantly higher than arterial invasion, and despite the similarity in the MDCT signs of vascular invasion between arteries and veins, they are seen significantly more in veins than arteries. This agrees with **Ali *et al.*** [11] who found that vascular infiltration was seen more in involved veins [67%] than in involved arteries [57.3%]. To increase the precision of the diagnosis of vascular invasion and tumour resectability, it is critical to take note of those variations. The existence of vascular involvement will determine tumour resectability in the absence of evident liver metastases or local tumour extension. **Shokry *et al.*** [12] reported similar findings, stating that the CT signals of venous and arterial involvement in pancreatic cancer differ. This is probably because the veins' walls are thinner and more flexible, which causes the vein to become irregular and narrower when it is affected. Similar to this, venous occlusion occurs more frequently than arterial occlusion. Additionally, **Abdallah *et al.*** [13] revealed that one of the most important criteria determining the potential respectability of pancreatic tumours is the assessment of arterial vascular involvement in individuals with pancreatic cancer.

In the current study, there was 20 resectable tumor; 16 of them underwent successful resection [14 of them underwent Whipple operation with free surgical margins; 2 of them underwent successful distal pancreatectomy operation]; 4 show failed surgical resection [two due to liver metastasis and underwent double by pass with three anastomoses; the other two underwent exploration as mass was adherent to PV]. In addition, we reach diagnosis of borderline resectable tumor in ten cases, 8 of them underwent successful resection [six of them underwent successful Whipple operation with free surgical margins, two cases underwent distal pancreato-ctomy], Two cases failed surgical resection as mass adherent to PV and SMV on exploration. We reach diagnosis of irrresectable tumor in 20 cases, 18 of them have no surgery; two cases underwent palliative surgery [palliative bypass].

Khattab *et al.* [9] mentioned that contrast-enhanced helical computed tomography [HCT] and, more recently, MDCT, are now commonly recognized as the preferred imaging technique for pancreatic cancer staging. Preoperative staging procedures are primarily used to identify patients who may be resectable and those who are not, hence preventing unnecessary surgical procedures; Only those patients who have a fully resectable tumour can benefit from improved survival. When compared to HCT studies, the development of MDCT technology has improved the ability to predict the resectability of pancreatic tumours, and the rate of successful surgical resection has increased while the incidence of palliative surgery has decreased. **Zakharova *et al.*** [10] stated that understanding the differences between the MDCT signs of local spread, vascular invasion, and metastatic disease is crucial to avoiding diagnostic errors and increasing the precision of assessing the resectability of pancreatic cancer. Preoperative tumour staging has been made possible by the advancement of modern imaging methods with higher resolution. By taking use of these opportunities, MDCT can better select patients who might benefit from tumour resection, reducing the risk of major perioperative morbidity and needless laparotomies. Because invaded vessels may only be evaluated during surgical exploration once the procedure is well progressed [pancreatic section, digestive transaction], MDCT detection of vascular invasion is crucial for preoperative staging of pancreatic cancer.

In the current study, regarding Accuracy, MDCT can predict the diagnosis and assess the resectability of pancreatic tumour of the studied patients with 100% sensitivity, 76.92% specificity, 80 %

PPV, 100% NPV and 88 % Accuracy. Due to its great accuracy, MDCT has been utilized to estimate resectability, and many grading schemes have been developed [14]. In agreement with our results, **Mokhtar *et al.*** [15] revealed that in comparison to laparoscopy, MDCTA may diagnose resectability with 100% sensitivity, 82.4% specificity, 91.7% PPV, 100% NPV, and 94% accuracy. Supporting our findings, **Azzaz *et al.*** [6] determined the accuracy of MDCT as a diagnostic tool for calculating the potential of eliminating pancreatic cancer. According to the pathology specimens, all cases [100%] had excellent procedures with no malignant cells in the margins, a PPV of 87.5%, and an accuracy of 89.47%. Also, **Kaneko *et al.*** [16] conducted a retrospective comparison of the outcomes of surgery and MDCTA performed prior to surgery in patients of pancreatic head cancer. MDCTA was found to have 100% sensitivity, 100% specificity, 100% PPV, 100% NPV, and 89.0% accuracy in this study. In addition, our findings agreed with those demonstrated by **Fusari et al.** [17] and **Zamboni *et al.*** [18].

Our study's primary limitations were that it was conducted at a single institution, which may limit the findings' generalizability, the sample size was small [50 patients], which reduces statistical power, some data collection was retrospective, which may introduce bias, and cases with distant metastases without clear local vascular involvement or local LN involvement presented challenges because we were unable to confirm the diagnosis of vascular and LN involvement without surgery.

In **conclusion,** because it is non-invasive and offers information on the location, size, relationship to the vascular tree, affection of the lymph nodes, and local and distant metastases, multi-detector computed tomography [MDCT] is an accurate method for diagnosing and evaluating the resectability of pancreatic cancer. Additionally, by adequately selecting patients who can benefit from tumour removal, MDCT might reduce the high perioperative morbidity and death associated with unnecessary surgeries. We recommend future studies in multiple centers with larger sample sizes to improve generalizability. Great effort should be made to reduce the waiting list time to shorten the time between CT scan and surgery time. A multidisciplinary approach is crucial for decision making [plan of management] for each individual patient. Increase number of studied border lines with resectable patient groups and help to increase their chance for surgical resectability. In some cases, complementary imaging study may be needed for assessment of resectability like DWI MRI sequence for detection of small liver metastasis.

Financial and Non-Financial Relationships and Activities of interest: None.

REFERENCES

1. Tang HY, Cao YZ, Zhou YW, Ma YS, Jiang H, Zhang H, et al. The power and the promise of CAR-mediated cell immunotherapy for clinical application in pancreatic cancer. J Adv Res. 2025 Jan; 67:253-267. doi: 10.1016/j.jare.2024.01.014.

2. Cassinotto C, Cortade J, Belleannée G, Lapuyade B, Terrebonne E, Vendrely V, Laurent C, Sa-Cunha A. An evaluation of the accuracy of CT when determining resectability of pancreatic head adenocarcinoma after neoadjuvant treatment. Eur J Radiol. 2013 Apr;82[4]:589-93. doi: 10.1016/j.ejrad.2012.12.002.

3. Wu HY, Li JW, Li JZ, Zhai QL, Ye JY, Zheng SY, Fang K. Comprehensive multimodal management of borderline resectable pancreatic cancer: Current status and progress. World J Gastrointest Surg. 2023 Feb 27; 15 [2]: 142-162. doi: 10.4240/wjgs.v15.i2.142.

4. Soloff EV, Al-Hawary MM, Desser TS, Fishman EK, Minter RM, Zins M. Imaging Assessment of Pancreatic Cancer Resectability After Neoadjuvant Therapy: *AJR* Expert Panel Narrative Review. AJR Am J Roentgenol. 2022 Apr; 218 [4]: 570-581. doi: 10.2214/AJR.21.26931.

5. Singhal S, Prabhu NK, Sethi P, Moorthy S. Role of Multi Detector Computed Tomography [MDCT] in Preoperative Staging of Pancreatic Carcinoma. J Clin Diagn Res. 2017 May;11[5]:TC01-TC05. doi: 10.7860/JCDR/2017/26734.9789.

6. Azzaz HEM, Abdullah MS, Habib RM. Role of multidetector computed tomography in evaluation of resectability of pancreatic cancer. Egy J Radiol Nuclear Med. 2021; **52**:1-9. doi:10.1186/s43055-021-00496-z

7. Low G, Panu A, Millo N, Leen E. Multimodality imaging of neoplastic and nonneoplastic solid lesions of the pancreas. Radiographics. 2011 Jul-Aug;31[4]:993-1015. doi: 10.1148/rg.314105731.

8. Freelove R, Walling AD. Pancreatic cancer: diagnosis and management. Am Fam Physician. 2006 Feb 1;73[3]:485-92. PMID: 16477897.

9. Khattab EM, AlAzzazy MZ, El Fiki IM, Morsy MM. Resectability of pancreatic tumors: Correlation of multidetector CT with surgical and pathologic results. Egy J Radiol Nuclear Med. 2012; **43**:11-7. doi: 10.1016/j.ejrnm.2011.11.002

10. Zakharova OP, Karmazanovsky GG, Egorov VI. Pancreatic adeno-carcinoma: Outstanding problems. World J Gastrointest Surg. 2012 May 27;4[5]:104-13. doi: 10.4240/wjgs.v4.i5.104.

11. Ali MH, Solyman M, Murad MZ, et al. Role of MDCT and CT Angiography in staging pancreatic cancer. SVU-International Journal of Medical Sciences. 2021; **4**: 49-67. doi:10.21608/svuijm.2021.112028

12. Shokry A, Mokhtar O, Salah A, Gomaa M, Abdelmottelb A. Preoperative assessment of vascular invasion in exocrine pancreatic cancer by multidetector CT. Egypt J Radiol Nucl Med. 2013; **44**:417-23. doi: 10.1016/j.ejrnm.2013.03.006

13. Abdallah A, Zaky M, Bayoumi D, et al. Role of CT angiography in the evaluation of tumor vascular relationship in patients with pancreatic tumors. Med J Cairo Uni. 2020; **88**:161-71. doi:10.21608/mjcu.2020.93974

14. Gupta S, Puri SK. Comparative analysis and assessment of diagnostic accuracy of 256 slice CT and endoscopic ultrasound in evaluation of pancreatic masses. Indian J Radiol Imaging. 2020 Jul-Sep; 30[3]: 294-303. doi: 10.4103/ijri.IJRI_437_19.

15. Mokhtar HM, Abou Taira NS. Evaluation of Resectability of Cancer Head of Pancreas by Multi-Detector CT Angiography. SVU-Int J Med Sci. 2024; **7**: 355-65. doi: 10.21608/svuijm.2024.254769.1756

16. Kaneko OF, Lee DM, Wong J, Kadell BM, Reber HA, Lu DS, Raman SS. Performance of multidetector computed tomographic angiography in determining surgical resectability of pancreatic head adenocarcinoma. J Comput Assist Tomogr. 2010 Sep-Oct; 34 [5]:732-8. doi: 10.1097/RCT.0b013e3181e5d6f7.

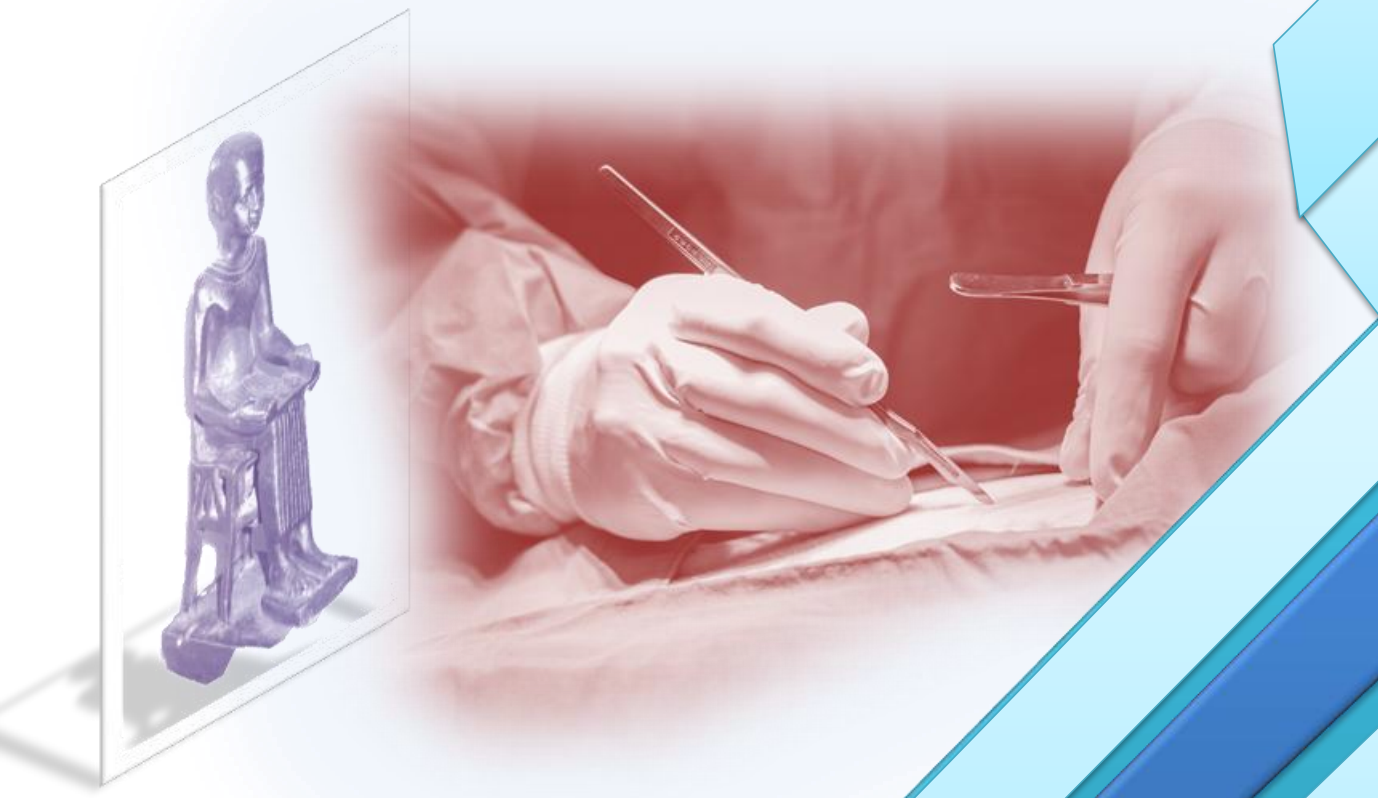
17. Fusari M, Maurea S, Imbriaco M, Mollica C, Avitabile G, Soscia F, Camera L, Salvatore M. Comparison between multislice CT and MR imaging in the diagnostic evaluation of patients with pancreatic masses. Radiol Med. 2010 Apr;115[3]:453-66. English, Italian. doi: 10.1007/s11547-010-0490-7.

18. Zamboni GA, Kruskal JB, Vollmer CM, Baptista J, Callery MP, Raptopoulos VD. Pancreatic adenocarcinoma: value of multidetector CT angiography in preoperative evaluation. Radiology. 2007 Dec; 245 [3]: 770-8. doi: 10.1148/radiol.2453061795.

IJMA

International Journal of Medical Arts

Volume 7, Issue 9 (September 2025)



http://ijma.journals.ekb.eg/

P-ISSN: 2636-4174

E-ISSN: 2682-3780