Med. J. Cairo Univ., Vol. 88, No. 4, Septemper: 1743-1751, 2020
www.medicaljournalofcairouniversity.net

The Diagnostic Value of CA19.9 in Predicting the Resectability of Pancreatic Cancer

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Abstract

Background: Pancreatic Ductal Adenocarcinoma (PDAC) is one of the deadliest cancers presenting an increased mortality rate of about 3% of all cancers and about 7% of all cancer death in the United States and Europe. One of them, used for long as potential independent predictor of surgery is the Sialylated Lewis blood group carbohydrate antigen 19.9 (CA19.9). CA19.9 is detected in low levels in healthy individuals (up to 37U/ml) and the level is elevated in several types of cancers including pancreatic, and also in benign conditions such as pancreatitis and choledocholithiasis.

Aim of Study: To evaluate the diagnostic value of CA19.9 in predicting the resectability of pancreatic cancer.

Patients and Methods: This is prospective and retrospective study which was carried out on 25 patients diagnosed as patients with biopsy-proved adenocarcinoma of the pancreas. All patients were selected from Eldemerdash Hospital University, Ain-Shams University Hospitals in the period from January 2016 to April 2019.

Results: The majority of the patients have cancer head of pancreas (72%), while 20% were confined to the body and 8% were confined to the body and tail. The majority of patients (44%) underwent pancreaticoduodenectomy, 20% of patients underwent distal pancreatectomy, 4% of patients underwent total pancreatectomy, and 32% patients underwent only exploratory laparotomy and biopsy. At present the best way for pre-operative staging of pancreatic cancer is bolous and tri-phase helical computed tomography, which have been showen to be almost 100% accurate in predicting unresectable disease. Serum CA19.9 level in patients with unresectable tumor was highly significantly higher compared with that in patients with resectable tumor. Positive significant correlation between CA19-9 with total bilirubin, ALT and AST.

Conclusion: CA19.9 is one of the tumor markers for pancreatic adenocarcinoma. It can be used as marker to identify pancreatic adenocarcinoma with limited sensitivity and specificity. The use of CA19.9 in conjunction with modern imaging techniques may improve the characterization of resectability and categorization of 'borderline-resectable' tumours, however this biomarker alone does not possess enough predictive value. Most likely, as suggested by many others, a combination of biomarkers is needed in order to achieve acceptable sensitivity and specificity in a disease with non-specific symptoms and low incidence.

Key Words: *Carbohydrate antigen 19.9 – Endoscopic retrograde cholangiopancreatography – Magnetic resonance cholangiopancreatography – Magnetic resonance imaging.*

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Introduction

PANCREATIC cancer is the most lethal solid organ malignancies. It represents the 11th most common cancer in the United Kingdom, accounting for 3% of all new cancer cases. Pancreatectomy offers the only potential for cure but it is only possible in minority of patient even in these patients who undergo resection **[1]**.

Pancreatic cancer affects males more than females. The tumor peak incidence lies between 55 and 70 years of age.

The prognosis of pancreatic cancer is extremely poor and its early diagnosis is difficult, still surgical resection offers the best chance of cure **[2]**.

At present the best way for pre-operative staging of pancreatic cancer is bolus and tri-phase helical computed tomography, which have been showing to be almost 100% accurate in predicting unresectable disease **[3]**.

CA19.9 is the most common tumors markers used for diagnosis or monitor pancreatic malignancies **[4]**.

CA19.9 more useful for monitoring of recurrence following curative surgery rather than for diagnosis **[5]**.

The sensitivity and specificity of CA19.9 for diagnosis of pancreatic malignancies varies from 70-90% [6].

Serum CA19.9 may also elevated at other condition such as cholangio carcinoma and chronic pancreatitis [7].

Aim of the work:

The aim of the study is to evaluate the diagnostic value of CA19.9 in predicting the resectability of pancreatic cancer.

Patients and Methods

The current study represents prospective and retrospective study which was carried out on 25 patients diagnosed as patients with biopsy-proved adenocarcinoma of the pancreas. All patients were selected from El-Demerdash Hospital University, Ain-Shams University Hospitals in the period from January 2016 to April 2019.

The study protocol: The study protocol was approved by Faculty of Medicine, Ain Shams University, Research Ethics Committee. Informed written consents were taken before inclusion of the patients into the study after explanation of the technique, expectations, possible side effects and alternative treatments.

Patients: Age of the study population ranged from 45-<85 years with and (64%) of them were males. Were recruited in the study.

Methods assay:

Serum samples were stored at –20~ to –70~C, and these specimens were then assayed within 1 week. The CA 19.9 concentration was determined by a solid phase radioimmunoassay (Centocor, Inc., Malvern, Pa).

A value of 37U/ml was used as the upper limit of normal. One unit of CA 19.9 antigen corresponds to 0.8ng/ml of pure antigen.

Chemiluminescent microparticle immunoassay-CMIA: All immunoassays require the use of the labeled material in order to measure the amount of antigen or antibody. A label is a molecule that will react as a part of the assay, so a change in signal can be measured in the blood after adding reagent solution. CMIA is noncompetitive sandwich assay technology to measure analyses. The amount of signal is directly proportional to the amount of analytic present in the sample. Architect CA 19.9 assay is two-step immunoassay to determine the presence CA 19.9 in human serum using CMIA technology.

In the first step, sample, assay diluent and anti-CA 19.9-antibody-coated paramagnetic particles are combined. CA 19.9, present in the sample, binds to the anti-CA 19.9 coated micro particles. After incubation and wash, anti-CA 19.9-acridinium-labeled conjugate is added in the second step. Following another incubation and wash, pre-trigger and trigger solutions are then added to the reaction mixture. The pre-trigger solution (hydrogen peroxide) creates an acidic environment to prevent the early release of energy (light emission), helps to keep micro particles from clumping and splits acridinium dye off the conjugate bound to the micro particle complex (this action prepares the acridinium dye for the next step). The trigger solution (sodium hydroxide) dispenses to the reaction mixture. The acridinium undergoes an oxidative reaction when is exposed to peroxide and an alkaline solution. This reaction causes the occurrence of the chemiluminescent reaction. N-methylacridone forms and releases energy (light emission) as it returns to its ground state. The resulting chemiluminescent reaction is measured as Relative Light Units (RLU). A direct relationship exists between the amount of CA 19.9 in the sample and RLU detected by Architect System optics.

Radiological assessment: Abdominal ultrasound. Pancreatic protocol CT and MRI were done. ERCP was done when necessary.

Administrative considerations: An official permission was obtained from Ain-Shams University Hospital. An official permission was obtained from the Osteology Department. An official permission was obtained from the Institutional Research. Approval from Ethical Committee in the Faculty of Medicine (Institutional Research Board IRB).

Ethical consideration: Informed consent was obtained from all participants after being informed about the aims and process of the study as well as applicable objectives. The study procedures were free from any harmful effects on the participants as well as the service provided. The principal investigators have kept individual data as private information safely.

Data management and statistical analysis:

Data entry, processing and statistical analysis was carried out using using SPSS version 20 (Statistical Package for the Social Sciences). Tests of significance (Kruskal-Wallis, Wilcoxon's, Chi square, logistic regression analysis, and Spearman's correlation) were used. Data were presented and suitable analysis was done according to the type of data (parametric and non-parametric) obtained

for each variable. p-values less than 0.05 (5%) was considered to be statistically significant.

p-value: Level of significance: $p>0.05$: Non-Significant (NS). $p<0.05$: Significant (S). $p<0.01$: Highly Significant (HS).

Descriptive statistics: Mean, Standard Deviation (± SD) and range for parametric numerical data, while median and Inter-Quartile Range (IQR) for non-parametric numerical data. Frequency and percentage of non-numerical data.

Analytical statistics:

Kruskal-Wallis test was used to assess the statistical significance of the difference of a non-parametric variable between more than two study groups.

Results

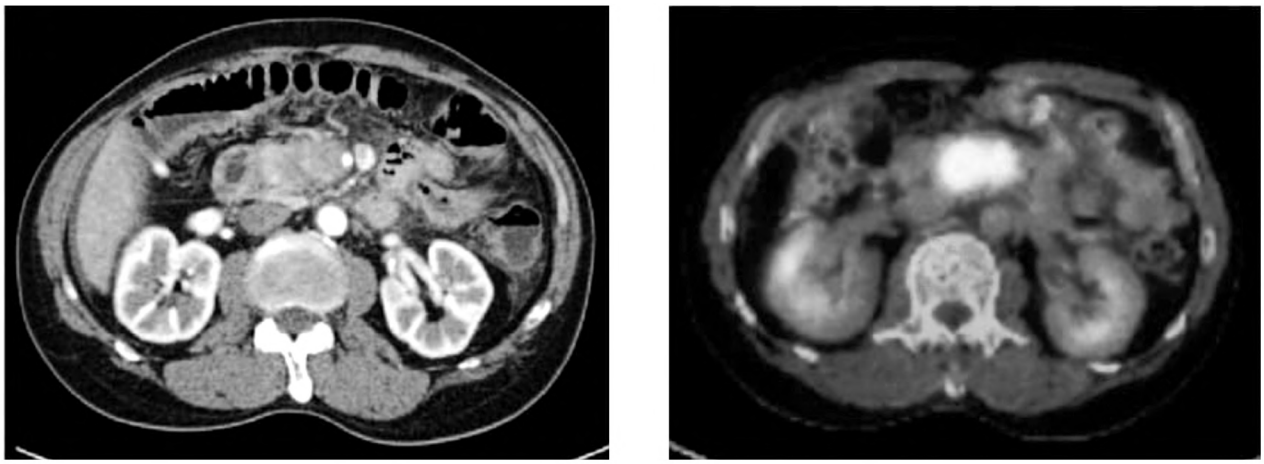

Fig. (1): Shows C.T and PET scan of pancreatic cancer.

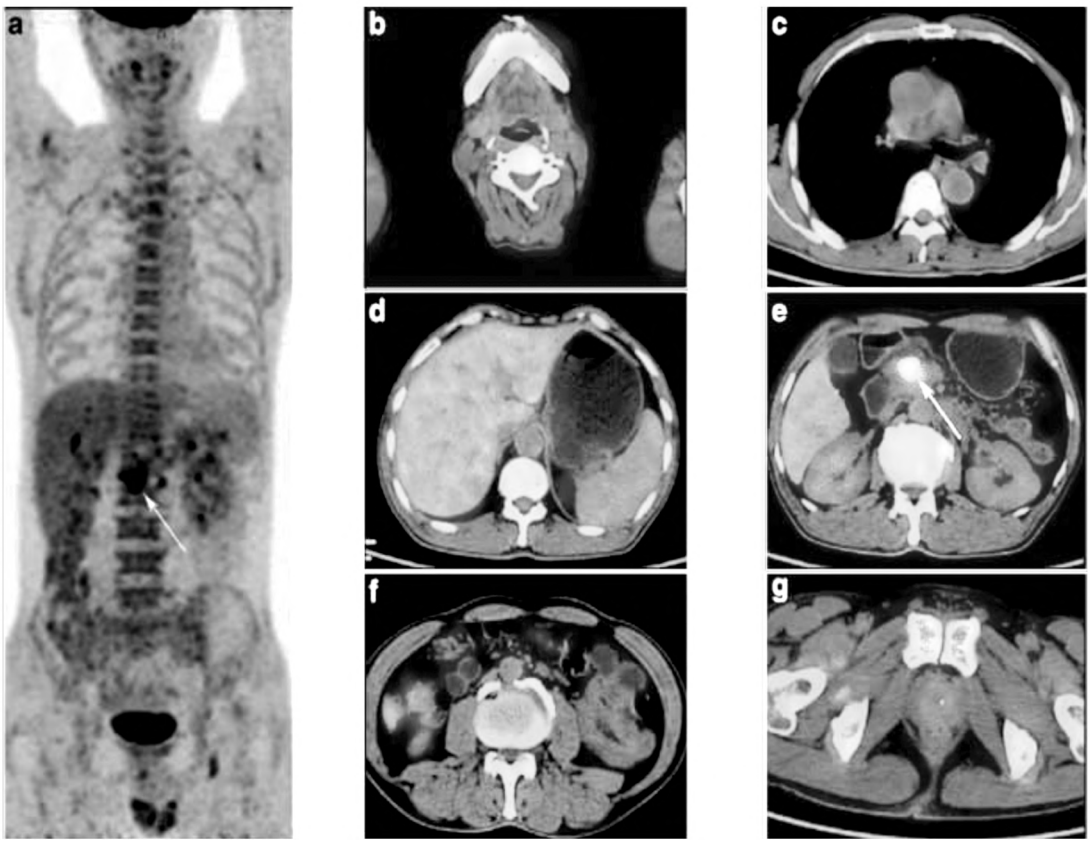

Fig. (2): Showing 59 years old male patient with pancreatic cancer (A) PET/C.T fusion, (E) Images show a mass in the pancreatic head increased FDG uptake (arrow).

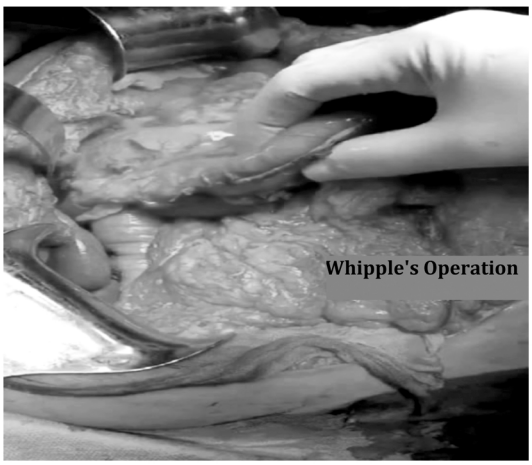

Fig. (3): Showing reconstruction after resection during the Whipple's operation for treatment of pancreatic head cancer.

Table (1): Showing age of the study groups ranged from 45 years to <85 years.

	Age	N	*p* %	M	S.D
1	a 45-<55	5	20	50.2	3.89
2	a 55-<65	5	20	60.6	3.64
3	a 65-<75	10	40	70.2	2.65
4	a 75-<85	5	20	68.2	5.16
	Total	25	100%		

Table (2): Showing sex of patients 16 patients are male and 9 patients are female.

	Gender	N	*p* %	M	S.D
1	Male	16	64	1.36	0.489
2	Female	9	36	(M=1, F=2)	
	Total	25	100%		

Table (3): Showing location of the tumors in all patients.

	Location of tumor	N	*p* %	M	S.D
1	Head	18	72	1.32	0.637
2	Body	5	20	head	
3	Body and tail	2	8		
	Total	25	100%		

Table (4): Showing types of operations in patients with pancreatic cancers.

Operations	N	*p* %	M	S.D
1 • Pancreaticoduodenectomy	11	44	1.2	1.33
2 • Distal pancreatectomy	5	20	pancr-	
3 • Total pancreatectomy	1	4	eaticoduo-	
4 • Exploratory laparotomy and biopsy	8	32	denectomy	
Total	25	100%		

Table (5): Showing pancreatic cancers classification according to C.T pancreatic protocol.

	Pancreatic cancer	N	*p* %	M	S.D
1	Resectable	10	40	1.24	1.23
2	Borderline	5	20	Resectable	
3	Locally advanced	4	16		
4	Metastatic	6	24		
	Total	25	100%		

Table (6): Showing borderline pancreatic tumors after surgery.

	Borderline pancreatic cancer	N	*p* %	M	S.D
1	• Resectable Borderline pancreatic cancer	2	40	1.6 Unresectable	0.547
2	• Unresectable Borderline pancreatic cancer	3	60	Borderline pancreatic cancer	
	Total	5	100%		

Table (7): Showing pancreatic tumors classification according to its operability.

	Pancreatic cancer	N	*p* %	M	S.D
1	Operable	12	48	1.52	0.509
2	Non operable	13	52	non operable	
	Total	25	100%		

Table (8): Showing operable pancreatic cancer.

	Pancreatic tumor - operable	N	*p* %	M	S.D
1	• Resectable pancreatic cancer	10	83.34	1.16 Resectable	0.389
2	• Resectable Borderline pancreatic cancer	2	16.66	pancreatic cancer	
	Total	12	100%		

Table (9): Showing non operable pancreatic cancer.

	Pancreatic tumor - Non operable	N	*p* %	M	S.D
1	• Unresectable borderline pancreatic cancer	3	23.08	2.23 Locally	0.832
2	• Locally advanced pancreatic cancer	4	30.77	advanced pancreatic	
3	• Metastatic	6	46.15	cancer	
	Total	13	100		

Table (10): Showing relationship between CA19.9 and its operability.

Total of pt	Pancreatic cancer	CA19.9	M	S.D	F	DF	Sig.
10	Resectable pancreatic cancer	<150u/ml	136.2	1.932	222.910	9	0.000
2	Resectable borderline pancreatic cancer	150-<300u/ml	229	9.899	1.101	1	0.419
3	Unresectable borderline pancreatic cancer	300-<450u/ml	330.6	15.885	1.055	2	0.240
4	Locally advanced pancreatic cancer	500-<1000u/ml	770.2	173.338	8.887	3	0.000
6	Metastatic	>1000u/ml	2587.1	881.405	7.190	5	0.000

Table (11): Comparison between CA19.9, and total and direct bilirubin and liver enzymes in the studied groups.

Total of pt	Pancreatic cancer	CA19.9	Total Bilirubin	Direct Bilirubin	ALT	AST
10 pts	• Resectable pancreatic cancer	<150u/ml: M=136.2 SD=1.932	1.5-2.5mg/dL: M=2.19 SD=0.334	1-2.5mg/dL: M=2.11 SD=0.445	10-20u/l: M=16.8 SD=2.936	10-15u/l: M=12.3 SD=1.059
2 pts	• Resectable borderline pancreatic cancer	150-<300u/ml: M=229 SD=9.899	5-7mg/dL: M=6 SD=1.414	3-6mg/dL: M=4.5 SD=2.121	15-25u/l: M=20 SD=7.071	5-25u/l: M=20.5 SD=6.363
3 pts	• Un resectable borderline pancreatic cancer	300-<450u/ml: M=330.6 SD=15.885	10-12mg/dL: M=11 SD=1	8-12mg/dL: M=10 SD=1.732	30-45u/l: M=36.6 SD=7.637	20-40u/l: M=32.3 SD=10.785
4 pts	• Locally advanced pancreatic cancer	500-<1000u/ml: M=770.2 SD=173.338	15-18mg/dL: M=16.75 SD=1258	10-15mg/dL: M=13 SD=2.160	100-150u/l: M=131.75 SD=22.306	80-130u/l: M=115.75 SD=23.893
6 pts	• Metastatic	> 1000u/ml: M=2587.1 SD=881.405	20-25mg/dL: M=23.16 SD=1.722	16-20mg/dL: M=18.166 SD=1.471	200-250u/l: M=232 SD=19.005	150-300u/l: M=221.6 SD=55.966

Discussion

Pancreatic cancer is one of the most lethal solid organ malignancies, with a 5-year survival rate of 6%. It represents the 1 1th most common cancer in the United Kingdom, accounting for 3% of all new cancer cases. It is characterized by diagnostic difficulty, distant metastasis and aggressive local invasion at an early stage **[8]**.

Pancreatic cancer affects males more than females. The tumor peak incidence lies between 55 and 70 years of age. The prognosis of pancreatic cancer is extremely poor and its early diagnosis is difficult **[9]**.

The only way to cure pancreatic cancer is to remove the entire tumor with no residual disease (microscopic resection-margin negative). A preoperative assessment for the possibility of complete resection for patients with pancreatic cancer is very important because precise estimation results in fewer unnecessary operations that do not afford survival benefit to the patients **[1]**.

Even in those patients who undergo resection, most die because occult extrapancreatic metastatic disease was likely present at the time of diagnosis **[10]**.

Currently, the study of choice for pre-operative staging of pancreatic cancer is Computed Tomography (CT). The accuracy of thin-cut, bolus-contrast, triple phase helical CT in predicting inoperability approaches 100%; however, the determination of resectability is only 75% to 80% **[11]**.

CA19.9 is detected in low levels in healthy individuals (up to 37U/ml) and the level is elevated in several types of cancers including pancreatic, and also in benign conditions such as pancreatitis and choledocholithiasis **[12]**.

CA19.9 is the most common tumor marker used for diagnosis and monitoring of pancreatic malignancies in which CA19.9 is reported to have a sensitivity ranging between 68% and 92%. Its measurement is simple, fast, cheap and noninvasive **[5]**.

Utility of CA19.9 in pancreatic cancer has been explored for screening, diagnostic, prognosis, predictive and also resectability purposes. Preoperative CA19.9 levels are associated with cancer staging and prognosis. Increased values are associated with the identification of unresectable disease during staging laparoscopy or laparotomy **[13]**.

The use of CA19.9 values is known to influence the decision of pancreatic cancer surgery. However,

still for years, controversy has existed in regard the clinical cut-off of CA19.9 levels to determine resectability [14].

In the present study, the majority of patients had cancer head of pancreas 18 patients (72%), while 5 patients (20%) were confined to the body and 2 patients (8%) were confined to the body and tail.

The majority of patients, 11 patients (44%) underwent pancreaticoduodenectomy, 5 patients (20%) of patients underwent distal pancreatectomy, 1 patients (4%) of patients underwent total pancreatectomy, and 8 patients (32%) patients underwent only exploratory laparotomy and biopsy.

Herrero s-Villanueva et al., [14] showed that, out of 203 patients included in their study tumor was localized in the head of pancreas in 138 patients (68%), body-tail in 20 patients (30%) and was not defined in 4 patients (2%). TNM clinical staging was I in 24 (11.8%) patients, II in 26 (12.8%), III in 48 (23.6%), IV in 94 (46.3%) and unknown in 11 (5.5%).

Among 25 patients included in the present study, C.T with pancreatic protocol has been done, 10 (40%) of them had resectable tumor and 5 patients (20%) had borderline pancreatic tumor. While, 4 patients (16%) had locally advanced pancreatic cancer and 6 patients (24%) had metastasis.

Herreros-Villanueva et al., [14] reported that 43 (21.2%) out of the 203 patients were considered resectable while 160 patients (78.8%) were considered unresectable. Out of the 43 resectable patients, 35 patients were curative and 8 with exploratory intent.

In Herrero s-Villanueva et al., [14], CA19.9 values were only available in 176 (86.7%) of the patients. The mean value of CA19.9 was 4793 ± 16,878U/ml and median of 309.7U/ml (95% CI 2282-7304). Among the 176 patients, CA19.9 was normal (≤37U/ml) in 50 (28.4%) and elevated (>37 U/ml) in 126 (71.6%). Significant differences were found between CA19.9 serum values between resectable and non resectable patients.

American Society of Clinical Oncology Clinical practice guideline [15] recommend surgical resection of the primary tumor and lymph nodes for patients with CA19.9 suggestive of potentially curable disease, but in absence of jaundice.

In the present study, there was a positive significant correlation between CA19.9 with total bilirubin, ALT and AST.

Also, in Herreros-Villanueva et al., [14], 26.6% of patients, presented jaundice at diagnosis; no correlation exists between CA19.9 and jaundice.

Identified that CA19.9 serum levels are not markedly affected by hyperbilirubinemia in both pancreatic cancer as well as chronic pancreatitis (correlation coefficients ≤0.135).

A study published in 2017 by Mirkin et al., [16] found an association between pre-treatment CA19.9 levels >800U/ml and advanced stage disease.

In 2018, Santucci et al., [17] reported CA19.9 levels over 178U/ml strongly suggest unresectable disease. This yielded a sensitivity of 87.7% and specificity of 81.6%.

Hartwig et al., [18] reported the usefulness of preoperative CA19.9 levels based on results from a cohort of more than 1600 patients with potentially resectable PDAC and investigated the correlation between CA19.9 levels and tumor resectability. In pre-operative levels more than 500U/ml, the resectability ratio was less than 70% and the median survival time after pancreatectomy was less than 20 months.

Herreros-Villanueva et al., [14], demonstrated a limited clinical utility of 500U/ml for CA19.9 as it provided only a sensitivity of 55.56% and a specifcity of 72.72%.

In Veldhuisen et al., [19], 54 patients with Locally Advanced Pancreatic Cancer (LAPC) after induction chemotherapy, using a 30% decrease of CA19.9 as cut-off, 9/10 patients were correctly classified as resectable (90% sensitivity, PPV 43%) and 3/15 as unresectable (20% specificity, NPV 75%). A CA19.9 decrease ≥30% was associated with improved survival (22.4 vs. 12.7 months, p=0.02).

In Kim et al., [20], the mean and median values of CA19.9 for resectable tumors were significantly lower than unresectable tumors. The best cut-off points for CA19.9, and tumor size to predict resectability were 92.77U/mL and 11.85cm^3, respectively. A CA19.9 ≥92.77U/mL and value no less than the cut-off level predicted the possibility of unresectability with 90.6% accuracy. However, tumor marker less than the cut-off levels predicted the probability of resection only with 40.6% accuracy.

The use of CA19.9 in conjunction with modern imaging techniques may improve the (I) Characterization of resectability, (II) Categorization of 'borderline-resectable' tumours and (III) Selection of patients for neoadjuvant systemic therapy.

The most important limitation is lack of consensus between different studies with different cut-off values of CA19.9; further homogenous studies are urgently needed.

Furthermore, the utility of CA19.9 has several confounding limitations. Patients, who are negative for the Lewis blood group antigen form approximately 4% to 15% of the general population, do not synthesize CA 19.9. We did not test for Lewis antigen status in our study. Only one-half of cancers less than 2cm are associated with an elevated CA 19.9. In addition, false-positive elevations in CA 19.9 exist in benign conditions, such as in patients with extrahepatic biliary obstruction caused by pancreatitis and choledocholithiasis.

Conclusion:

CA19.9 is one of the tumor markers for pancreatic adenocarcinoma. It can be used as marker to identify pancreatic adenocarcinoma with limited sensitivity and specificity. The use of CA19.9 in conjunction with modern imaging techniques may improve the characterization of resectability and categorization of 'borderline-resectable' tumours, however this biomarker alone does not possess enough predictive value. Most likely, as suggested by many others, a combination of biomarkers is needed in order to achieve acceptable sensitivity and specificity in a disease with non-specific symptoms and low incidence.

The CA19.9 level may be a useful marker for determining pre-operatively which patients have unresectable pancreatic cancer. Even though it is not the main target of this study. The presence of an elevated CA19.9 level should direct the surgeon to more liberal use of staging laparoscopy.

Pre-operative CA19.9 serum levels provide important prognostic information in pancreatic cancer patients, correlate with tumor stage and independently predict overall survival. An increasing post-operative CA19.9 serum level or failure of the CA19.9 serum levels to normalize post-operatively is associated with a poor prognosis and suggests residual disease or the presence of occult metastasis while a decline or normalization of the post-operative CA19.9 serum level is associated with improved survival.

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القيمة التشخيصية لدليل الآورام CA19.9 بإمكانية التنبؤ عن سرطان البنكرياس القابل للإستئصال الجراحى

يعتبر سرطان البنكرياس واحد من أكثر السرطانات المميتة وهو يمثل ٣٪ من معدل الوفيات من بين السرطانات الآخرى ويسبب الوفاة فى ٧٪ فى الولايات المتحدة الآمريكية وأوروبا.

وقد تسبب سرطان البنكرياس فى عام ٢٠١٨ فى وفاة حوالى ٤٣٢.٢٤٢ حالة من الوفيات، وقد قدر عالمياً أنه ٤٥٨.٩١٨ حالة سرطان بنكرياس قد حدثت فى عام ٢٠١٨ وحوالى ٣٥٥.٣٧١ حالة سرطان بنكرياس من المتوقع حدوثها حتى عام ٢٠٤٠.

ونظراً لتآخر ظهور الآعراض الخاصة بسرطان البنكرياس، فإنه حوالى (١٠-٢٠٪) من المرضى سوف يعالجوا جراحياً بالإضافة إلى العلاج الكيمائى المساعد لذلك يعتبر الإستئصال الجراحى الخيار الآمثل لسرطان البنكرياس.

ويوجد دليل الآورام CA19.9 بمستويات منخفضة فى الآشخاص الآصحاء (آقل من ٣٧ وحدة لكل ملل) ولكن ترتفع مستوياته فى العديد من السرطانات (مثل سرطان البنكرياس – سرطان المعده) كما آنه ترتفع مستوياته فى بعض الحالات الحميدة مثل (إلتهاب البنكرياس – وحصوات القنوات المرارية).

وقد تم إكتشاف دليل الآورم CA19.9 كوسيلة لتقصى والتشخيص وإمكانية إستئصال سرطان البنكرياس من عدمه، فمستوياته يعطى فكرة عن درجة السرطان ومدى التحسن بعد العملية ولكنه هناك دراسات عديدة ومختلفة لا تؤاكد إستخدامه كدليل على إمكانية إستئصال الورم من عدمه.

الهدف من هذه الدراسة هى معرفة القيمة التشخيصية لدليل الآورام CA19.9 فى القدرة على التنبؤ بسرطان البنكرياس القابل للإستئصال الجراحى.

وقد تمت هذه الدراسة التتبعية على ٢٥ مريض بسرطان البنكرياس بعد آخذ عينة من الورم وعمل تحليل آنسجة وتم إختيار المرضى من مستشفى الدمرداش جامعة عين شمس فى الفترة من يناير ٢٠١٦ إلى آبريل ٢٠١٩.

تراوحت آعمار المرضى فى هذه الدراسة ما بين ٤٥ إلى آقل من ٨٥ عام وكان (٦٤٪) منهم من الذكور و(٣٦٪) من الإناث.

غالبية المرضى (٧٢٪) لديهم سرطان البنكرياس فى رآس البنكرياس بينما (٢٠٪) منهم لديهم السرطان فى جسم البنكرياس و (٨٪) محصورين فى الجسم والذيل.

غالبية المرضى (٤٤٪) تم إستئصال سرطان البنكرياس والإثنى عشر (عملية ويبلز) بينما (٢٠٪) من هم خضعوا للإستئصال البنكرياس القاصى و (٤٪) من هم خضعوا للإستئصال الكلى للبنكرياس و (٣٢٪) منهم تم عمل إستكشاف جراحى للبطن وآخذ عينة.

فى الوقت الحالى آفضل طريقة لتحديد درجة سرطان البنكرياس فى مرحلة ما قبل التدخل الجراحى هى إجراء التصوير بإستخدام الآشعة متعددة المقاطع بالصبغة وثلاثية الآبعاد والتى آثبتت آنها دقيقة ١٠٠٪ فى التنبؤ بسرطان البنكرياس الغير قابل للإستئصال الجراحى.

مستوى دليل الآورام CA19.9 فى مرضى سرطان البنكرياس الغير قابل للإستئصال الجراحى آعلى بكثير مقارنة بمرضى سرطان البنكرياس القابل للإستئصال الجراحى.

توجد علاقة إيجابية بين دليل الآورام CA19.9 والبليروبين الكلى وإنزيمات الكبد (ALT - AST).