

The value of serum carbohydrate antigen 19-9 as a predictor of resectability in pancreatic adenocarcinoma

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Background

Pancreatic cancer is one of the most common causes for cancer-related deaths. Recently, considerable improvements in radiological imaging have made it possible to limit surgery for patients who will benefit. However, ~25–50% of patients with resectable disease on computed tomography (CT) are found to have unresectable lesions at laparotomy. The sensitivity and specificity of carbohydrate antigen 19-9 (CA 19-9) in the diagnosis of pancreatic cancer has been reported to be as high as 90 and 98%, respectively. However, little is known about the value of serum CA 19-9 levels in evaluating the resectability of pancreatic carcinoma.

Aim of the work

The aim of this study was to evaluate the value of serum CA 19-9 level in determining resectability of pancreatic cancer in comparison with triphasic CT.

Patients and methods

This retrospective study included 40 patients with histologically confirmed pancreatic adenocarcinomas. Serum CA 19-9 level was recorded, together with the CT findings. The operative decision as regards resectability was recorded. The level of CA 19-9 in the resectable and irresectable cases was recorded to determine a cutoff value for serum CA 19-9.

Results

Serum CA 19-9 in resectable cases was 182.84 ± 219.68 , whereas in irresectable cases it was: 1119.60 ± 668.66 ($P < 0.001$). At a cutoff value of 307.55, the sensitivity for resection was 100%, specificity was 88.67%, positive predictive value was 71.43%, the negative predictive value was 100%, and accuracy was 90%.

Conclusion

Preoperative CA 19-9 serum level is a useful marker for further evaluating the resectability of pancreatic adenocarcinoma. Obviously increased serum level of CA 19-9 more than 307.55 U/ml can be regarded as a predictor for unresectable pancreatic cancer. This is beneficial in avoiding unnecessary laparotomy and preventing its morbidity.

Keywords:

carbohydrate antigen 19-9, pancreatic adenocarcinoma, resectability

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Introduction

Pancreatic cancer is one of the most common causes for cancer-related deaths. Local vascular involvement and nodal and distant metastases are frequently found at the time of diagnosis [1].

Recently, considerable improvements in radiological imaging have made it possible to limit surgery for patients who will benefit. However, ~25–50% of patients with resectable disease on computed tomography (CT) are found to have unresectable lesions at laparotomy [2].

Resectability of a pancreatic tumor was defined as a tumor limited to the pancreas with no invasion of the superior mesenteric artery and vein, portal vein, and metastases [3].

Carbohydrate antigen 19-9 (CA 19-9) is the gold-standard serologic marker for the diagnosis of pancreatic cancer. Originally described by Koprowski

and colleagues as a marker for colon cancer, the CA 19-9 antigen is sialylated lacto-*N*-fucopentaose II, related to the Lewis blood group antigen. The sensitivity and specificity of CA 19-9 in the diagnosis of pancreatic cancer has been reported to be as high as 90 and 98%, respectively [3,4]. However, little is known about the value of serum CA 19-9 levels in evaluating the resectability of pancreatic carcinoma.

Aim of the work

The aim of this study was to evaluate the value of serum CA 19-9 level in determining the

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resectability of pancreatic cancer in comparison with triphasic CT.

Patients and methods

This retrospective study included 40 patients with histologically confirmed pancreatic adenocarcinomas presented and treated at Menoufia University Hospital and Damanhour Oncology Center between January 2011 and December 2014. All patients proved resectable on triphasic CT.

The following data were retrieved from the patients' files:

CT findings: pancreatic adenocarcinoma without invasion of the superior mesenteric vein, portal vein, or metastases.

Endoscopic retrograde cholangiopancreatography (ERCP) and cytological findings (if performed).

Serum level of CA 19-9.

Following laparotomy, the resectability of the tumor was recorded. The relationship between resectability and CA 19-9 level was statistically studied.

Statistical analysis

Data were analyzed using IBM SPSS software package, version 20 (SPSS Inc., Chicago, Illinois, USA). Significance of obtained results was judged at the 5% level. Agreement of the different predictives with the outcome was used and expressed in sensitivity, specificity, positive predictive value, negative predictive value, and accuracy. Receiver operating characteristic curve was plotted to analyze a recommended cutoff value; the area under the receiver operating characteristic curve denotes the diagnostic performance of the test. An area more than 50% gives acceptable performance and an area about 100% is the best performance for the test.

Results

The demographic data of the studied patients are presented in Table 1.

Triphasic CT imaging of patients in this study revealed pancreatic mass in 37 of 40 patients (92.5%). The mass was located in the head in 28 cases (70%), in the body in eight cases (20%), and in the tail in only one case (2.5%). In the remaining three cases (7.5%), the diagnosis was based on ERCP and cytology findings.

Table 2 represents the minimum, maximum, mean, SD and median of CA 19-9 level in both respectable and unresectable patients.

Discussion

Pancreatic cancer is one of the most common causes of cancer-related deaths. The overall 5-year survival rate ranges from 0.4 to 4%, the lowest for any cancer. Early diagnosis of pancreatic cancer is difficult because its early symptoms are usually nonspecific (weight loss, anorexia, nausea, and anemia of chronic illness). Local vascular involvement and nodal and distant metastases are frequently found at the time of diagnosis [1].

Recently, considerable improvements in radiological imaging have made it possible to limit surgery for patients who will benefit. The current methods of choice for diagnosing and staging pancreatic cancer are thin section, contrast-enhanced, and triple-phase helical CT. However, ~25–50% of patients with resectable disease on CT are found to have unresectable lesions at laparotomy. Although MRI is increasingly used in the evaluation of pancreatic tumor, it was reported that it offers no significant diagnostic advantage over CT [5].

It has been reported that CA 19-9 level is useful in both the diagnosis and the prognosis of pancreatic cancer [6]. However, little is known about the value of serum CA 19-9 levels in evaluating the resectability of pancreatic carcinoma. Certain limitations for the use of CA 19-9 do exist. Not every patient with pancreatic cancer will have high CA 19-9. Although a high CA 19-9 is most commonly associated with

Table 1 Demographic data of the studied patients

Point of comparison	Resectable (n = 30)		Irresectable (n = 10)		Test of significance	P
	No.	%	No.	%		
Sex						
Male	20	66.7	6	60	$\chi^2 = 2.22$	FEp = 0.159
Female	10	33.6	4	40		
Age						
Min–max	51–77		48–76		$t = 1.835$	0.074
Mean \pm SD	50.6 \pm 13.64		59.4 \pm 11.35			

χ^2 , value of Chi square; FE, Fisher exact test; t, Student t-test.

Table 2 Comparison between the studied patients according to CA 19-9

Point of comparison	Resectable (n = 30)	Irresectable (n = 10)	Z	P
Min–Max	5.0–1001.0	319.0–2138.0	4.312	<0.001
Mean \pm SD	182.84 \pm 219.68	1119.60 \pm 668.66		
Median	106.75	902.0		

Z, Z for Mann Whitney test.

Table 3 Agreement (sensitivity, specificity, positive predictive value, negative predictive value and accuracy) for CA 19.9 at the presumed cutoff value of 307.55

	Level	Resectable	Irresectable	Sensitivity	Specificity	PPV	NPV	Accuracy
CA 19.9	≤307.55	26	0	100.0	88.67	71.43	100.0	90.0
	>307.55	4	10					

pancreatic cancer, high levels may be found in patients with other cancers such as colorectal and lung cancers. Furthermore, high CA 19-9 levels may also be found in noncancerous conditions such as gall stones and pancreatitis. Moreover, patients with pancreatic cancers receiving radiotherapy may have higher CA 19-9 (Table 1). Both resectable and irresectable groups were comparable as regards the demographic data ($P > 0.05$).

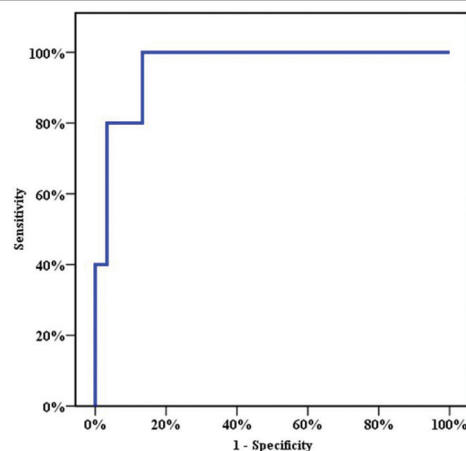
Triphasic CT imaging of patients in this study revealed pancreatic mass in 37 of 40 patients (92.5%), and in three cases the diagnosis was based on ERCP and cytology findings. In this study, CT failed to detect irresectability in 10 cases preoperatively (25%).

We agree with Clark and colleagues, who stated the following: 'CT is almost 100% accurate in predicting unresectable disease. However, the positive predictive value of the test is low and ~25–50% of patients predicted to have resectable disease on CT turn out to have irresectable lesion at laparotomy. The identification by means of preoperative imaging of patients who would not benefit from surgical exploration remains a challenge' [7].

The comparison between CA 19-9 levels in resectable versus irresectable patients (Table 2) revealed a highly significant increase of CA 19-9 in irresectable cases ($P < 0.001$), with a cutoff level of CA 19-9 between resectable and irresectable at 307.55 U/ml (Fig. 1 and Table 3), indicating that increased serum level of CA 19-9 above this value suspects irresectability of the tumor. In fact, only two cases with CA 19-9 level more than the cutoff level were found resectable.

From the above data we noticed that preoperative CA 19-9 level together with CT findings gave more accurate data about the decision as regards resectability.

This finding is in accordance with that of Zhang and colleagues, who reported similar results, yet with a higher cutoff value of CA 19-9 (353 U/ml). They reported that, at a cutoff value of CA 19-9 at 353.15 U/ml, the sensitivity, specificity, positive predictive value, and negative predictive value were 93.1, 78.3, 84.38, and 90%, respectively [8].

Figure 1

Receiver operating characteristic curve for carbohydrate antigen 19-9 to diagnose the cutoff value denoting irresectability.

Moreover, Kilic *et al.* [9] reported that the sensitivity, specificity, positive predictive value, and negative predictive value were 82.4, 92.3, 91.4, and 83.9%, respectively, in 51 patients, at a cutoff value of CA 19-9 at 256.4 U/ml.

Conclusion

Preoperative CA 19-9 serum level is a useful marker for further evaluating the resectability of pancreatic adenocarcinoma. Obviously increased serum level of CA 19-9 more than 307.55 U/ml can be regarded as a predictor for unresectable pancreatic cancer. This is beneficial in avoiding unnecessary laparotomy and preventing its morbidity.

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Nil.

Conflicts of interest

There are no conflicts of interest.

References

- Jemal A, Siegel R, Ward E, Hao Y, Xu J, Murray T, Thun MJ. Cancer statistics, 2008. *CA Cancer J Clin* 2008; 58:71–96.
- Hanbidge AE. Cancer of the pancreas; the best image for early detection-CT, MRI, PET or US? *Can J Gastroenterol* 2002; 16:101–105.
- Pappas S, Federle MP, Lokshin AE, Zeh HJ 3rd. Early detection and staging of adenocarcinoma of the pancreas. *Gastroenterol Clin North Am* 2007; 36:413–429.

- 4 Koprowski H, Steplewski Z, Mitchell K, Herlyn M, Herlyn D, Fuhrer P. Colorectal carcinoma antigens detected by hybridoma antibodies. *Somatic Cell Genet* 1979; 5:957–971.
- 5 Sahani DV, Shah ZK, Catalano OA, Boland GW, Brugge WR. Radiology of pancreatic adenocarcinoma: current status of imaging. *J Gastroenterol Hepatol* 2008; 23:23–33.
- 6 Dong Q, Yang XH, Zhang Y, Jing W, Zheng LQ, Liu YP, Qu XJ. Elevated serum CA19-9 level is a promising predictor for poor prognosis in patients with resectable pancreatic ductal adenocarcinoma: a pilot study. *World J Surg Oncol* 2014; 12:171.
- 7 Clarke DL, Thomson SR, Madiba TE, Sanyika C. Preoperative imaging of pancreatic cancer: a management-oriented approach. *J Am Coll Surg* 2003; 196:119–129.
- 8 Zhang S, Wang YM, Sun CD, Lu Y, Wu LQ. Clinical value of serum CA19-9 levels in evaluating resectability of pancreatic carcinoma. *World J Gastroenterol* 2008; 14:3750–3753.
- 9 Kilic M, Goemen E, Tez M, Ertan T, Keskek M, Koç M. Value of preoperative serum CA 19-9 levels in predicting resectability for pancreatic cancer. *Can J Surg* 2006; 49:241–244.