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ORIGINAL ARTICLE

RELIABILITY OF PREDICTION OF PERIAMPULLARY TUMOURS RESECTABILITY BEFORE PANCREATICODUODENECTOMY OPERATION

By

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Aim: *The aim of this study was to evaluate the accuracy of preoperative assessment in predicting surgical resectability in cases with periampullary tumours in reference to the intraoperative findings.*

Methods: *This study included 88 cases with obstructive jaundice suspected to have potentially resectable periampullary tumours and fit for surgical exploration. These cases were subjected to biochemical laboratory investigations, ultrasonography (US), endoscopic retrograde cholangiopancreatography (ERCP), computerized tomography (CT) scan, and diagnostic laparoscopy before surgical exploration.*

Results: *Surgical exploration revealed that 59 (67%) cases were irresectable due to portal vein[(39)] and coeliac trunk[(5)] invasions, LN infiltration,[(2)] liver metastasis[(7)] peritoneal nodules[(3)] and peripancreatic fat affection.[(3)] Abdominal US and ERCP were of little value in predicting resectability of such tumours. CT gave sensitivity and specificity in portal vein (97.4% & 100%) and coeliac trunk (100% & 100%) invasion, liver metastasis (71.4% & 100%) and peritoneal nodules (33.3% & 100%) respectively. Diagnostic laparoscopy could detect cases of small lesions of peritoneal nodules and liver metastasis that were missed on CT scanning. Although the sensitivity of detection of LN and peripancreatic fat plane affection were 100 %, their specificity were much less reliable that reached 75% & 60 % respectively.*

Conclusion: *CT revealed high accuracy results in evaluation of periampullary tumours resectability before pancreaticoduodenectomy operations. Its accuracy is improved on using diagnostic laparoscopy before exploratory laparotomy to detect early metastasis.*

Keywords: *Pancreatic resection, Preoperative assessment, Operability.*

INTRODUCTION

Periampullary tumours are major public health concerns throughout the world.[(1)] the most of them are malignant tumours and arise within 2 cm of the major papilla in the duodenum.[(2)] They include four different types of cancer that affect papilla of Vater, intrapancreatic distal bile duct, pancreatic head and second part of duodenum.[(1,2)]

Pancreaticoduodenectomy operation currently provides the only opportunity for cure for patients with periampullary carcinoma.[(3,4)] At present, exploratory laparotomy is aimed to judge whether the tumour is resectable or not. However, pancreaticoduodenectomy is a complex surgical procedure associated with significant mortality of 2-5% and morbidity of 30-50%.[(5)] The major surgical complications include postoperative pancreatic fistula, hemorrhage, and abscess and delayed gastric emptying. These complications may require
modification in the postoperative management with prolonged hospital stay, repeated operation and mortality.[(6-9)] Furthermore, only 15% to 20% of patients who undergo operation have resectable periampullary tumours, while the remaining are

irresectable due to vascular invasion, liver metastasis or peritoneal nodules.[10-14] Therefore, preoperative assessment of tumour resectability greatly influences the therapeutic strategies.

Despite progress in imaging techniques, accurate staging and correct prediction of resectability remains one of the chief problems in the management of periampullary tumours.[11,15,16] If reliable enough, it enable surgeon to separate operable from inoperable patients.[17] The latter cases could be saved an unnecessary operation with its complication besides increasing the opportunity of dissemination and metastasis of the tumour. Alternatively, these cases could be managed nonoperatively by endoscopic biliary stenting and percutaneous transhepatic drainage (PTD).[1,18]

This prospective study was conducted to evaluate the accuracy of preoperative assessment in predicting surgical resectability in patients with periampullary tumours by comparing them with the operative findings.

PATIENTS AND METHODS

This work was conducted on 88 cases with obstructive jaundice, suspected to have potentially resectable periampullary tumours and fit for surgical exploration. It also included cases, which had an associated pyloric obstruction and candidate for surgical palliative pyloric and biliary bypass. It was carried out between March 2001 and January 2006.

All patients were subjected to thorough history taking, clinical examination and routine laboratory investigation. Complete clinical assessment was done by the intensive care unit (ICU) staff to assess fitness for surgery and the possibility of postoperative ICU admission. Exclusion criteria comprises patients unfit for major surgery or those whom had short life expectancy and patients with a tumour metastasises.

Abdominal ultrasonography (US and endoscopic retrograde cholangiopancreatography (ERCP) were done in all cases to prove the diagnosis of obstructive jaundice and evaluation of their provisional etiologies. Computed tomography (CT) examination was performed in all cases to verify the presence of periampullary tumour and assess its potential resectability.

Just before laparatomy, diagnostic laparoscopy was done for further assessment particularly for detection of liver metastasis and peritoneal nodules. Patients were explored through extended right subcostal incision 4 fingers below the costal margin. In cases, which seemed to be resectable, the incision was extended to the left side to get a formal bilateral subcostal incision through which pancreaticoduodenectomy was attempted. Frozen section examination way performed for suspected tissues or lymph nodes and to assess the surgical margin in resected cases. In irresectable cases, the reasons of irresectability were recorded. All the resected specimens were sent for histopathalogical examination. The operative data were compared with the finding of the preoperative assessment to evaluate their accuracy.

All cases in this study were divided into 2 groups according to the type of operation performed. The first group (GI) included cases in which pancreaticoduodenectomy was carried out, while irresectable cases that underwent palliative bypass were included in the second group (GII).

The intraoperative findings regarding irresectability were recorded, with particular reference to the vascular invasion, lymph nodes affection, liver metastasis and peritoneal nodules. These findings were correlated with those reported in the preoperative assessment and laparoscopic examination.

The operative mortality and postoperative morbidity were detected and recorded in both groups.

Statistical analysis: Values in this study were expressed as mean ± standard deviation(SD). Proportions were tested using Chi-square test. Significance was taken as $P<0.05$.

RESULTS

In this study, 118 cases of obstructive jaundice suggested to have periampullary tumours were referred for surgical consultation. These cases were diagnosed on basis of laboratory finding, US and ERCP. They were 82 ♀ and 36 ♂ with their ages ranged from 28 to 81 with a mean of 52.8 ± 30.2 years. Of them 30 cases were excluded from the study due to associated decompensated cardiopulmonary disease,[6] renal failure,[2] septicemia of pancreatitis or cholangitis as complication of obstruction and ERCP,[8] terminal liver cirrhosis[7] and severe cachexia[5] (Fig. 1). These patients were managed nonoperatively using endoscopic billiary stent[18] or PTD.[12] They survived for a periods ranged from 3 week to 5 months after diagnosis with a mean of 3.2 ± 2.4 months.

The study included 88 cases fit for surgical exploration. Their male to female ratio was 62:26 and their ages ranged from 28 to 68 with a mean of 48.4 ± 20.3 years.

Surgical exploration revealed that only 29 cases with periampullary tumours were respectable. They constitute 24.6% of cases of periampullary tumours referred to the surgical department and 33% of cases fit for surgical exploration. The remaining 59 (67 %) cases were irresectable. The surgical causes of irresectability were peritoneal nodules,(3) liver metastasis,(7) positive peripancreatic fat plane affection,(3) positive LN involvement,(2) coeliac trunk(5) and portal vein involvement.(39) The decision-making algorithm in shown in (Fig. 1).

Abdominal US defined periampullary tumours in only 19 (21.6%) cases. Anatomical diagnosis of the tumours could be detected in only 9 (10.2%) cases with pancreatic head tumours. Signs of irresectability were only detected in 3 (42.9%) out of 7 cases with liver metastases with overall results of 3.4% of the 88 cases fit for surgical exploration. US gave no definite findings regarding vascular invasion, LN affection, peripancreatic planes infiltration and peritoneal nodules. ERCP diagnosed periampullary mass in 54 (61.4 %) cases of them 51 cases were demonstrated as an indentation shadow on cholangiopancreatography films and 3 cases were directly visualized during duodenoscopy, where tissue biopsy were also taken for histopathalogical confirmation. ERCP gave no valuable data denoting state of irresectability of the periampullary tumours.

Periampullary tumours irresectability signs were found on C.T examination in 57 out of 59 cases , these signs were portal vein and/or SMV invasion,(38) coeliac trunk infiltration,(5) lymph node involvement,(3) liver metastases,(5) peritoneal nodules(1) and peripancreatic fat plane affection.(5) (Table 1, Figs. 2,3,4).

Diagnostic laparoscopy revealed liver metastasis in 7 cases. Only 5 (71.45) them were detected on CT exanimation. Similarly, 3 cases of peritoneal nodules were seen during laparoscopy, of them 1 (33.3%) case only was diagnosed using C.T scan.

The preoperative C.T scan revealed signs of irresectability in 57 out of 59 cases. Prediction of portal vein infiltration was achieved in 38 out of the 39 cases proved intraoperatively with 97.4% sensitivity and 100% specificity rates. All cases proved to have coeliac trunk infiltration during operation could be predicted preoperatively on C.T examination with 100% sensitively and specificity rates. C.T scan detected 5 out of 7 cases proved to have liver metastasis intraoperatively with 71.4% & 100% sensitively and specifically rates respectively. The other 2 cases could be successively diagnosed using laparoscopy before surgical laparotomy incision. Similarly, peritoneal nodules were diagnosed preoperatively in only one case out of 3 cases proved to have these lesions intraoperatively with 33.3%&100% sensitivity and specificity rates respectively.

These 59 cases where subjected to the palliative by pass surgery in spite of the presence of signs of irresectability in C.T scan because:

1- The young age of the patients with long life expectancy.
2- Failed preoperative endoscopic stenting and release of the obstruction.
3- To prevent exposing the patients later on for another surgery under bad general conditions in cases of developing pyloric obstruction or failed repeated stenting.

Diagnostic laparoscopy was more significantly sensitive than C.T scan in diagnosis of liver metastases (P<.01) and peritoneal nodules (P<0.01). Affection of peripancreatic fat plane was demonstrated in 5 cases of pancreatic head lesions on CT examination. During laparatomy, frozen section detected positive infiltration in only 3 of them with 100% and 60% sensitivity and specificity rates respectively. Again, lymph node was affection demonstrated in 4 cases on CT examination while intraoperative frozen section proved malignancy in 3 of them with 100% and 75% sensitivity and specificity rate respectively. The reaming negative lymph node and peripancreatic fat cases were inflammatory in nature.

The overall sensitivities of CT scan in detecting irresectability was 91.5% which was statistically significant compared to US with P<0.001. The overall false negative result of CT scan in detection of irresectabilities was 8.8% due to failure in diagnosis of a case of vascular infiltration, liver metastasis and peritoneal nodules. In the meantime, the overall false positive results were 5.3 % due to inflammatory affection of lymph nodes or peripancreatic fat Table 1.

The operative mortality and postoperative morbidity in both resectable and unrespectable cases are shown in Table 2.

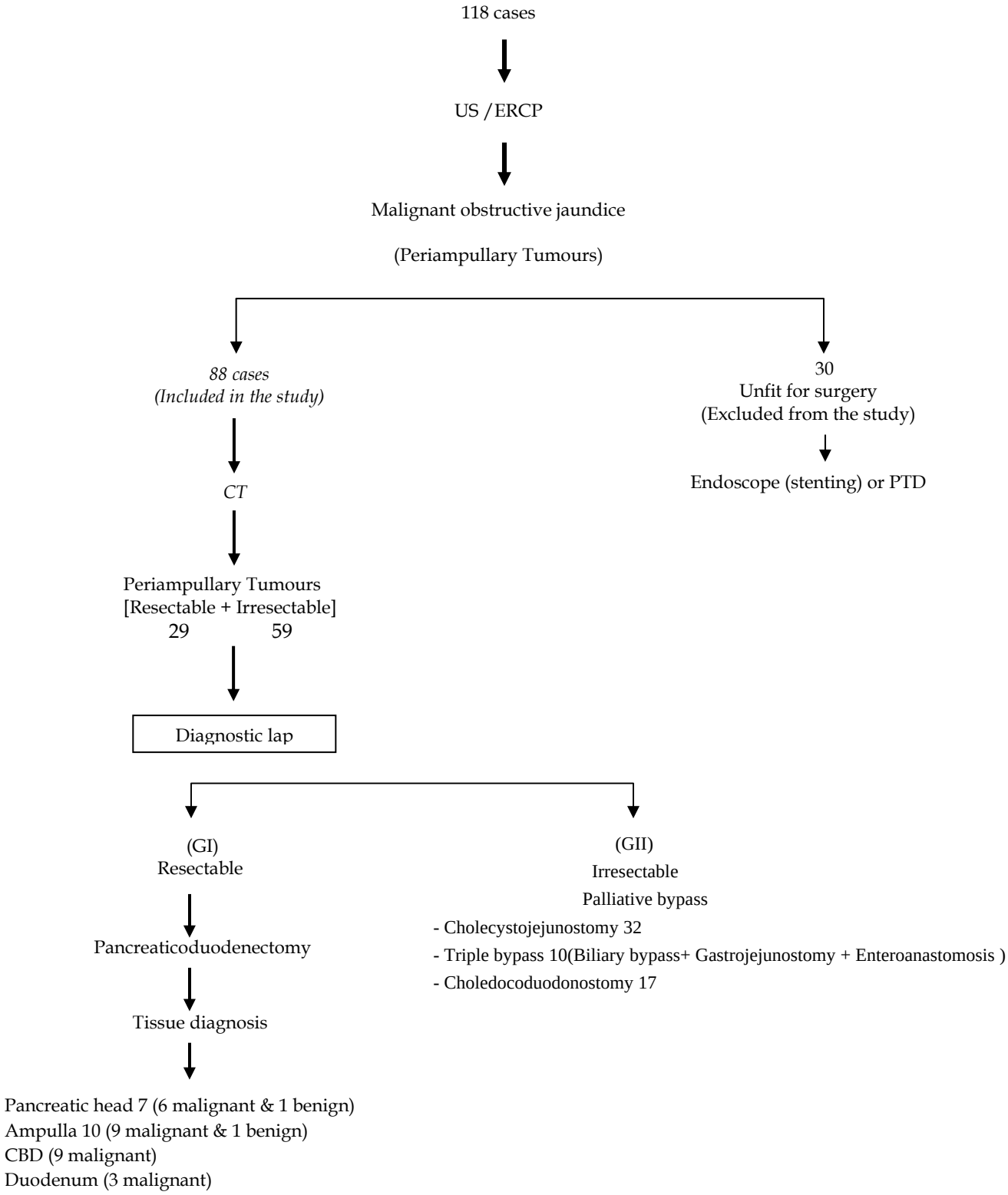

Fig 1. Decision making in cases referred to surgical department.

Table 1. CT and operative findings in irresectable cases.

Data	CT	Operative	False – ve	False +ve
Portal vein and /or SMV	38	39	1	-
Caeliac trunk	5	5	-	-
L N	3	2	-	1
Liver metastasis	5	7	2*	-
Peritoneal nodules	1	3	2*	-
Peripancreatic fat	5	3	-	2
Overall	57	59	5	3

* These cases could be detected during diagnostic laparoscopes before laparatomy incision.

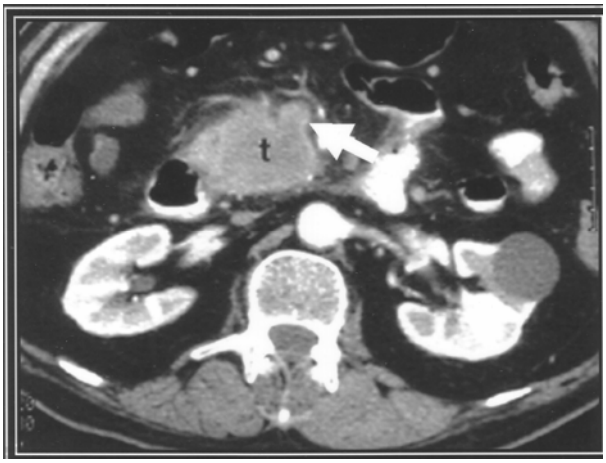

Fig 2. Pancreatic head tumor (t) with SMV invasion (white arrow)

Fig 3. Pancreatic head tumour (t) with coeliac axis invasion.

Figs. 4a,b,c Lymph node involvement (black arrow, a), hepatic metastases (white arrow, b) and pancreatic head carcinoma (open arrow, c).

Table 2. The operative mortality and postoperative morbidity of resectable and irresectable cases.

Findings	(GI ,n =29) Respectable cases	(G II , n=59) Irresectable cases
Operative mortality	2 (7%)	-
	(on day 1 , bleeding)	
	(on day5 , pul. embolism)	
Controlled postop. bleeding	1 (reoperation)	-
Self controlled fistula:		
- Pancreatic	7 (24 %)	
- Biliary	2 (7 %)	3 (5 %)
- G I T	-	-
Delayed gastric emptying	11 (38 %)	8 (14 %)
Chest infection	5 (17 %)	8 (14 %)
Wound complications:		
- Infection	6 (21 %)	8 (14%)
- Burst	1 (3 %)	

DISCUSSION

In this study, and to be more applicable, the preoperative assessment was carried out using the modalities that have become conventional in the surgical field. Accordingly, transabdominal ultrasonography, ERCP, CT scan and diagnostic laparoscopy were used. Other less available investigations as MRI, MRCP endoscopic US, laparoscopic US and angiography were not resorted to despite their accuracy that proved in previous studies.[18-20] Also, CA 19 – 9[21] tumour marker could not be done or followed up except in sporadic cases, therefore, excluded as a studied parameter.

The resectability of periampullary tumours was proved intraoperatively in 24.6 % of cases referred for surgical consultation and 33% of cases fit for surgery. Other studies demonstrated lower rates of resectability that ranged from 15% to 20%.[10-14] The higher incidence of resectability in our study might be due to the small number of cases and the selection of cases referred for surgical consultation.

Abdominal US did not show a high accuracy in diagnosis of periampullary tumours. It also gave no helpful data regarding resectability of these tumours. Its value might be in diagnosis common bile duct (CBD) obstruction and exclusion of biliary stones. These results agreed with these reported by other investigators who reported low accuracy in diagnosis of periampullary tumours or assessment of their respectability.[22,23]

ERCP could accurately diagnosed obstructive jaundice and its exact level. It also excludes cases of calculus obstruction and has the facility of stone extraction. However, in the current study it was of little value in detection of the exact nature of obstructive lesions and of no value in prediction of their resectability. Moreover, other studies reported that ERCP is an invasive procedure that carries considerable complications. They recommended its replacement by other less invasive diagnostic imaging as MRCP, despite lacking therapeutic potentiality.[24-26]

The overall sensitivity and specificity of CT scan in prediction of periampullary tumours irresectability were 91.5 % and 95 % respectively. Its accuracy might be improved if we considered the results of other investigations used in this study. CT examination failed to detect small lesions of liver metastasis and peritoneal nodules in 4 cases, which could be easily diagnosed during laparoscopy. This supposed to increase the sensitivity in detection of irresectable cases to 98.3%, as only one case of portal vein infiltration will be wrongly explored as a resectable case. However, many authors consider early portal vein involvement as a resectable case in which they excise the affected segment with primary anastomosis or using an autogeneses vein graft.[10,27] On the other hand, lymph node and pancreatic fat affection gave a positive result in 5 of 8 diagnosed cases with 62.5% specificity rate. However, the later 2 signs usually associated with other irresectable signs that improve its irresectability specificity rate. Even if they were the

prominent signs as it was the case in our study, ignoring of these 2 irreliable signs exposing 5 (7.8 %) cases only to unnecessary laparatomy without missing any resectable cases.

Other studies reported variable results of CT in preoperative assessment of periampullary tumours resectability. Some investigators demonstrated sensitivity and specificity rates of 33% & 86 %,[28] 36% & 85%,[22] and 44% & 78%[23] respectively. Others showed a higher rate of sensitivity and specificity rates that reached 71.4% & 90.6%,[18] 72% & 100%[29] and 87%& 100%[30] respectively. Further more, another study showed that the CT - PET proved not to be more superior over the convential CT in diagnosis of small periampullary tumours or assessment of their respectability.[31]

Diagnostic laparoscopy proved to be a valuable tool in assessment of periampullary tumours.[32-34] In this study, it accurately detected liver metastasis and peritoneal nodules that missed by other radiological examination. Other studies proved the high accuracy of laparoscopic ultrasonography in evaluation of periampullary tumours resectability regarding local extension of the tumour.[21,35,36] Also, palliation of pyloric or biliary obstruction due to periampullary tumour extension could by done by laparoscopic gastrojejunostomy or hepaticojejunostomy respectively.[32] Furthermore, many recent studies have reported formal pancreaticoduodenectomy by laparoscopic technique.[35,36]

The importance of saving the patients with irresectable periampullary tumour an unnecessary laparatomy has been raised particularly in the presence of nonoperative palliation. Biliary obstruction could be palliated by internal drainage using endoscopic biliary stent or externally using percutaneous transhepatic drainage.[1,2,26] In the meantime, pyloric obstruction due to local spread of the tumours is successfully bypassed using endoscopic stent.[37-42]

To conclude, CT examination is still the gold standard modality in evaluation of periampullary tumours resectability before pancreaticoduodenectomy operation. Its accuracy improved on using diagnostic laparoscopy that detects early metastasis. The preoperative assessment is proposed to remarkably decrease the need of unnecessary laparatomy of irresectable cases particularly after emerging of the nonoperative palliation procedures of biliary and pyloric obstruction.

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