

REGIONAL PANCREATECTOMY WITH PORTAL/SUPERIOR MESENTERIC VEIN RESECTION AND RECONSTRUCTION IN TREATMENT OF PANCREATIC ADENOCARCINOMA: A PRELIMINARY REPORT

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Background: Pancreatic adenocarcinoma has poor prognosis and low resectability rates. Resection is the only potential curative treatment. Portal vein involvement can be detected either intraoperatively or during preoperative staging. Portal vein resection and reconstruction can be performed to increase resectability rate.

Aim of the study: Is to evaluate the results of early experience in regional pancreatectomy for patients with portal vein involvement by carcinoma head of pancreas.

Methodology: The study included nine patients with carcinoma head of pancreas and involvement of portal /superior mesenteric vein confluence. Regional pancreatectomy has been done with portal/ superior mesenteric vein resection and reconstruction. Saphenous vein was used in 2 cases and superficial femoral vein in 7 cases. The effect of different factors as demographic data, operative factors, tumor factors and types of grafts on morbidity and mortality were studied

Results: Three cases of mortality mainly due to liver cell failure and 6 cases survived 6 to 12 months during the first year of follow up. Graft thrombosis occurred in two cases, biliary leakage in one case and severe intestinal edema in 2 cases due to portal vein clamping. No single factor has its impact on survival.

Conclusion: Involvement of the portal/ superior mesenteric vein is not a contraindication to resection. Regional pancreatectomy offers free safety margin of resection and can be facilitated by consideration of some technical steps during the procedure. The Superficial femoral vein can be used as a graft for reconstruction with minimal limb morbidity

Keywords: Regional pancreatectomy-portal vein reconstruction

INTRODUCTION

Although surgical resection remains the only potential curative treatment for adenocarcinoma of the pancreas, only 10% to 20% of all patients are candidates for pancreatic resection^(1,2). This low resectability rate reflects the advanced stage of the disease at the time of diagnosis. At presentation, almost 50% of patients have distant spread of the tumor and 35% manifest locally advanced disease. Although distant metastases constitute an absolute contraindication for resection, locally advanced disease may also preclude curative resection^(3,4,5).

Inability to separate the pancreas from the portal vein historically has been a locoregional contraindication for

resection in patients with adenocarcinoma pancreas, and frequently isolated local invasion of the portal vein is the only obstacle to curative resection.

In an attempt to improve resectability rates, Fortner proposed excision of the pancreatic tumor combined with resection of the portal vein and hepatic / superior mesenteric artery. Although this extended resection improved resectability rate, it was associated with high rates of morbidity and mortality. Failure to achieve long term survival dissuaded most surgeons from pursuing the regional pancreatectomy^(6,7).

Since Asada's first reported case of portal vein resection and reconstruction⁽⁸⁾ and Fortner's original report,

this procedure has undergone considerable evolution and refinement with acceptable morbidity and mortality⁽⁹⁾. Isolated portal vein resection (PVR) can be performed safely. Some reports even suggest an improvement in survival^(10,11). Moreover, Lillemoe et al. have proposed that locally advanced disease is not a contraindication to resection because resection is the best palliation⁽¹²⁾.

This study was performed to evaluate the technique, the use of superficial femoral vein in portal/superior mesenteric vein reconstruction, and the technical points that help improving the outcome of this kind of surgery.

PATIENTS AND METHODS

A review of nine patients who have undergone regional pancreatectomy with portal /superior mesenteric vein resection and reconstruction at Kasr Al Aini hospital between April 2001 to January 2003, were included in this study. They were 4 women and 5 men with age range between 42 and 71 years. They came with malignant obstructive jaundice due to mass in the head of the pancreas seen by abdominal ultrasonography. All patients had prior diagnosis of portal vein involvement either by computed tomography scan (Figs. 1 and 2) or diagnosed intra-operatively during the classical pancreaticoduodenectomy (Fig. 3). Regional pancreatectomy with portal vein/superior mesenteric vein reconstruction was performed for all and vein reconstruction was done by the use of vein graft, long saphenous vein in 2 cases and superficial femoral vein in 7 cases (Figs. 4 ,5).

Operative Technique:

After bilateral subcostal incision and abdominal exploration, the diagnosis was confirmed by palpation of the mass after Kocherization of the duodenum. Dissection of common bile duct, hepatic artery and portal vein was the first step. Ligation of the gastroduodenal artery helps to release the hepatic artery from the field then division of the common bile duct above the duodenum was done. This step will make the pancreatic mass attached only to the portal vein from above. Next dissection of the superior mesenteric vein and artery was done from below and ligating all the branches to the duodenum and upper jejunum. This would allow division and dissection of duodeno-jejunal flexure and mobilization of the third and fourth parts of the duodenum from behind the superior mesenteric vessels (Fig 6). In the mean time division of the stomach was done from above and by this step, the mass will be attached only to the portal/ superior mesenteric vein confluence. After systemic heparinization, clamping of the superior mesenteric artery was done (7 cases) before clamping of the portal and superior mesenteric vein to prevent intestinal edema as missing this step in the first 2 cases was associated with severe bowel edema (Fig 7). Vein resection was considered the last step before tumor

resection to decrease the ischemia time of the liver due to portal vein clamping. Splenic vein is doubly ligated and divided with division of the pancreatic head and the tumor (Figs.7 A&B). Vein reconstruction was performed with long saphenous vein in 2 cases and superficial femoral vein in 7 cases by continuous 5/0 proline sutures. Pancreatic stump was closed with non-absorbable 3/0 proline sutures and covered with jejunal serosal patch.

Choliodochojejunostomy and gastrojejunostomy were done then abdominal wound was closed with drainage.

For cases discovered intra-operatively to have portal vein involved, Completion of the procedure was done by dissection of the superior mesenteric vein and artery before resection and vein reconstruction. In these cases ample time was consumed in dissecting the portal/ superior mesenteric vein confluence and identification of the junction with the splenic vein can be made. In these cases, saphenous vein graft can be anastomosed to the superior mesenteric vein below and portal /splenic vein confluence above. Then the operative steps were completed.

Criteria of evaluation included 1) demographic parameters, 2) operative factors, as operative time, transfusion requirements, Time of clamping and graft anastomosis, 3) Tumor characteristics as tumor size, margins, lymph node status and tumor grade. 4) Outcome of the procedure including, morbidity, mortality and over all survival.

RESULTS

Demographics:

A total number of 9 patients with pancreatic cancer underwent regional pancreatic resection with portal/superior mesenteric vein reconstruction during almost one and half years. They were 4 women and 5 men with age range between 42 to 71 years. Although a small series, there was no significance of the age or the sex in the outcome of the procedure.

Operative factors:

Of the nine patients 2 had long saphenous vein interposition grafts, and 7 had superficial femoral vein grafts for reconstruction of the portal/superior mesenteric vein segment. (Deep veins have been used in reconstruction of infected prosthetic aortic grafts since 1990 by Nevelsteen⁽¹³⁾). There were no postoperative problems with the use of the superficial femoral vein as these patients were put on low molecular weight heparin postoperatively and continue on elastic stocking before discharge. Only one patient had signs of chronic venous hypertension on follow up. In two cases only there was no clamping of the superior mesenteric artery during reconstruction, (a step that was routine in the rest of the cases), severe intestinal edema occurred that made the anastomosis with the common bile

duct and stomach a difficult task. Total clamping time was in the range of 30 to 45 minutes for the tumor resection and vein reconstruction. Anesthesia time ranged from 6 to 9 hours. Blood transfusion requirements ranged from 3 to 5 units during the procedure and 1 to 3 units in the postoperative period. Tumor size ranged from 4cm to 7 cm (Fig. 8). Microscopic surgical margins were negative in 6 cases and positive retroperitoneal extension in 3 cases. Metastatic lymph nodes were positive in all cases with one or two lymph nodes detected. Tumor grade was between grade 1 to 3, and 3 well-differentiated adenocarcinoma of the pancreas.

Outcome:

In hospital re-operation was required in one patient due to internal bleeding from the stump of the ligated

splenic vein and the vein graft was found intact and patent. There were no problems with pancreatic leak which is a very troublesome complication as in this study closure of the pancreatic stump was done in all cases with jejunum serosal patch. Bile leakage occurred in a case that had intestinal edema due to clamping of the superior mesenteric vein without clamping of the artery. This complication was treated conservatively and closed by simple drainage. The length of the hospital stay ranged from 30 to 45 days. There were three postoperative deaths in this group. The main causes of death were severe rise of liver enzymes and liver failure in two cases and acute myocardial infarction in the third case. Short-term survival of the remaining 6 patients ranged between 6 to 12 months during the first year of follow up. Postoperative Doppler studies proved that vein grafts used for reconstruction were patent in 6 cases before discharge.

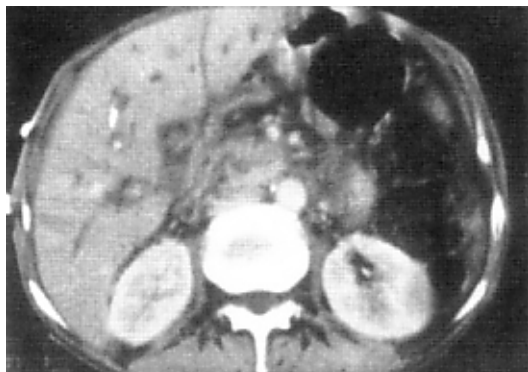


Fig (1): CT scan with contrast shows tumor of the pancreatic head and suspected involvement of the portal vein.

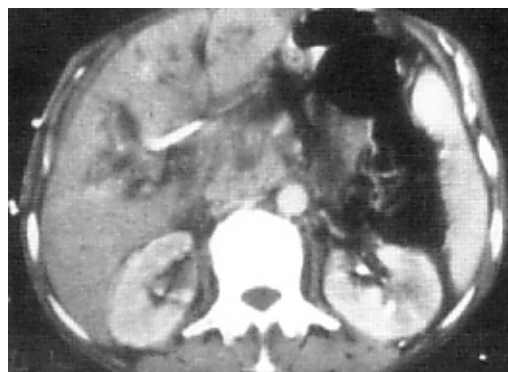


Fig (2): CT scan with cancer head of pancreas and no plane of separation between the tumor and the portal vein.

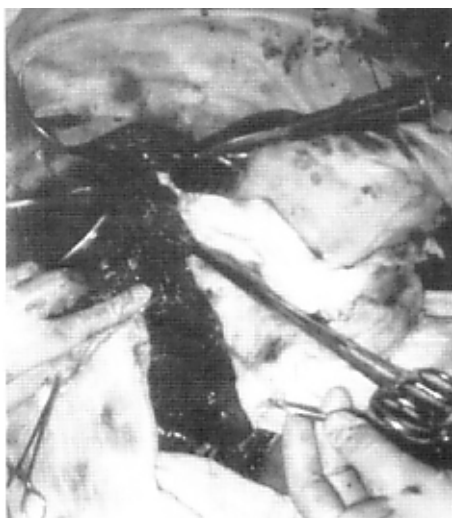


Fig (3): Portal vein involvement found intra-operatively as dissection could not be completed.



Fig (4): Saphenous vein graft used for portal/superior mesenteric vein reconstruction



Fig (5): Superficial femoral vein segment used for reconstruction of the portal/superior mesenteric vein.

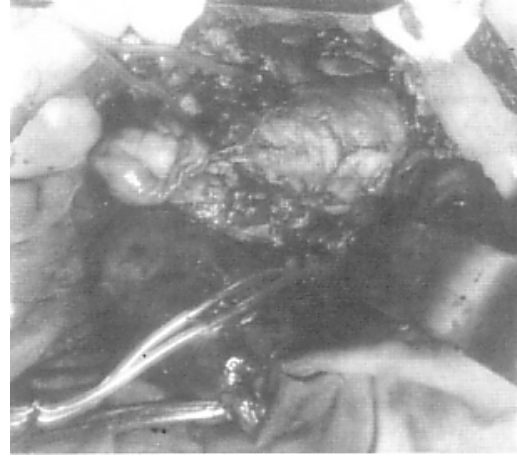


Fig (6): Operative picture shows the vascular control of portal vein, superior mesenteric artery and vein. The 3rd and 4th part of the duodenum is mobilized from behind mesenteric vessels

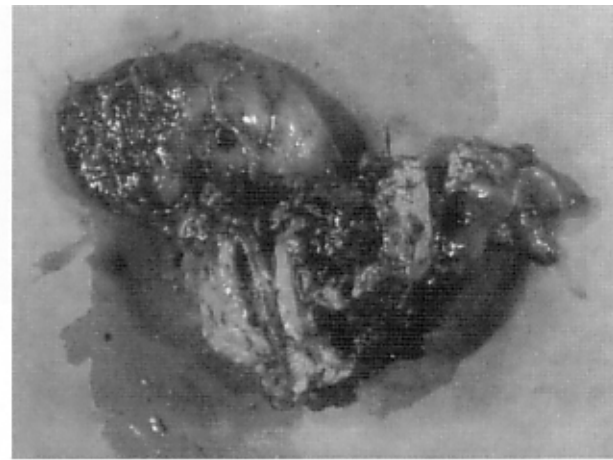
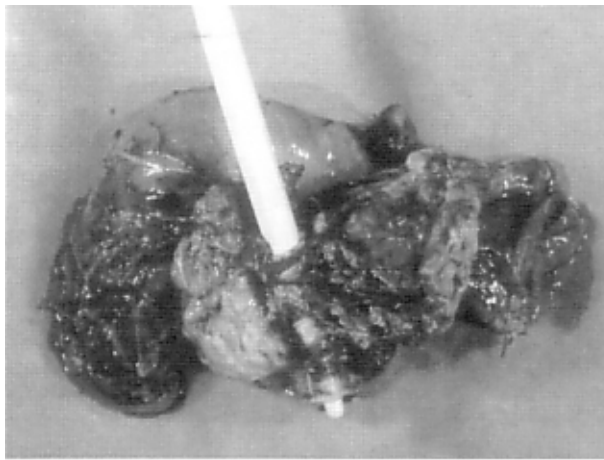


Fig. (7- A&B): Tumor after excision shows the portal/superior mesenteric vein segment with the stump of the splenic vein. Notice the involvement of the vein after splitting the vein longitudinally.

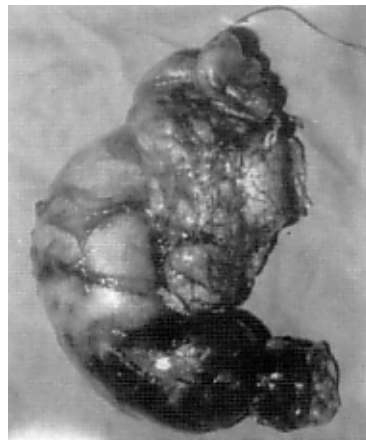


Fig (8): Tumor of the head of pancreas (Pathological specimen) shows tumor size of 4cm.

DISCUSSION

Although the prognosis remains poor, surgical exploration with complete resection provides the only potential of cure for patients with adenocarcinoma of the pancreas. Isolated portal vein involvement classically has been a contraindication for resection, this study demonstrates that portal/superior mesenteric vein can be resected and reconstructed safely. It also suggests that patient with portal vein involvement can benefit from resection as well as those without portal vein involvement.

Resection with portal vein reconstruction requires a longer operation, longer anesthesia time and more steps over the classic resection without portal vein reconstruction.

The majority of patients require a vein graft that matches with the size of the portal and superior mesenteric vein. Previous reports used interposition grafts as internal jugular, left renal, saphenous vein or synthetic material^(14,15,16,17). In this study, saphenous vein was used in only 2 cases and superficial femoral vein was used in the rest of the patients. The reason for use of the latter was the presence of small saphenous vein in one patient. The use of the superficial femoral vein segment just below the junction with the deep femoral vein was based on the previous experience of Nevelsteen who used the a longer segments in situ infected aortic graft reconstruction. It was found matching with the size of the portal and superior mesenteric vein with no postoperative complications as these patients were put on low molecular weight heparin postoperatively.

Other studies reported no need for interposition grafts as primary end-to-end anastomosis could be performed by mobilization of small bowel mesentery after division of the splenic vein. Others performed lateral venorrhaphy for adequate tumor clearance. There was no case in this study with primary anastomosis as we elected to resect a long segment from the start to make resection easy and for better control of the splenic vein from behind.

Although Fortner introduced the concept that portal vein reconstruction is technically feasible and recent reports confirmed the safety of the procedure, the question of whether PVR for clinically apparent portal vein involvement impact on survival needs to be evaluated. Some reports have proved improved survival but they have not been reproduced consistently. However equivalent survival to resection without PVR suggested that portal vein involvement should not be a deterrent to resection. In this study 6 patients out of nine had negative margin of resection and survived after resection and PVR. Although a small series, it suggests that if portal vein

involvement is suspected or found accidentally during operation pancreatic resection with PVR should be considered.

The rationale of PVR is so confusing and debatable. One may say that the prognosis of pancreatic carcinoma is so dismal, and it is difficult to detect small difference in survival after any intervention. As some patients with resection and PVR may in fact do worse than those having resection without PVR. The point that survival can be improved is that involvement of the portal vein is not an indicator of tumor aggression but rather a reflection of tumor size and location. Moreover, true vascular invasion of the portal vein is difficult to differentiate from inflammatory adhesions by conventional surgical exploration⁽¹⁸⁾. Up to 50% of tumors thought to have vascular invasion intraoperatively were found subsequently adherent to the portal vein after histopathologic examination⁽¹⁹⁾. The difference in survival is well documented to decrease as the depth of invasion is increased⁽²⁰⁾. In this study histologic confirmation of portal vein involvement was not routinely done although it was proved in some cases to be infiltrated by the tumor. A point that must be considered, is that histopathological examination of the excised portal vein segment must be done to differentiate between adherence and infiltration.

Diagnosis of portal vein involvement in this study was based on computed tomography scanning or the classic intraoperative evaluation. The first is a poor predictor of vascular invasion and the second is better accompanied by intraoperative ultrasound that may improve detection of invasion as has been proved recently by some reports^(21,22).

Stratification of all parameters against mortality and survival proved that no single factor has a significant effect on the outcome. This may be due a small series of patients but a larger group is recommended and followed for a longer time for better definition of the effect of each factor on survival.

In conclusion, portal vein involvement should not be considered as a contraindication to resection in patients with pancreatic adenocarcinoma. Although it is a lengthy operation but it offers curative resection in some cases. Reconstruction of the portal vein can be performed with the use of superficial femoral vein with very good match and low morbidity. Clamping of the superior mesenteric artery before reconstruction is an essential step to prevent intestinal edema and to make anastomosis to the common bile duct and stomach an easy job. Moreover, the use of superficial femoral vein as a substitute for portal/superior mesenteric vein reconstruction is a good matching vein with little morbidity that could be controlled by low

molecular weight heparin and elastic stoking.

Finally a large series is recommended with better evaluation of the different factors affecting the outcome. Routine histological examination of the portal vein is recommended to differentiate between inflammation and invasion. A control group of patients with pancreaticoduodenectomy without portal vein reconstruction has to be added as a control group for comparison in future studies.

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