

## CASE REPORT

## Radical Antegrade Modular Pancreato-Splenectomy (RAMPS) Procedure with Celiac Trunk Resection Case Report

RaafatRaof Ahmed Al-Turfi\*,Ali Hussein Jasim\*\*

### ABSTRACT:

Carcinoma of the body and tail of the pancreas considered one of the most challenging tumors due its retroperitoneal location and neighboring major blood vessels. Therefore, it is often presents at an advanced stage and is deemed unresectable in the majority of patients. The traditional approach of left-to-right Pancreato-Splenectomy is associated with a high positive tangential margin rate, is not based on the described lymph node drainage of the organ, and is associated with high recurrence rate. In 2003, Strasberg SM described a novel approach for resection of this part of the pancreas called Radical Antegrade Modular Pancreato-Splenectomy (RAMPS) which was introduced to obtain a higher rate of negative tangential margins and a higher lymph node count. This is a case report of pancreatic tumor with celiac trunk invasion treated by the new RAMPS procedure with celiac trunk resection. Patient discharged home on fifth postoperative day, follow up reveals recurrence free survival one year later.

**KEYWORDS:** pancreatic tumour, RAMPS procedure, celiac trunk resection

### INTRODUCTION:

Carcinoma of the body and tail of pancreas considered one of the most challenging tumors due its retroperitoneal location and neighboring major blood vessels that led to late presentation, low resectability and having a high rate of recurrence after resection. Conlon and Brennan from the Memorial Sloan- Kettering Cancer Center described extensive experience with adenocarcinoma of the body and tail of the pancreas; 58 of 502 patients (12%) had resectable conditions<sup>(1)</sup>, the procedure was performed with the traditional left-to right-method.

The traditional approach of left-to-right Pancreato-Splenectomy is associated with a high

positive tangential margin rate and is not based on the described lymph node drainage of the organ. Margin positivity according to the same reference mentioned above was 16 of 58 (28%)<sup>(1)</sup>. In 2003, Strasberg SM described a novel approach for resection of this part of the pancreas called Radical Antegrade Modular Pancreato-Splenectomy (RAMPS)<sup>(2)</sup>.

This is a case report of pancreatic tumor with celiac trunk invasion treated by the new RAMPS procedure with celiac trunk resection.

### CASE REPORT:

A 50 y old male presented with abdominal pain, weight loss, and anorexia. Abdominal ultrasound revealed hypo-echoic pancreatic body and tail mass 6 cm with enlarged peripancreatic LN. MDCT (figure 1), revealed enhanced mass with invasion of left celiac trunk and splenic vein, and there are two non-enhancing liver nodules at segment 7, MRI revealed they are simple liver cysts. Tumor markers were normal except serum chromogranin-A was 163. EUS- guided FNAC was done to the patient which suspecting but not confirming the presence of neuroendocrine tumor of pancreas.

Review of CT scan revealed that the common hepatic artery arise from superior mesenteric artery and left hepatic artery arise from LGA (Michel classification VIII), figure (2).

### Surgical Technique:

Through right J-shaped incision laparotomy was done, the liver and peritoneal metastasis was excluded. After preserving right and left gastroepiploic arch near the stomach side omentectomy was done. Full mobilization of right colon and duodenum was done. Confirmation that the common hepatic artery is arising from SMA as seen in CT scan, and followed to gastro duodenal artery.

The superior mesenteric vein followed superiorly and the tunnel between portal vein and pancreatic neck cleared. The pancreatic neck elevated by stay sutures and transacted to the right of PV, the proximal pancreatic duct was over sewn by 4/0 vicryl suture, and the pancreatic head stump was

\*Gastroenterology & Hepatology Teaching Hospital.

\*\*Al-Zahrawee Surgical Hospital.

over sewn by 4/0 prolene. The splenic vein divided near its junction with SMV, PV defect closed with 5/0 prolene. After identification of involvement of LGA at its origin to celiac trunk, the division of the celiac trunk was done at its origin with aorta, figure (3). LGA further divided near lesser curvature and celiac as well as left gastric lymph node taken with specimen. The lesser omentum is mobilized inferiorly and accessory left hepatic artery is lighted near the liver hilum. Posteriorly, the dissection run anterior to left renal vein and left adrenal gland (anterior RAMPS), the inferior mesenteric vein divided in inferior margin of pancreas. The spleen was mobilized by division of lino-renal ligament, and removed with specimen (figure4).

### Postoperative course and histology results

Patient discharged home on fifth postoperative day, and then he developed symptomatic 400ml collection, which was aspirated under ultrasound guide. Regular follow up reveals recurrence free survival one year later.

Histology revealed infiltration of pancreas by 4x4x3cm neuroendocrine tumor, with invasion of celiac trunk. Three lymph nodes showed infiltration with malignant epithelial nest. Proximal, distal and posterior (marked by ink) resection margin were tumor free. The tumor has mitotic figure 5/10HPF, and ki-67 index 3% (intermediate grade), T4 N1 M0 according to TNM classification.

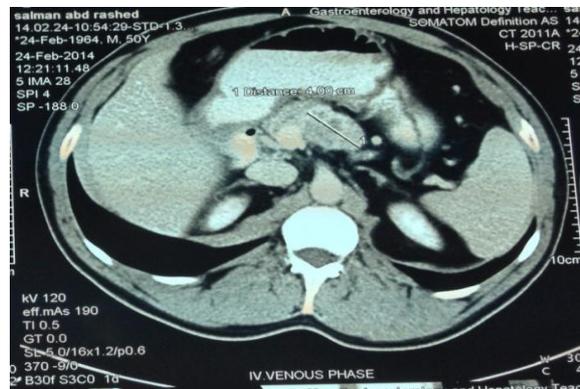
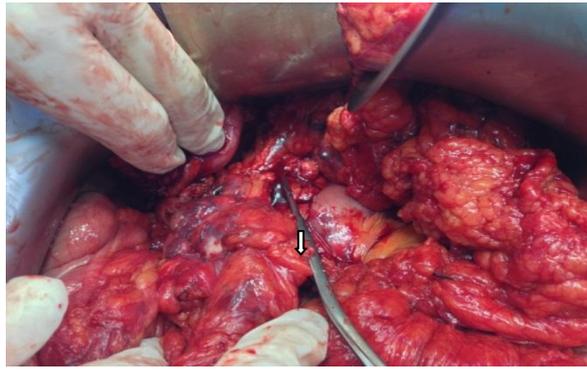


Figure 1: MDCT scan shows pancreatic body mass with splenic vein invasion.



Figure 2: Coronal section arterial phase CT scan shows common hepatic artery arising from SMA (Michel classification VIII) white arrow, and invasion of celiac trunk by tumour (arrow head).



**Figure 3: Shows a clamp applied on the origin of the celiac trunk before its division.**



**Figure 4: Shows the resected specimen (body and tail of pancreas and spleen). The clamp is on celiac trunk specimen side.**

#### **DISCUSSION:**

Adenocarcinoma of the body and tail of the pancreas often presents at an advanced stage and is deemed unresectable in the majority of patients<sup>(3)</sup>. Common reasons for the unresectability are the presence of hepatic metastases and peritoneal dissemination of the tumour. Other reasons are local invasion of the major vascular structures even in the absence of distant disease<sup>(4)</sup>. The goals of pancreatic cancer surgery are to obtain tumour-free margins and perform a sufficient regional lymphadenectomy. However, conventional distal pancreatectomy, which is performed in the left-to-right direction along the anterior border of Gerota's fascia, is inappropriate for achieving this goal because the tumour easily infiltrates the retroperitoneum and spreads to lymph nodes at an early stage. There have been few surgical methods to overcome these limitations. RAMPS was introduced with the theoretical advantages of obtaining a higher rate of negative tangential margins and a higher lymph node count<sup>(5)</sup>. RAMPS procedure was designed to bring the oncologic rationale of the Whipple procedure to distal pancreatectomy<sup>(6)</sup>. The main features of the procedure are N1 lymph

node dissection, modular setting of the posterior plane of dissection optimized to achieve negative posterior margins, and right-to-left dissection to achieve early vascular control. They specified that the depth of the posterior dissection should always lie behind the anterior renal fascia and that the plane of the posterior margin should lie behind the anterior renal fascia while dissected onto the left renal vein. The left renal vein is an important guide for posterior dissection including the anterior renal fascia. Using the Strasberg method, the left renal vein is exposed where it passes behind the superior mesenteric artery and in front of the aorta<sup>(7)</sup>.

One of the reasons why body-tail pancreatic cancer may be unresectable is due to the encasement of the CA and of the origin of the common hepatic artery (CHA), usually associated with severe pain. Cancer invading the CA is considered a locally advanced, unresectable, primary tumor<sup>(8)</sup>. Appleby, a Canadian surgeon, was the first to describe a distal pancreatectomy (DP) with CA resection (DP-CAR) and en bloc resection of the stomach, spleen, left pancreas, and CHA in a patient with

---

gastric cancer in 1953. Nimura et al. performed the first DP-CAR in a patient with body-tail pancreatic cancer in 1976<sup>(4,9)</sup>.

In our patient, he had large pancreatic body mass with celiac axis invasion. This patient was good candidate for the new approach in our center which is RAMPS operation. In addition to that we did a challenging step which is the resection of celiac axis based on two findings, first is tumor invasion to the celiac trunk, second is that common hepatic artery arise from superior mesenteric artery and left hepatic artery arise from LGA (Michel classification VIII), which facilitate celiac trunk resection without jeopardizing liver blood supply.

In patients in whom a pancreatic carcinoma has invaded only into the CA but not the SMA, a radical resection is possible using DP-CAR. Until now, most reports on DP-CAR or the Appleby operation have come from Japanese institutes, although sporadic cases have been reported from Western countries<sup>(10)</sup>. These reports proved that this procedure can increase the resectability with an acceptable postoperative complication rate and improve overall results. However, the indication for this operation is controversial, and the long-term results are not clear because the numbers included in the study population were too small. A few reports have presented a comparison of the short- and long-term results between the patients who received DP-CAR and those who received DP<sup>(11)</sup>.

#### **SUMMARY:**

New modification of distal pancreatectomy adapts some the evolutionary changes in the Whipple procedure to distal pancreatectomy. It should increase the probability of achieving negative margin resections and complete N1 node dissections. It adds to the time and difficulty of the procedure. DP-CAR can be performed safely by an experienced surgical team and may improve survival for carefully selected patients with locally advanced pancreatic cancer. Larger case series of patients treated in this fashion are needed to determine whether there seems to be clinical benefit to this method. Perhaps then, formal comparative studies with the standard approach would be warranted.

#### **REFERENCES:**

1. Conlon KC, Brennan MF. Management of adenocarcinoma of the body and tail of the pancreas. In: JL Cameron, editor Atlas of clinical oncology: pancreatic cancer. Ontario Canada: DC Decker, Inc; 2001: 255-63.
2. Steven M. Strasberg, Jeffrey A. Drebin, and David Linehan. Radical antegrade modular pancreatosplenectomy. *Surgery* 2003; 133:521-27.

3. Shoup M, Conlon KC, Klimstra D et al Is extended resection for adenocarcinoma of the body or tail of the pancreas justified? *J Gastrointest Surg* 2003; 7:946-52.
4. Gagandeep S, Artinyan A, Jabbour N et al. Extended pancreatectomy with resection of the celiac axis: the modified Appleby operation. *Am J Surg* 2006;192:330-35.
5. Chang YR et al. Surgical outcome of RAMPS procedure, *World J Gastroenterol* 2012 October 21;18:5595-5600.
6. Jonathan B Mitchem, Nicholas Hamilton, Feng Gao, William G Hawkins, David C Linehan, Steven M Strasberg. Long-Term Results of Resection of Adenocarcinoma of the Body and Tail of the Pancreas Using Radical Antegrade Modular Pancreatosplenectomy Procedure. *American College of Surgeons. j am coll surg.*2011;10:2008.
7. Hirohisa Kitagawa, Hidehiro Tajima, Hisatoshi Nakagawara, Isamu Makino, Tomoharu Miyashita, Hirofumi Terakawa Shinichi Nakanuma, Hironori Hayashi, Hiroyuki Takamura, Tetsuo Ohta. A Modification of Radical Antegrade Modular Pancreatosplenectomy for Adenocarcinoma of the Left Pancreas: Significance of En Bloc Resection Including the Anterior Renal Fascia. *World J Surg* DOI 10.1007/s00268-014-2572-5.
8. Balachandran A, Darden DL, Tamm EP, Faria SC, Evans DB, Charnsangavej C: Arterial variants in pancreatic adenocarcinoma. *Abdom Imaging* 2008;33:214-21.
9. Nimura Y, Hattori T, Miura K, Nakajima N, Hibi M: Our experience of resection of carcinoma of the body and tail of the pancreas by Appleby's procedure (in Japanese). *Operation* 1976;15: 885-89.
10. Yu Takahashi, Yuji Kaneoka, Atsuyuki Maeda, Masatoshi Isogai. Distal Pancreatectomy with Celiac Axis Resection for Carcinoma of the Body and Tail of the Pancreas. *World J Surg* 2011; 35:2535-42.
11. Wu X, Tao R, Lei R et al Distal pancreatectomy combined with celiac axis resection in treatment of carcinoma of the body/ tail of the pancreas: a single-center experience. *Ann Surg Oncol* 2010; 17:1359-66.

