SHORT COMMUNICATION

# The "Mesopancreas" Dissection - A New Surgical Paradigm: An Anatomical "Reflection" of Surgical and Prognostic Importance?

**Harsh A Kanhere, Markus I Trochsler, Guy J Maddern**

Division of Surgery, UGI/HPB unit, The Queen Elizabeth Hospital, University of Adelaide, Australia

Surgical excision remains the mainstay of curative treatment for pancreatic cancers. Despite "curative" resection, the 5 year survival rates remain dismal.

Many prognostic factors are studied including lymph node involvement, ratio of positive lymph nodes, perineural and perivascular involvement etc. Amongst these, microscopic margin positivity (R1 resection) is an important prognostic factor.

R1 resections are commonplace (50%) [1] in conventional pancreaticoduodenectomy (PD) for pancreatic head carcinoma. To the experienced pancreatic surgeon it is evident that the posteromedial dissection (in the retro portal, retro pancreatic tissue) is many times technically unsatisfactory and is carried out in a completely non-anatomical plane. This tissue to the right of the superior mesenteric artery (SMA) and posterior to the superior mesenteric vein is not bound by any fascia or covered with peritoneum and the dissection is mostly "by feel" in a conventional PD to protect the SMA. Furthermore in conventional PD this tissue is divided as a last step in the resection after the all irreversible steps have been taken. Involvement of this tissue by the tumor can lead to surprising difficulty in dissecting it off the SMV on its posterior aspect or even the SMA causing troublesome bleeding and higher rates of positive margins. It is therefore difficult to ensure a complete (R0) clearance in this area.

The concept of a "mesopancreas" has been mooted from this observation [2]. This is tissue between the head of the pancreas on its dorsal surface and extending to the SMA medially and cranially from the coeliac ganglion to caudally the ligament of Treitz. The question is - does the mesopancreas exist as a true anatomic entity and if so would circumferential clearance of this tissue provide similar benefit to a total mesorectal excision? A review of evidence suggests that there is some merit in this argument.

**Received** April 25th, 2015-**Accepted** May 29th, 2015
**Keywords** Pancreaticoduodenectomy; Pancreatic Neoplasms
**Correspondence** Harsh Kanhere
Division of Surgery
UGI/HPB unit
The Queen Elizabeth Hospital
University of Adelaide
South Australia
Australia 5011
**Phone** +61 82226750
**Fax** +61 82226028
**E-mail** Kanhere.harsh@health.sa.gov.au

## Anatomical Considerations

Embryologically the pancreas develops in the mesentery of the foregut and midgut and therefore possesses a mesentery. With the rotation of the duodenum and fusion with the retroperitoneal tissues, the peritoneal layers disappear and the pancreas becomes a fixed retroperitoneal structure [2]. Do the structures, however, that are present in this embryologic mesentery persist in adulthood?

Goeckel *et al*. [2] first studied this structure on 5 fresh cadavers and concluded that the retropancreatic tissue coursing from the pancreatic head towards the SMA contains lymphatics and neuronal structures and called this tissue –the Mesopancreas. According to their research, Borghi *et al*. [3] showed that there is a close oncogenetic relationship between the dorsal pancreas and the lymphatic and neuronal structures in the dorsal mesogastrium, which later forms the retropancreatic connective tissue and relationship of other lymphatic structures was confined to the ventral pancreatic bud.

Agrawal *et al*. [4] concurred with Goeckel *et al*. in finding lymphatics, neuronal tissue and loose areolar tissue along with capillaries in this lamina from their study on 20 cadavers. They however concluded that a mesopancreas does not exist as a definite anatomical structure since there is no fibrous or fascial layer that encloses this tissue. They contended that an enbloc mesopancreatic dissection was not possible in an anatomical plane since such a layer did not exist.

In a more detailed study, Bouassida *et al*. [5] confirmed the histological findings and also showed that if one dissected in the subadventitial layer on the right side of the SMA, an enbloc dissection of this tissue was indeed feasible. Since this tissue lacked a fascial peritoneal covering they recommended the use of the term retroportal lamina rather than mesopancreas as being more appropriate.

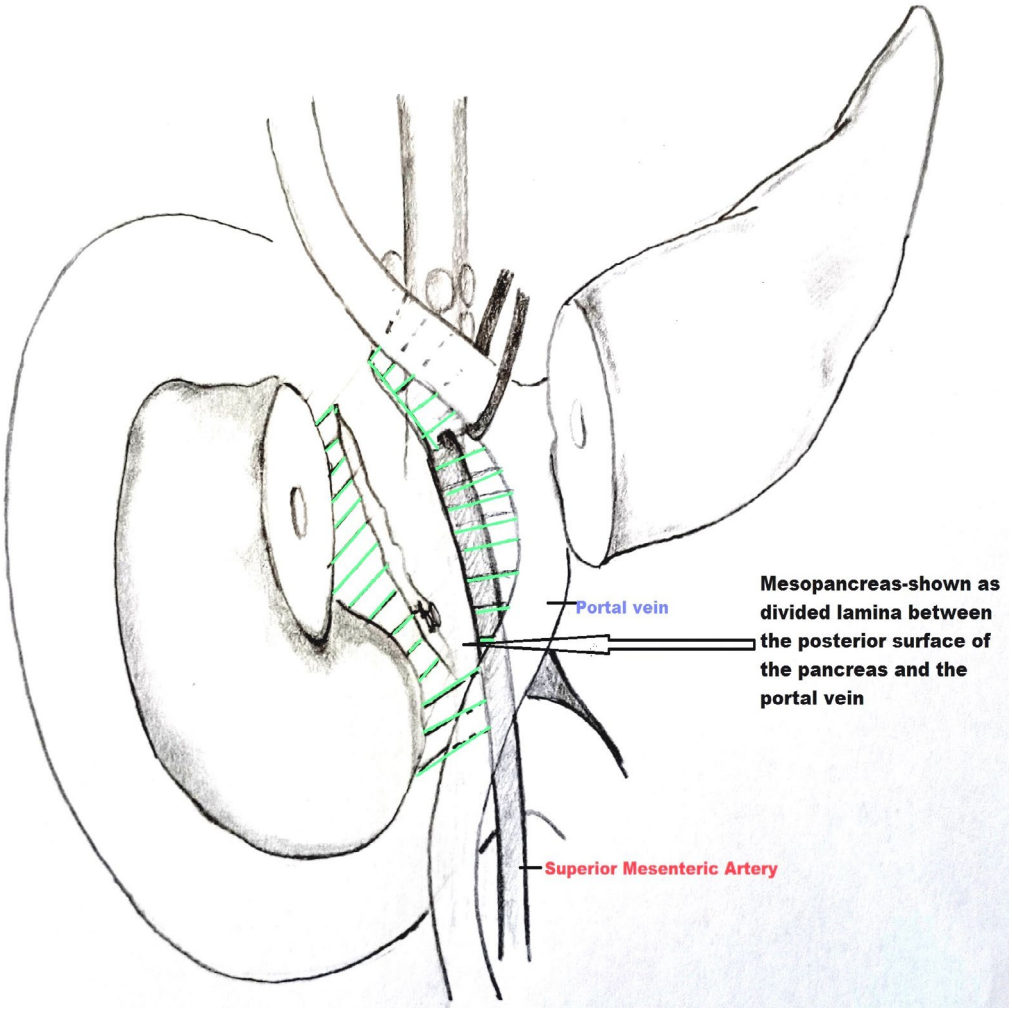


**Figure 1.** The Mesopancreas (green stippled) divided between the posterior surface of the pancreas and the portal vein and its attachment extending to the SMA and coeliac ganglion.

In conventional anatomical terms then, the mesopancreas does not exist as a defined structure with boundaries as it has no defined fascial/peritoneal covering. This tissue is however made up of the same components as that in any mesentery and is oncogenetically related to the embryologic contents in the mesogastrium. Is it likely then that due to the fusion of tissues with the retroperitoneum the peritoneal layers have disappeared but the contents persists (a mesentery without peritoneal or fascial covering - an anatomical quandary) as a pathway for lymphatic, perineural and vascular spread of pancreatic cancer in this region.

Pathologically it has been shown that an R1 resection margin has a significant impact on long term outcome in pancreatic cancers [6]. Gaedecke *et al*. [7] confirmed that this tissue – the mesopancreas is the primary site for R1 resection in pancreatic head cancer. Our recently published data suggested that margins were positive in 37% of PDs for pancreatic cancer with the posterior or medial margin accounting for 17/24 positive margins [8].

The surgical and clinical data on mesopancreatic dissection are meagre to date. Less than 10 articles describing the technique of a mesopancreatic resection were found on a pubmed search. The latest of these articles by Inoue *et al*. [9], published in the Annals of Surgery seems to suggest a better perioperative outcome in the "systematic mesopancreas dissection" group (SMD) as compared to a conventional PD in a comparative study on a 162 consecutive patients undergoing a PD with curative intent. The systematic mesopancreas dissection was achieved using an "artery first" technique through the supra colic anterior approach. There was less blood loss and operative time was shorter in the SMD group as compared to the conventional PD group. Imaging conducted during this study revealed that $4/5^{th}$ of the pancreatic arterial branches came off the right dorsal aspect of the SMA indicating persistence of the structures in the embryologic mesentery of the pancreas and cancer abutment occurred in this same direction. The authors though have not outlined comparisons between margin positive rates, resectability and lymph node yield in these groups **(Figure 1)**.

Good results have also been demonstrated with regards to negative margins utilising mesopancreatic resection by Adham and Singhirunnusorn [10] in a series of 52 patients. Mesopancreatic tissue was invaded by tumor in 12 cases and a negative margin was achieved in 42/ 52 cases and an additional 7 cases with a margin less than 1mm. Similar results were demonstrated by other authors as well with low morbidity and mortality [11, 12].

The common thread seems to be a change from the conventional approach to an artery first approach to assess definite resectability and achieve as wide a margin as possible in this all important groove of tissue. Further studies are indeed required but it is plausible that a small change to the surgical technique may enhance the margin negative rates and make PD an oncologially better surgery without a significant impact on perioperative mortality and morbidity.

## Conflict of interest

Authors declare to have no conflict of interest.

## References

1. Verbeke CS, Leitch D, Menon KV, McMahon MJ, Guillou PJ, Anthoney A. Redefining the R1 resection in pancreatic cancer. Br J Surg 2006; 93:1232-7. [PMID: 16804874]

2. Gockel I, Domeyer M, Wolloscheck T, Konerding MA, Junginger T. Resection of the mesopancreas (RMP): a new surgical classification of a known anatomical space. World J Surg Oncol 2007; 5:44. [PMID: 17459163]

3. Borghi F, Gattolin A, Garbossa D, Bogliatto F, Garavoglia M, Levi AC. Embryologic bases of extended radical resection in pancreatic cancer. Arch Surg 1998; 133:297-301. [PMID: 9517744]

4. Agrawal MK, Thakur DS, Somashekar U, Chandrakar SK, Sharma D. Mesopancreas: myth or reality? JOP 2010; 11:230-3. [PMID: 20442517]

5. Bouassida M, Mighri MM, Chtourou MF, Sassi S, Touinsi H, Hajji H, *et al*. Retroportal lamina or mesopancreas? Lessons learned by anatomical and histological study of thirty three cadaveric dissections. Int J Surg 2013; 11:834-6. [PMID: 23994001]

6. Rau BM, Moritz K, Schuschan S, Alsfasser G, Prall F, Klar E. R1 resection in pancreatic cancer has significant impact on long-term outcome in standardized pathology modified for routine use. Surgery 2012; 152:S103-11. [PMID: 22766366]

7. Gaedcke J, Gunawan B, Grade M, Szöke R, Liersch T, Becker H, Ghadimi BM. The mesopancreas is the primary site for R1 resection in pancreatic head cancer: relevance for clinical trials. Langenbecks Arch Surg 2010; 395:451-8. [PMID: 19418067]

8. Chandrasegaram MD, Chiam SC, Chen JW, Khalid A, Mittinty ML, Neo EL, *et al*.. Distribution and pathological features of pancreatic, ampullary, biliary and duodenal cancers resected with pancreaticoduodenectomy. World J Surg Oncol 2015; 13:85. [PMID: 25890023]

9. Inoue Y, Saiura A, Yoshioka R, Ono Y, Takahashi M, Arita J, *et al*. Pancreatoduodenectomy With Systematic Mesopancreas Dissection Using a Supracolic Anterior Artery-First Approach. Ann Surg 2015. [PMID: 25587814]

10. Adham M, Singhirunnusorn J. Surgical technique and results of total mesopancreas excision (TMpE) in pancreatic tumors. Eur J Surg Oncol 2012; 38:340-5. [PMID: 22264964]

11. Georgescu S, Ursulescu C, Grigorean VT, Lupascu C. Hind right approach pancreaticoduodenectomy: from skill to indications. Gastroenterol Res Pract 2014; 210835. [PMID: 25221601]

12. Moldovan SC, Moldovan AM, Dumitraæcu T, Andrei S, Popescu I. The advantages of retropancreatic vascular dissection for pancreatic head cancer with portal/superior mesenteric vein invasion: posterior approach pancreatico-duodenectomy technique and the mesopancreas theory. Chirurgia (Bucur) 2012; 107:571-8. [PMID: 23116829]