

## Technical Aspects of a Posterior Pancreatic Head Enucleation – An Organ-Sparing Alternative to Pancreatico-Duodenectomy for Benign and Low-Grade Malignant Pancreatic Tumors

Traian Dumitrascu<sup>1,2\*</sup>

<sup>1</sup>Center of General Surgery and Liver Transplant, Fundeni Clinical Institute, Bucharest, Romania

<sup>2</sup>Carol Davila University of Medicine and Pharmacy, Bucharest, Romania

**\*Corresponding author:**

Traian Dumitrascu, MD, Ph.D.  
Carol Davila University of Medicine  
and Pharmacy, Center of General  
Surgery and Liver Transplant,  
Fundeni Clinical Institute  
Fundeni Street no 258, 022328  
Bucharest, Romania  
Phone/ Fax +4021 318 04 17  
E-mail: [traian.dumitrascu@umfcd.ro](mailto:traian.dumitrascu@umfcd.ro)

### Rezumat

*Tehnica enucleerii la nivelul feței posterioare a capului pancreasului – un procedeu chirurgical conservator, alternativă la duodenopancreatectomia cefalică pentru tumori pancreatice benigne și cu potențial scăzut de malignitate*

Din punct de vedere tehnic, enucleerea pancreatică poate pune probleme în cazul localizărilor cu acces dificil precum fața posterioară a capului pancreatic, în mod particular pentru leziunile cu localizare profundă, aflate în contact apropiat cu ductul Wirsung. În aceste situații particulare, riscul de lezare a ductului Wirsung este crescut. Prezentăm tehnica enucleerii pancreatice la nivelul feței posterioare a capului pancreasului în cazul unui pacient de 48 de ani diagnosticat cu tumoră intraductală papilară mucinoasă pancreatică cu afectarea ductelor pancreatice secundare, cu localizare profundă. S-a realizat o enucleere pancreatică a tumorii situate la nivelul feței posterioare a capului de pancreas împreună cu o rezecție segmentară de duct Wirsung, cu anastomoză termino-terminală protezată de un stent de plastic exteriorizat prin papila duodenală. Nu am considerat că fiind necesară asocierea unei anastomoze pancreatico-jejunale. Evoluția postoperatorie a fost marcată de apariția unei fistule pancreatice de grad B și a stazei gastrice de grad A, ambele putând fi tratate conservator. Enucleerea leziunilor profund situate la nivelul feței posterioare a capului de pancreas este dificilă tehnic dar fezabilă și sigură. Rezecția segmentară a ductului Wirsung cu anastomoză termino-terminală protezată pe stent de plastic exteriorizat prin papila duodenală poate fi deasemenea efectuată în condiții de siguranță. În acest fel, prin omiterea anastomozei pancreatico-jejunale se reduce timpul operator și rata de complicații.

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**Cuvinte cheie:** neoplasme chistice pancreatice, neoplasme intraductale papilare mucinoase, enucleere pancreatică, ductul Wirsung, fistula pancreatică

### Abstract

From a technical point of view, enucleation can be challenging for a few locations with hard access, such as the posterior pancreatic head, particularly for deeply-located lesions, in close relationship with the main pancreatic duct (MPD). The risk of MPD injuries with secondary pancreatic fistula is high in these specific situations. Hereby we describe a technique of posterior pancreatic head enucleation in a 48-year-old male patient diagnosed with a deeply-located branch duct type intraductal papillary mucinous neoplasm (BD-IPMN). A posterior pancreatic head enucleation of the BD-IPMN was performed along with segmental resection of the MPD and end-to-end anastomosis, with protection by a plastic stent passing both through the MPD anastomosis and major duodenal papilla. No protective pancreatico-jejunostomy was necessary. A grade B pancreatic fistula complicated the postoperative course, and a grade A delayed gastric emptying, both conservatively managed. Enucleation of deeply-located tumors at the dorsal pancreatic head is challenging but feasible and safe. Segmental resection of the MPD with end-to-end anastomosis protected by a transpapillary plastic stent for injuries during enucleation can be safely performed. Thus, the operative time during enucleation is reduced, and the potential morbidity of a pancreatico-jejunostomy is eliminated.

**Key words:** cystic pancreatic neoplasm, intraductal papillary mucinous neoplasm, enucleation, main pancreatic duct, pancreatic fistula

### Introduction

Pancreatic cystic neoplasms (PCN) are an increasing pathology in an era of widely used modern cross-sectional imaging methods. Among the PCN, intraductal papillary mucinous neoplasms (IPMN) appear to be the most common. Depending on the type of IPMN and a few other factors, there are different risks for high-grade dysplasia or invasive cancer. Thus, for a resected branch duct type intraductal papillary mucinous neoplasm (BD-IPMN), the risk of high-grade dysplasia or invasive cancer varies between 11% and 30%. Nowadays, few guidelines recommend different indications for surgery in PCN, including BD-IPMN (1,2).

Whether to perform a standard pancreatic resection or a parenchyma-sparing resection for a PCN with surgical indication remains an open debate. Parenchyma-sparing surgical procedures such as duodenum-preserving

pancreatic head resections, central pancreatectomies, or pancreatic enucleations have been successfully used for PCN, including BD-IPMN (3-6). Compared with the standard pancreatic resections, central pancreatectomies and enucleations have the lowest incidence of postoperative pancreatic exocrine and endocrine insufficiency rates (3-8), an essential factor to be considered for patients with long-life expectations after surgery. A recent study has shown that patients with enucleations share the same quality of life as the general population at long-term follow-up (9).

Up to 70% of patients diagnosed with an IPMN have the lesion located in the pancreatic head or uncinata process (2). If surgery is indicated, pancreatico-duodenectomies are the standard approach. Alternatively, in selected patients, a duodenum-preserving pancreas head resection or an enucleation can be performed (3).

Although it is a widely accepted alternative to standard pancreatic resection for a specific pathology, however, enucleation can be challenging, from a technical point of view, for few locations with hard access, such as the posterior pancreatic head, particularly for deeply-located lesions, in close relationship with the main pancreatic duct (MPD). The risk of MPD injuries with secondary pancreatic fistula is high in these specific situations. Thus, a protective pancreatico-jejunostomy was proposed aiming to reduce the clinical consequences of a postoperative pancreatic fistula (10-12). However, pancreatico-jejunostomy increases morbidity and prolongs the operative time (10).

Hereby we describe a technique of the posterior pancreatic head enucleation in a patient diagnosed with a deeply-located BD-IPMN without protective pancreatico-jejunostomy.

### Case Presentation & Surgical Technique

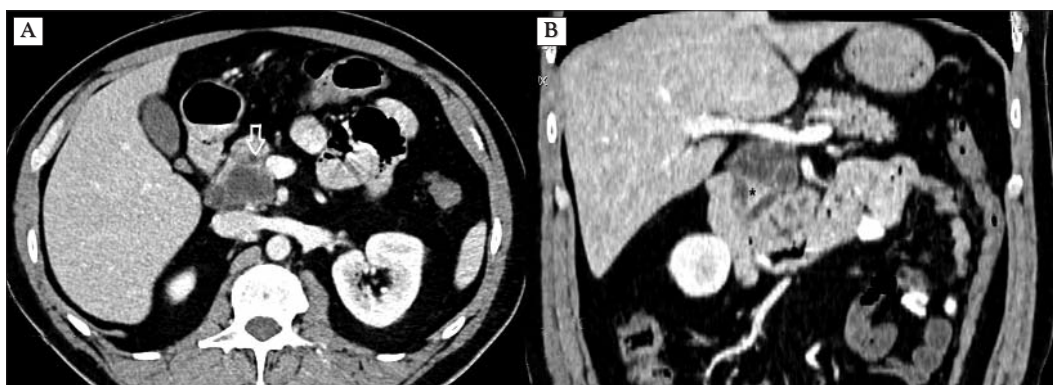
A 48-year-old male patient with no significant medical history was investigated for recurrent episodes of upper abdominal pain. The patient denies any smoking or alcohol abuse. The laboratory studies showed no abnormalities, including the serum level of CA 19-9. The contrast-enhanced computed tomography showed a “grape-like” hypodense clustered

cystic lesion with septa and lobulated margins, at the dorsal pancreatic head, towards the uncinate process, connected to the MPD. Inside de 42/ 32/ 31 mm cyst, an enhancing mural nodule of 8 mm. A dilated branch duct of the uncinate process was also observed. There was no dilatation of the MPD. These findings were highly suggestive of a BD-IPMN (*Fig. 1*).

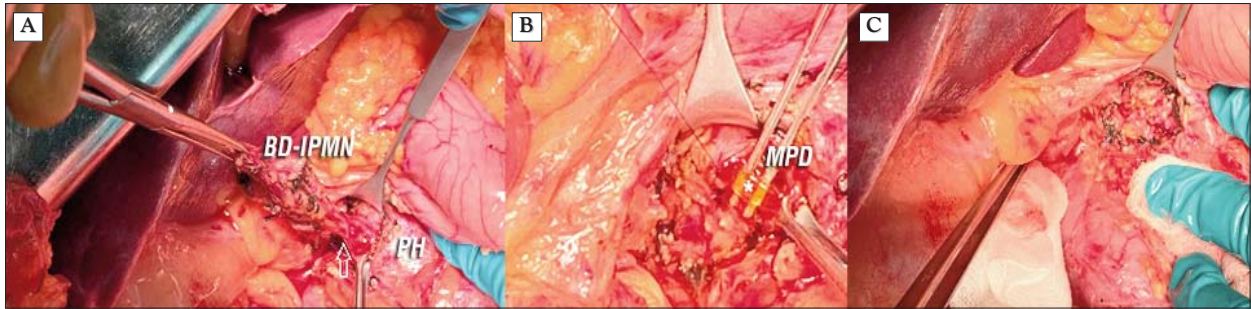
With the diagnosis of BD-IPMN, the patient was referred for surgery in January 2020. The indication for surgery was made based on the persistent symptoms, cyst diameter, and, most important, the presence of high-risk stigmata (enhancing mural nodule  $\geq$  5 mm). The preoperative plan was to perform either a pancreatico-duodenectomy or a pancreatic enucleation, depending on the intraoperative aspects and frozen-section analyses.

### Surgical Technique

A vertical midline incision was made, followed by abdominal exploration. Broad exposure of the dorsal part of the pancreatic head was obtained after extensive Kocher maneuver and dissection of the lesser omentum. Thus, good visualization of the pancreatic head's posterior part and the cystic neoplasm was obtained (*Fig. 2A*). As expected, a soft pancreas texture was observed. Cholecystectomy



**Figure 1.** Contrast-enhanced computed tomography axial (A) and coronal planes (B) showing a “grape-like” hypodense clustered cystic lesion with septa and lobulated margins, at the dorsal pancreatic head, towards the uncinate process, with connection to the MPD and an enhancing mural nodule (\*); a dilated branch duct of the uncinate process is also observed (white arrow).



**Figure 2.** Intraoperative aspects of a posterior pancreatic head (PH) enucleation technique for a deeply-located branch duct type intraductal papillary mucinous neoplasm (BD-IPMN) (the white arrow marks the communicating duct with the main pancreatic duct – MPD) (A), with segmental resection of the MPD (the \* marks the plastic stent inside the MPD) (B) and end-to-end anastomosis without protective pancreatico-jejunostomy (C).

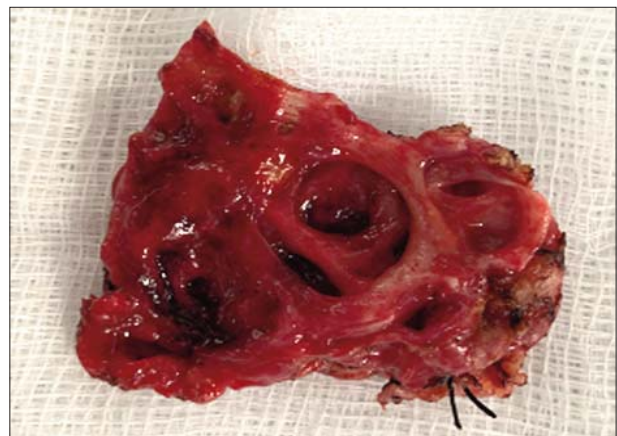
was performed with transcystic instrumental exploration of the common bile duct aiming to identify and protect the intrapancreatic distal bile duct during the enucleation. Enucleation of the cystic neoplasm was performed in a plane between the pancreatic parenchyma and the tumor, using a monopolar cautery; hemostasis was reinforced with non-absorbable 5/0 sutures. The connection of the cystic neoplasm with the MPD was identified and transected (Fig. 2A). The cystic neoplasm marginally involved the MPD (Fig. 2A). Thus, a short segmental resection of the MPD was added (Fig. 2B). The frozen-sections of the branch connection with the MPD did not show any signs of dysplasia. The frozen section of the cystic neoplasm diagnosed an IPMN with low-grade dysplasia, with no signs of malignancy. An end-to-end anastomosis of the MPD was made using interrupted non-absorbable 5/0 sutures, with protection by a plastic stent passing both through the MPD anastomosis and major duodenal papilla (Fig. 2b). No protective pancreatico-jejunostomy was considered as necessary (Fig. 2C). Two drains were left in place at the resection site.

### Postoperative Management and Outcomes

The patient received intra- and postoperatively subcutaneous injections of somatostatin analog octreotide (200 micrograms, three times per day, for up to seven days). The postoperative course was complicated by a grade B pancreatic fistula and a grade A delayed

gastric emptying. Both complications were conservatively managed with a further uneventful course. The patient was discharged on postoperative day 10, and the drain was removed on postoperative day 24. Three months after the operation, the pancreatic stent was endoscopically extracted with an uneventful course.

The final pathological examination of the operative specimen revealed an IPMN with low-grade epithelial dysplasia and high-grade focal dysplasia at the level of the mural nodule (Fig. 3). No dysplasia was found at the resection margins of the communicating branch with the MPD. At 29 months after surgery, the patient is free of symptoms with no clinical signs of pancreatic exocrine insufficiency, endocrine pancreatic insufficiency, or imaging signs of disease recurrence.



**Figure 3.** The operative specimen (macroscopic aspects).

## Discussions

Parenchyma-sparing pancreatic resections, including enucleations, have been proven to be feasible and safe not only for PCN (including BD-IPMN) (6,13,14) but also for other pathologies such as neuroendocrine (3,15,16) or solid pseudopapillary tumors (17).

Although it is associated with neglectable postoperative pancreatic insufficiency rates, enucleation is potentially associated with high pancreatic fistula rates in the context of a soft pancreatic texture (3). Thus, an accurate technique for enucleation is of utmost importance for the postoperative course.

Compared with the standard pancreatic resections, enucleations appear to be associated with less operative times (6-8,14,15), blood loss (6-8), transfusions (15), morbidity (3,15), and mortality rates (3), and shorter postoperative hospital stays (15). Thus, the in-hospital mortality rates after pancreatoduodenectomies vary between 3 – 7%, while enucleation is less than 3% (18). However, few studies did not find any significant differences in the morbidity (6,7,14,16) or mortality (7,16) rates between enucleations and standard pancreatic resections. Two meta-analyses comparing enucleations with standard pancreatic resections have found significantly higher rates of pancreatic fistula after enucleations (7,8).

Few enucleation techniques of the pancreatic head have been previously described proposing, for patients with a high risk of MPD injuries (i.e., deeply-located tumors), a protective pancreatico-jejunostomy to mitigate the clinical consequences of a postoperative pancreatic fistula (10-12). Enucleations of the deeply-located tumors are associated with up to 73.3% rates of pancreatic fistula (19). The present technique allows good exposure of the lesion at the level of the posterior pancreatic head and a safe deep enucleation without protective pancreatico-jejunostomy. A pancreatico-jejunostomy during enucleation is associated with increased operative time, blood loss, morbidity rates, and length of hospital stay (10).

Segmental resection of the MPD with end-

to-end anastomosis protected by a transpapillary plastic stent appears to be a safe and more accessible alternative to protective pancreatico-jejunostomy. The feasibility and safety of MPD segmental resection with end-to-end anastomosis was previously demonstrated for enucleation (20) and central pancreatectomy (21,22). Few previous studies proposed preoperative endoscopic stents to reduce the risk of MPD injuries during enucleations (23,24).

## Conclusions

Enucleation of deeply-located tumors at the dorsal pancreatic head is challenging but feasible and safe. Segmental resection of the MPD with end-to-end anastomosis protected by a transpapillary plastic stent for injuries during enucleation can be safely performed. Thus, the operative time during enucleation is reduced, and the potential morbidity of a pancreato-jejunostomy is eliminated.

*Conflicts of Interests: None*

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