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## Laparoscopic Radical Left Pancreatectomy for Pancreatic Cancer: Surgical Strategy and Technique Video.

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**TITLE:**

**Laparoscopic Radical Left Pancreatectomy for Pancreatic Cancer: Surgical Strategy and Technique Video**

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**KEYWORDS:**

pancreas, surgery, laparoscopic, minimally invasive, pancreatic cancer, distal pancreatectomy, left pancreatectomy

**SUMMARY:**

Oncologically safe left pancreatectomy requires radical resection (R0), Gerota's (perirenal) fascia resection, and adequate lymph node dissection. This study describes the technical details of laparoscopic radical left pancreatectomy (LRLP), used in the first international multicenter randomized trial comparing minimally invasive with open left pancreatectomy for pancreatic cancer, the DIPLOMA trial.

**ABSTRACT:**

Radical resection margins, resection of Gerota's (perirenal) fascia, and adequate lymph node dissection are crucial for an adequate oncological resection of left-sided pancreatic cancer. Several surgical techniques have been described in recent years, but few were specifically designed for minimally invasive approaches. This study describes and demonstrates a

standardized and reproducible technique for an adequate oncological resection of pancreatic cancer: laparoscopic radical left pancreatectomy (LRLP).

A 61-year-old woman presented with an incidental finding of a 3 cm mass in the left pancreas suspect for malignancy. Imaging did not reveal distant metastases, central vascular involvement, or morbid obesity, hence the patient was suitable for LRLP. This study describes the main steps of LRLP for pancreatic cancer. First, the lesser sac is opened by transecting the gastrocolic ligament. The inferior border of the pancreas is then dissected down to the inferior border of the spleen. The splenic flexure of the colon is mobilized and Gerota's fascia is incised at the inferior border of the pancreas. The pancreas is tunneled and hung, including Gerota's fascia with a vessel loop. At the pancreatic neck, a tunnel is created between the pancreas and the portal vein, likewise a vessel loop is passed. The pancreas is then transected using the graded compression technique with an endostapler. Both the splenic vein and artery are transected before completing the resection. The entire specimen is extracted in a retrieval bag via a small Pfannenstiel incision.

Duration of the surgery was 210 min with 250 mL blood loss. Pathology revealed a R0-resection (>1 mm) of a well-to-moderately differentiated adenocarcinoma originating from an intraductal papillary mucinous neoplasm. A total of 15 tumor-negative lymph nodes were resected. This is a detailed description of LRLP for left-sided pancreatic cancer as is currently being used within the international, multicenter randomized DIPLOMA (Distal Pancreatectomy Minimally Invasive or Open for PDAC) trial.

## **INTRODUCTION:**

Surgical resection combined with systemic chemotherapy is the most effective treatment for resectable pancreatic cancer. Several meta-analyses have shown comparable results for minimally invasive and open distal pancreatectomy for benign and premalignant disease<sup>1-6</sup>. Recently, the first multicenter randomized trial demonstrated a shorter time to functional recovery using laparoscopic distal pancreatectomy (LDP) as compared to open distal pancreatectomy (ODP)<sup>7</sup>. Although minimally invasive techniques have been shown to be safe and feasible for left pancreatectomy when performed by experienced surgeons<sup>8-13</sup>, the non-inferiority of minimally invasive surgery compared to the open surgical approach for the treatment of pancreatic cancer is still debated<sup>14-17</sup>. A pan-European survey showed that 31% of pancreatic surgeons considered ODP superior to minimally invasive distal pancreatectomy (MIDP) in terms of oncological margins and lymphadenectomy in pancreatic cancer<sup>18</sup>. On both a European and global level, 19–20% of participating surgeons considered malignancy a contraindication for a minimally invasive approach<sup>18,19</sup>.

Given the current lack of randomized controlled trials on the effectiveness of MIDP, the only available data to compare the procedures are limited to retrospective and prospective cohort studies. In a recent systematic review and meta-analysis on oncological safety in MIDP versus ODP for pancreatic cancer, no differences between the two groups regarding oncologic outcomes (OR = 0.49,  $p$  = 0.12) and overall survival (OS = 3 years, HR = 1.03,  $p$  = 0.66; OS = 5 years, HR = 0.91,  $p$  = 0.59) were seen<sup>20</sup>. Another systematic review showed comparable outcomes for MIDP

versus ODP in overall survival and a somewhat surprising higher margin-negative (R0) resection rate but at the cost of a lower lymph node dissection in MIDP<sup>21</sup>.

The radical antegrade modular pancreatectomy (RAMPS) technique, as described by Strasberg in 2003, aims to perform a better, radical resection of pancreatic ductal adenocarcinoma (PDAC) in the body or the tail of the pancreas including resection of Gerota's fascia<sup>15</sup>. The laparoscopic radical left pancreatectomy (LRLP) technique, as described by Abu Hilal et al.<sup>16</sup>, aims to obtain the same results but during minimally invasive surgery by combining a formal lymphadenectomy with the no-touch technique. Hereby, a radical oncological resection can be obtained with a minimized risk of tumor dissemination and seeding<sup>15,22</sup>. The standardization of this technique allows for reproducibility and adoption in different health care centers. This paper describes LRLP, because this technique is currently used in the international, multicenter randomized DIPLOMA trial<sup>16,23</sup>.

## **PROTOCOL:**

### **1. Patient Selection**

1.1. Select patients with an upfront resectable pancreatic cancer in the pancreas body or tail visible on a recent contrast enhanced CT scan (maximum of 4 weeks old) without downstaging neoadjuvant therapy.

1.2. Exclude patients with metastatic disease or vascular involvement of vessels other than the splenic vein or artery<sup>24</sup>.

1.3. During training, it is best to exclude patients with a body mass index (BMI) > 35 kg/m<sup>2</sup>, recurrent acute or chronic pancreatitis, previous major upper abdominal surgery, or pancreas targeted radiotherapy.

### **2. Surgical Technique**

#### **2.1. Operative setting**

2.1.1. Place the anesthetized patient in the French position on a bean bag. Place both arms in 90° abduction.

2.1.2. Place sterile drapes so that the suprapubic region is exposed for the Pfannenstiel incision.

2.1.3. Create pneumoperitoneum via a Veress needle at Palmer's point.

2.1.4. Perform a routine diagnostic laparoscopy to exclude peritoneal and liver metastases.

2.1.5. The procedure is performed using a 5-port technique. Place additional trocars as shown in **Figure 1**.

NOTE: Use of laparoscopic ultrasound is advisable for staging and localizing the lesion, thereby determining the extent of the resection.

## 2.2. Exploration Phase

### 2.2.1. Exposure

2.2.1.1. Divide the gastrocolic ligament approximately 2 cm distal from the gastroepiploic artery and vein, thus opening the lesser sac.

2.2.1.2. Dissect and ligate the short gastric vessels in preparation of splenectomy. The most superior short gastric vessels may also be spared at this stage to avoid early bleeding without adequate exposure.

2.2.1.3. Mobilize the stomach from the pancreas and retract upwards. The stomach may be retracted in various ways. Use of umbilical tape around the stomach, after it has been rolled backwards and secured in this position with surgical gauze between the top of the stomach and the surgical tape is recommended.

2.2.1.4. Extract this tape next to the subxiphoidal trocar and grip using a surgical clamp.

NOTE: A second piece of tape may pull the pyloric region to the right upper quadrant using a stab incision to extract it<sup>25</sup>. This second tape is especially useful to obtain maximal exposure of the pancreatic neck and hepatic artery region.

2.2.1.5. Divide the splenocolic ligament in order to mobilize the splenic flexure and visualize the pancreatic tail. If needed, the lesion is located using laparoscopic ultrasonography. The transection plane of the pancreas in case of pancreatic cancer is at the portal confluence.

2.2.1.6. Mobilize the lower margin of the pancreas from medial to lateral including the splenic inferior border. At this stage, both the superior and inferior mesenteric vein may be visualized. Incise Gerota's fascia.

NOTE: Care should be taken to avoid venous bleeding. Optionally, the splenic flexure of the colon can be mobilized separately using a lateral to medial approach but often this is not required.

2.2.1.7. Identify the splenic vein at the inferior border of the pancreas.

NOTE: The inferior mesenteric vein could drain directly into the splenic vein.

2.2.1.8. Identify the splenic artery at the superior border of the pancreas.

2.2.2. Pancreatic hanging and dissection of Gerota's fascia dissection.

175  
176 2.2.2.1. During the dissection of the posterior plane, mobilize and lift the Gerota's fascia (i.e.,  
177 anterior renal fascia).

178  
179 2.2.2.2. Create the posterior plane underneath the Gerota's fascia superior to the adrenal gland  
180 toward the superior border of the pancreas. This is an avascular plane. If needed, the adrenal  
181 gland can be included (i.e., posterior RAMPS).

182  
183 2.2.2.3. Create a tunnel by dissecting the superior pancreatic margin.

184  
185 2.2.2.4. Pass a quarter length vessel loop through the tunnel and secure with a nonabsorbable  
186 locking clip. Use this to hang the pancreas including Gerota's fascia.

187  
188 2.2.2.5. Identify the splenic artery at the superior border of the pancreas.

189  
190 2.2.2.6. Mobilize the splenic artery using blunt and sharp dissection and a pass quarter length  
191 vessel loop.

192  
193 2.2.2.7. Transect the artery using 3–4 nonabsorbable locking clips. Alternatively, a vascular  
194 endostapler may be used.

195  
196 NOTE: The splenic artery must not be transected until the entire anatomy, especially the hepatic  
197 artery, is visualized and confirmed. If the splenic artery cannot be visualized from the pancreatic  
198 superior margin, it may identified from beneath the pancreas or by following the hepatic artery  
199 towards the celiac artery.

200  
201 2.2.2.8. Perform the same tunneling procedure at the pancreatic neck, on the right side of the  
202 pancreatic lesion, mostly above the confluence/portal vein.

203  
204 2.2.2.9. The two vessel loops can be held by an assistant to literally hang the pancreas and expose  
205 the posterior margin during the retroperitoneal dissection.

206  
207 2.2.2.10. Determine the transection plane at the inferior border of the pancreas.

208  
209 2.2.2.11. Mobilize the remaining part of the pancreas, including Gerota's fascia, exposing the  
210 anterior aspect of the kidney.

## 211 2.2.3. Pancreatic transection

212  
213  
214 2.2.3.1. Pull the pancreas ventrally using the vessel loops.

215  
216 2.2.3.2. Transect the pancreas at the neck using a stapler with a graded compression technique  
217 (vascular or thicker cartridge, based on the pancreatic thickness and texture at the transection  
218 level)<sup>26</sup>.

NOTE: With this technique, the stapler is closed very slowly, in steps, until resistance is felt. Before continuing with the compression, the surgeon should wait for 20–30 s until the resistance decreases. The entire process typically requires 4–5 min before the stapler is completely closed. Faster closure often leads to rupture of the pancreatic capsule<sup>27</sup>. If needed, sutures can be applied to the pancreatic stump in case of rupture or bleeding.

2.2.3.3. Identify the left gastric vein and the splenic vein. Clip and transect the left gastric vein.

2.2.3.4. Mobilize the splenic vein, pass and secure a vessel loop.

2.2.3.5. Hereafter, place 3–4 locking clips on the splenic vein: two on the patient site and at least one on the specimen site. In case of lack of space, an additional metal clip may be placed on the specimen site.

NOTE: The standard order of transection is splenic artery, pancreas, splenic vein. This order may be varied based on local anatomy (e.g., by transecting the pancreas first). However, if the splenic vein is transected before the splenic artery, there will be venous congestion with increased risk of conversion due to bleeding.

#### 2.2.4. Lymph node dissection

2.2.4.1. Dissect the lymph nodes in a clockwise fashion, according to the description of Strasberg's RAMPS procedure<sup>15</sup>.

2.2.4.2. Start with lymph node station 8A at the hepatic artery and station 9 at the celiac trunk.

NOTE: If possible, the left gastric artery should be preserved while performing lymphadenectomy. If needed, it can be resected.

2.2.4.3. Extend the lymphadenectomy to the left border of the aorta and the left side of the superior mesenteric artery.

2.2.4.4. Proceed with the dissection laterally towards the spleen, where any further attached tissue is taken, including the Gerota's fascia.

2.2.4.5. Detach the spleen by transecting the gastrosplenic ligament, splenorenal ligament, and retroperitoneal adhesion.

#### 2.2.5. Extraction and drain placement

2.2.5.1. Once the spleen is detached, remove the specimen using an endo-bag through a Pfannenstiel incision. Turn the camera 180° to the inferior part of the abdomen to visualize the extraction of the specimen.

2.2.5.2. The Pfannenstiel incision should be an approximately 6 cm transverse skin incision and 8 cm transverse fascia incision where the midline is divided between both rectus muscles.

2.2.5.3. Take caution during the extraction to avoid small bowel injury and compromising of the specimen for pathological assessment.

2.2.5.4. Place one surgical drain. This drain enters through the left most trocar site, loops with 2–3 additional holes through the splenic bed, runs under the stomach, and ends next to the pancreatic stump.

NOTE: Care must be taken to avoid direct contact with the pancreas, artery, and vein stump.

## 2.2.6. Closure

2.2.6.1. Close the peritoneum using an absorbable braided suture and the fascia with a monofilament absorbable suture.

2.2.6.2. Re-insufflate the abdomen.

2.2.6.3. Confirm hemostasis at the transection planes.

2.2.6.4. Revert all loops and the gastric hanging.

2.2.6.5. Inspect the stomach for any injuries.

2.2.6.6. Close any fascia defect larger than 5 mm using an absorbable multifilament suture.

2.2.6.7 Close the skin intracutaneously using an absorbable monofilament suture.

## RESULTS:

A 61-year-old woman presented with mild liver dysfunction at the surgical outpatient clinic. On both CT and MRI scans, an incidental finding of a 3 cm mass in the pancreatic tail suspect for malignancy was seen with potential involvement of the left adrenal gland (See **Figure 2**). No distant metastasis or lymph node involvement was seen on the preoperative contrast-enhanced CT scan. Therefore, the patient was deemed suitable for a minimally invasive approach.

The total operation time was 210 min with 250 mL blood loss. Intraoperatively the adrenal gland was not involved, and an anterior RAMPS procedure was performed, leaving the adrenal gland in situ. The postoperative course was uncomplicated. The postoperative day (POD) 3 amylase level in the drain was 1,316 U/L. The drain was removed in POD 5 when the amylase level was 158 U/L, and the patient was discharged on the same day in good health. The pathology assessment revealed a 31 mm well-to-moderately differentiated adenocarcinoma originating from an



intraductal papillary mucinous neoplasm. The resection margins were microscopically radical (R0), and none of the 15 lymph nodes were involved.

## FIGURE AND TABLE LEGENDS:

**Figure 1: Trocar placement.** The right-most trocar may also be a 12 mm trocar. The distance between trocars should be at least one hand's width. The figure is reproduced from T. De Rooij et al.<sup>35</sup> and is licensed under CC BY 3.0 copyright mark was removed from original figure.

**Figure 2: Preoperative CT-scan.** Mass in the pancreatic tail suspect for malignancy.

## DISCUSSION:

### Advantages of the technique

LRLP is a standardized, reproducible, and safe procedure if performed by experienced surgeons. Moreover, this minimally invasive procedure offers low intraoperative blood loss, early mobilization, and short hospital stays as confirmed by the LEOPARD trial<sup>7</sup>. Surgery for pancreatic cancer must aim for a radical resection, adequate lymphadenectomy, and a no-touch dissection to prevent seeding and dissemination of tumor cells<sup>16,28</sup>. Laparoscopy can offer high quality visualization, enlarge the details within the surgical field, and minimize tissue manipulation<sup>16</sup>. In a recent study on MIDP for PDAC over an 8-year period, the laparoscopic approach seemed to have a similar survival as compared to ODP<sup>29</sup>. Current surgical series show no difference between laparoscopic and open technique for radicality (R0) of the resection<sup>30,31</sup>. However, fewer lymph nodes were retrieved with laparoscopy, therefore the non-inferiority of lymphadenectomy with minimally invasive distal pancreatectomy is still debated<sup>30-33</sup>.

### Recommendations

Intraoperative ultrasound is useful to locate the neoplasm and better understand the anatomy of the pancreatic body and tail also in relation to major vasculature. The described LRLP technique using the double hanging of the pancreas (both to the left and right side of the neoplasm), allows for a no-touch dissection of the retroperitoneal plane<sup>16</sup>. Furthermore, the vessel mobilization and slinging give a better understanding of the anatomy and is useful during the lymph node dissection. Finally, early mobilization and transection of the splenic artery reduces the perfusion of the pancreatic body, tail, and spleen in order to minimize the blood loss during the dissection phases. Splenic vessels should only be cut once the anatomy is clear and the resectability of the primary tumor has been confirmed.

### Limitations

LRLP needs specialized training. The difficulty of the operation is related to the tumor extension beyond the pancreatic parenchyma, requiring reaching a deeper plane in relation to the Gerota's fascia or need for an extended resection.

### Future applications

LRLP is a feasible, safe, oncologically efficient, and reproducible technique and should be taught in order to ensure its validity and acceptance<sup>16</sup>. Due to the possible complications of this

laparoscopic procedure, it should be performed in high-volume centers by surgeons with extensive experience in both open and minimally invasive surgery, where failure to rescue is low<sup>34</sup>. Future studies should identify the minimum annual volume required to obtain adequate results.

LRLP is also highly suitable for a robotic approach to left-sided pancreatic cancer. Further pragmatic multicenter randomized controlled trials are needed to assess the long-term outcomes of MIDP specifically for PDAC. The DIPLOMA trial is currently being performed in centers across Europe and in the United States.

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This technique was originally described by Abu Hilal et al.<sup>16</sup>.

#### **DISCLOSURES:**

The authors have nothing to disclose.

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Figure 1: Trocar placement

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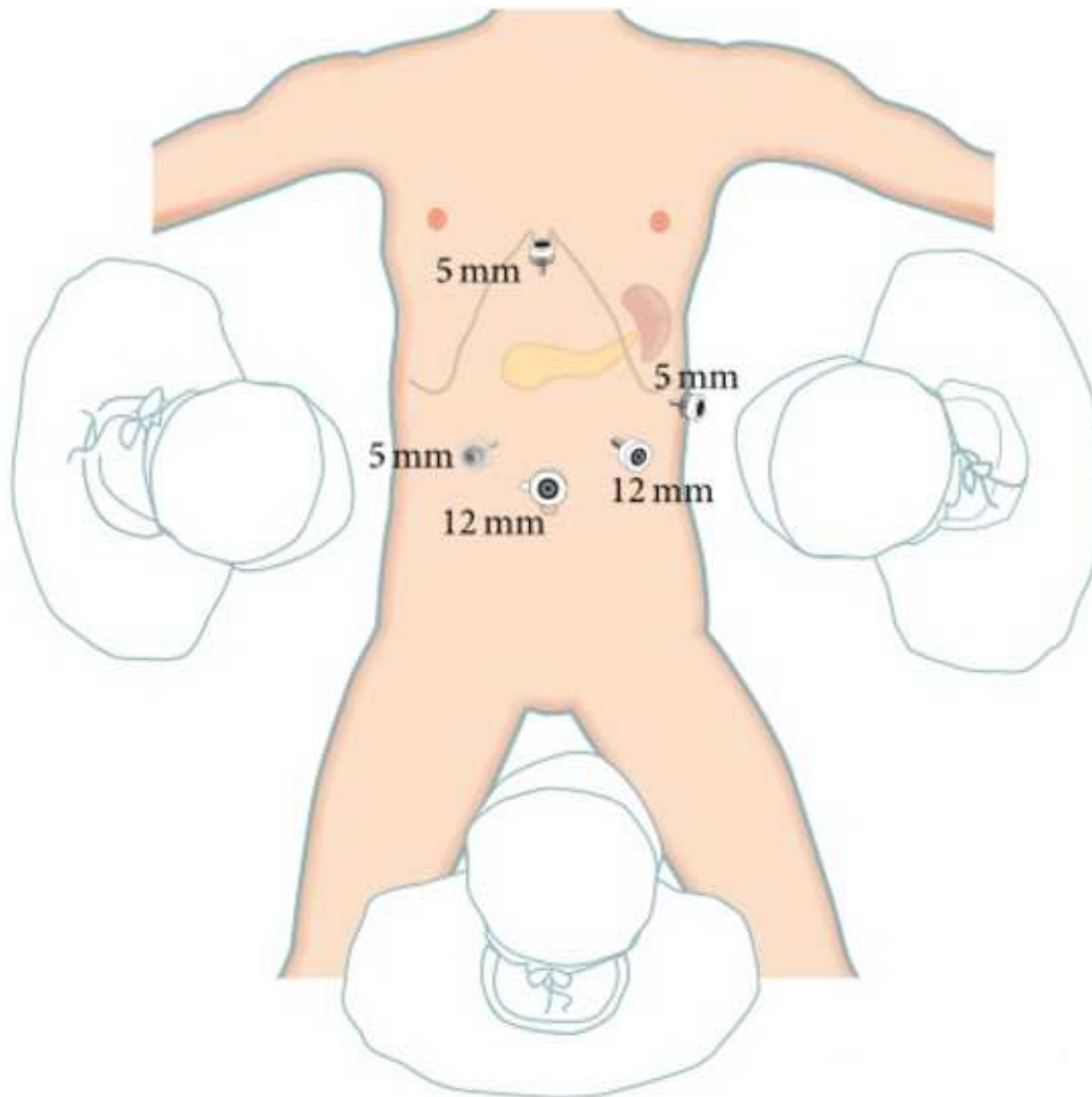
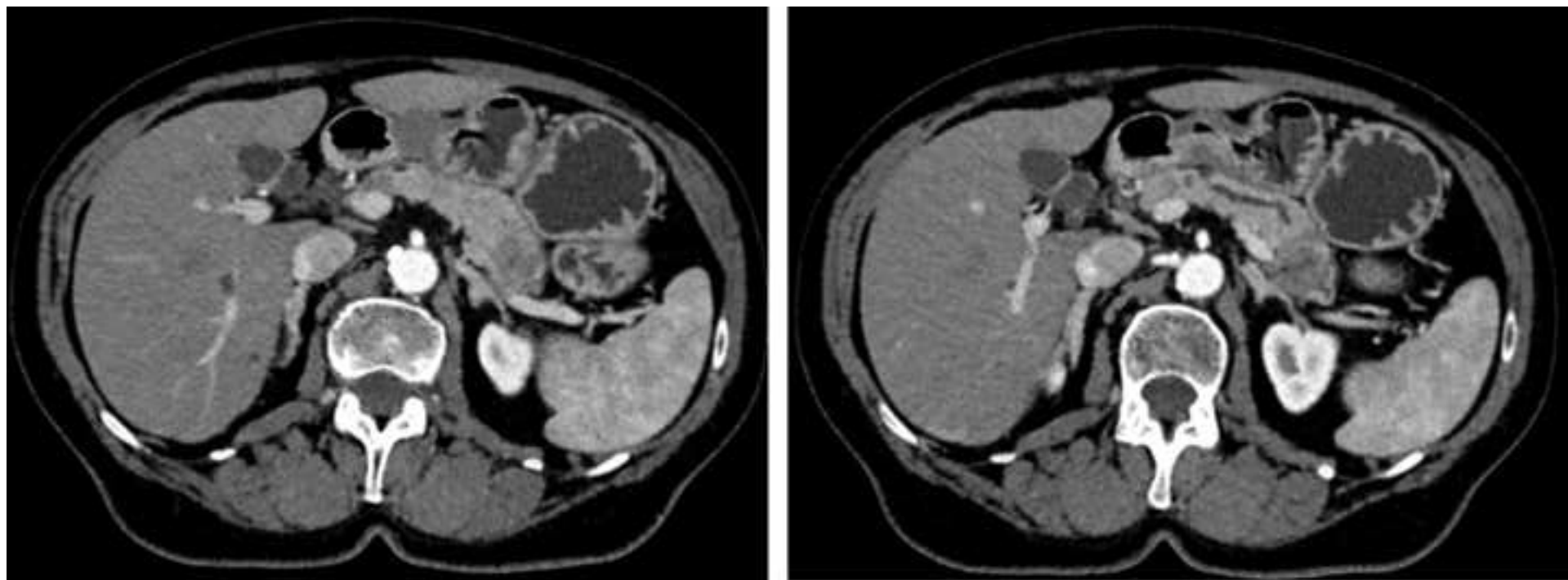


Figure 2: Preoperative CT-scan

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Name of Material/Equipment	Company	Catalog Number	Comments/Description
Arietta Ultrasound	Hitachi		Intraoperative laparoscopic ultrasonography
Autosuture Endo Clip applier 5 mm	Covidien	176620	Sling use clip applier, 5 mm
Blue reload for Echelon 60	Ethicon	GST60B	Regular tissue thickness, open staple height 3.6 mm, closed staple height 1.5 mm
ECHELON FLEX ENDOPATH 60mm Stapler	Ethicon	GST60T	Powered surgical stapler with gripping surface technology
Endo Catch II Pouch 15 mm	Covidien	173049	For single lymph node extractions a cut off finger surgical glove can be used.
Green reload for Echelon 60	Ethicon	GST60G	Thick tissue thickness, open staple height 4.1 mm, closed staple height 2.0 mm
Harmonic Advanced Hemostasis 36 cm	Ethicon	HARH36	Curved tip, energy sealing and dissecting, diameter 5 mm, length 36 cm
Hem-o-lok Clips MLX	Weck Surgical Instruments, Teleflex Medical, Durham, NC	544230	Vascular clip 3 mm – 10 mm Size Range
Hem-o-lok clips XI	Weck Surgical Instruments, Teleflex Medical, Durham, NC	544250	Vascular clip 7 mm – 16 mm Size Range
Hem-o-Lok Polymer Ligation System	Weck Surgical Instruments, Teleflex Medical, Durham, NC	544965	
LigaSure Dolphin Tip Laparoscopic Sealer/Divider	Medtronic	LS1500	Dolphin-nose tip sealer and divider, 37 cm shaft
White reload for Echelon 60	Ethicon	GST60W	Mesentery/thin tissue thickness, open staple height 2.6 mm, closed staple height 1.0 mm



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**Editorial Comments on the manuscript:**

- Please take this opportunity to thoroughly proofread the manuscript to ensure that there are no spelling or grammatical errors.
- Abstracts:
  - 1) Please reduce the summary to 50 words.
  - 2) Please remove the subheadings "Background" etc from the abstract and ensure that it is under 300 words.
- Protocol Language: The JoVE protocol should be almost entirely composed of numbered short steps (2-3 related actions each) written in the imperative voice/tense (as if you are telling someone how to do the technique, i.e. "Do this", "Measure that" etc.). Any text that cannot be written in the imperative tense may be added as a brief "Note" at the end of the step (please limit notes). Please re-write your ENTIRE protocol section accordingly. Descriptive sections of the protocol can be moved to Representative Results or Discussion. The JoVE protocol should be a set of instructions rather a report of a study. Any reporting should be moved into the representative results.
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Changes to be made to the video:

- Future submissions should contain the article ID number (60032) in the file name.
- 2:15-2:50, 4:24-5:10, 7:11-7:46, 8:26-9:00 - These are long silent parts of the video. There is on-screen text to help inform the viewer, but, from an audience perspective, it is unclear as to why we are now receiving information via text when we had been receiving it via audio just previously. Narration should be recorded to explain to the audience what they are seeing and, if applicable, offer tips or advice on how to perform the step being seen.
- 9:50-9:52 - The stray audio here should be cut out.
- 10:00 - At this point, the video should end. We do not need an additional 19 seconds of the title card from this point.

>> The editorial comments are adjusted in the revised manuscript and video.

#### **Reviewers' comments:**

##### **Reviewer #1:**

This manuscript described laparoscopic radical distal pancreatectomy for pancreatic cancer with a technique video. The author concluded that this minimally invasive procedure is feasible, safe, reproduced, and oncologically efficient for pancreatic cancer. This manuscript has an important finding, however, I have some questions and comments about this manuscript.

1) Figure 1, CT image in this manuscript, shows abutment of the tumor to left adrenal gland. Why didn't you plan posterior RAMPS before surgery to obtain secure R0 retro surgical margin?

>>We thank the reviewer for this important point. On the preoperative CT-scan there was indeed potential involvement of the adrenal gland. Intraoperatively, however, there was the adrenal gland was free from tumor, leading to the decision to perform an anterior RAMPS procedure. The resection was R0. We have added this information in the manuscript. In the



“Patient characteristics” paragraph: “On both CT-scan and MRI-scan, an incidental finding of a 3 centimeters mass in the pancreatic tail suspect for malignancy was seen with potential involvement of the left adrenal gland” (See figure 1). And in the the “Results” paragraph: “...estimated blood loss. Intraoperatively the adrenal gland was not involved and an anterior RAMPS procedure was performed leaving the adrenal gland in situ”.

2) As you described, laparoscopic procedure could offer low intraoperative blood loss by abdominal air pressure. However, in this manuscript, intraoperative blood loss was 250 ml, which is similar or higher compared to that of open RAMPS. What procedures caused such amount of bleeding?

>>In general, laparoscopic distal pancreatectomy is indeed associated with less blood loss than open distal pancreatectomy. In the randomized multicenter LEOPARD trial blood loss was 150 vs 400ml. (De Rooij, Ann Surg 2018). In the pan-European retrospective DIPLOMA cohort blood loss was 200ml with minimally invasive and 300ml with open distal pancreatectomy for cancer.(Van Hilst, Ann Surg 2019). As in both studies, our average blood loss is indeed less than 250ml. In n this case there was minor venous oozing.

3) In distal pancreatectomy, how to cut the pancreas is important for postoperative complications. How did you determine the type of stapler, cutting the pancreas? Furthermore, how do you cut the pancreas in a case whose pancreas is too thick to be tucked by a stapler, for example, when you need to cut the pancreas on the right side of the portal vein?

>>At the neck we typically use a white (vascular) cartridge using the grade compressing technique as first described by Asbun in which we take 3-5 minutes to slowly in steps close the stapler. In case the pancreas is thicker (as suggested at the right side of the portal vein) we use a blue cartridge, always with graded compression which reduces the risk of tears.

## **Reviewer #2:**

Manuscript Summary:

this video shows a standard RAMPS procedure which is actually used to be included in the DIPLOMA trial for distal pancreatectomy

Minor Concerns:

It is a very interesting video for surgical community. However, it would be very interesting, as well, to adds some data about the main results achieved by the authors and which are the main different with the standard laparoscopic distal pancreatectomy. Furthermore, it may be very useful to add some pictures, arrows and lines to better identify the structure along the video, making it more pleasant.

>>We thank the reviewer, we have now added information and looped some parts of the video to better identify the structures along the video.

## **Reviewer #3:**

I congratulate the authors on performing this case. Considering that the a lap distal pancreatectomy and splenectomy is now commonly performed by high volume pancreatic

surgeons for over 20 years, and that there is a plethora of published and online videos of this procedure, I found several major issues with this video:

- 1- The quality of the video is not up to par. There are many segments that are barely watchable
- 2- The speed of the video should be reduced. Many segments can be removed to condense it in order to reduce the speed
- 3- Structures are not labeled
- 4- Narration would be very helpful. Again, I would expect this video to offer something different from the literature.
- 5- The nomenclature of some of the vessels is not standard. For example: Great vein ?? (left gastric vein or coronary??), also v.leinalis (is this splenic vein? if so why not just use the standard nomenclature)
- 6- Multiple typos in the slides. The syntax and grammar needs proofing. Patient discharged on Hospital day? (data not provided-typo)
- 7- I don't see a proper lap RAMPS as the authors claim. The plain over the adrenal and renal vessels is not shown. How is this case different from the many videos already published?
- 8- What is the role of the 2 seniors surgeons (from 2 different countries in this video?). Are authorship criteria met here?

>>We thank the reviewer for these relevant points. The speed of the video has been reduced at several segments and we have better addressed the structures and surgical steps. The narration has also been added and typos corrected. Finally, we now better shown the plane over the adrenal gland.

This case is not intended to differ from others but aims to demonstrate the technique as used in the DIPLOMA trial. Two senior authors stem from the fact that both are the principal investigators of the trial, one has taught the technique to the other and both together coordinate the work of the PhD students on this project.

#### **Reviewer #4:**

Manuscript Summary:

This manuscript is educative and after minor linguistic revision could be published

Major Concerns:

No

Minor Concerns:

Minor linguistic revision

>>The manuscript has been corrected.

#### **Reviewer #5:**

Manuscript Summary:

I think this is a well written manuscript describing an important standardise way of a minimally invasive distal pancreatectomy for malignant disease. The manuscript is easy to read without obvious grammatical errors, the surgical technique is well described, including small modifications such as elevation of the stomach and the preservation of the top short gastric vessels in order to avoid bleeding, small tips that will be of benefit to all surgeons. Lessons learnt from experience. I also like the description of using Gerota's fascia to elevate

the pancreas. I described this as lifting the pancreas on a carpet of Gerota's fascia. The 4 to 5 minute closure of the pancreatic stapler is a new addition to the literature. This may be important.

>>Thank you.

Minor points

1. A sling around the neck of the pancreas would be to the right side of the pancreatic tumour not the left
2. Favourable pathological differentiation is usually described as "well differentiated" rather than "good"
3. Microscopic margins are usually described as free or clear rather than "radical"

>>These three points have been improved now. Thank you.

Major Concerns:

None significant

Minor Concerns:

My only criticism regarding the description of the surgical technique is it would be of interest to have more rigorous anatomical descriptions of the dissection in the retroperitoneum behind the body/tail of the pancreas in the area anterior to the left renal vein and near the adrenal. It is not seem to be a robust description of how to tackle this retroperitoneal ill-defined tissue.

>>We have now corrected this in the video.



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