

Pancreatic Cancer Surgical Algorithm

Surgical Oncology Clinical Protocol

1. Scope & Purpose

This protocol defines the surgical algorithm for management of pancreatic ductal adenocarcinoma (PDAC) and periampullary tumors requiring operative intervention. It encompasses resectability classification, neoadjuvant sequencing, operative technique, and postoperative management. Intended for surgical oncology teams and multidisciplinary tumor boards.

2. Resectability Classification

Category	Arterial Criteria	Venous Criteria
Resectable	No arterial contact (SMA, celiac axis, CHA)	No SMV/PV contact, or $\leq 180^\circ$ contact without contour irregularity
Borderline Resectable	Contact with SMA/celiac $\leq 180^\circ$; short-segment CHA contact without extension to celiac or proper hepatic artery	SMV/PV contact $> 180^\circ$, or $\leq 180^\circ$ with contour irregularity or thrombosis; IVC contact
Locally Advanced	SMA or celiac contact $> 180^\circ$; aortic involvement	Unreconstructible SMV/PV occlusion; most extensive venous involvement
Metastatic	N/A — distant disease present	N/A — distant disease present

3. Preoperative Evaluation

3.1 Diagnostic Workup

- Pancreatic-protocol CT (arterial and portal venous phase, thin-slice multiplanar reformats)
- CA 19-9 (baseline; correlate with bilirubin — may be falsely elevated in obstruction)
- EUS with FNA/FNB for tissue diagnosis (if no prior histologic confirmation)
- MRI abdomen with MRCP for indeterminate liver lesions or biliary anatomy
- PET-CT when metastatic disease is suspected or equivocal on cross-sectional imaging
- Diagnostic laparoscopy with peritoneal washings for body/tail lesions and borderline resectable tumors
- Chest CT for pulmonary staging

3.2 Biliary Drainage

- Preoperative biliary drainage indicated if: total bilirubin > 15 mg/dL, cholangitis, significant pruritus, or delayed surgery (> 2 weeks)
- Preferred method: ERCP with short metal stent (plastic stent if neoadjuvant therapy planned with uncertain duration)
- Percutaneous transhepatic biliary drainage (PTBD) as alternative if ERCP fails
- Avoid routine preoperative drainage for upfront resectable disease if surgery within 1–2 weeks

3.3 Neoadjuvant Therapy

Borderline Resectable / Locally Advanced PDAC:

- FOLFIRINOX (modified) or gemcitabine/nab-paclitaxel × 4–6 cycles
- Consider chemoradiation (50.4 Gy in 28 fractions with concurrent capecitabine or 5-FU) or SBRT
- Re-stage with pancreatic-protocol CT and CA 19-9 after 2–3 months
- Surgical exploration if no disease progression and adequate performance status

Resectable PDAC (Neoadjuvant Consideration):

- Neoadjuvant therapy increasingly favored — improves R0 resection rate, tests tumor biology
- Preferred regimen: mFOLFIRINOX × 4 cycles → surgery → adjuvant to complete 6 months total
- Alternative: gemcitabine/nab-paclitaxel for patients not tolerating FOLFIRINOX

4. Surgical Procedures

4.1 Pancreaticoduodenectomy (Whipple)

Indicated for tumors of the pancreatic head, uncinate process, distal common bile duct, ampulla of Vater, and duodenum.

Key Operative Steps:

- Extended Kocher maneuver with assessment of SMA margin
- Portal dissection: cholecystectomy, division of bile duct, gastroduodenal artery ligation
- SMV/PV dissection; assess for venous involvement — proceed with segmental resection and reconstruction if needed
- Pancreatic transection at the neck; frozen-section margin assessment
- Uncinate dissection along the SMA with soft-tissue clearance (SMA-first approach preferred for borderline tumors)
- Reconstruction: pancreaticojejunostomy (duct-to-mucosa or invagination), hepaticojejunostomy, gastrojejunostomy
- Assess need for pylorus preservation vs. classic Whipple based on margin and tumor proximity

4.2 Distal Pancreatectomy

Indicated for tumors of the pancreatic body and tail.

- Radical antegrade modular pancreatectomy (RAMPS) preferred for oncologic resection
- En bloc splenectomy (splenic vessels ligated at origin)

- Posterior dissection plane: anterior to left renal vein and adrenal gland (posterior RAMPS) or anterior to Gerota's fascia (anterior RAMPS) based on tumor extent
- Celiac axis resection (modified Appleby) for selected locally advanced tumors with confirmed hepatic arterial collateral flow via GDA arcade
- Stapled pancreatic stump; consider reinforcement (omental patch, fibrin sealant)

4.3 Total Pancreatectomy

- Consider for multifocal disease, diffuse IPMN with high-grade dysplasia, or positive pancreatic margin on frozen section during Whipple
- Results in insulin-dependent diabetes and exocrine insufficiency — extensive patient counseling required
- Splenectomy included; vaccinate preoperatively (pneumococcal, meningococcal, Haemophilus influenzae type B)

4.4 Vascular Resection & Reconstruction

- SMV/PV resection: tangential venorrhaphy, patch repair, or segmental resection with primary anastomosis or interposition graft
- Arterial resection (SMA, CHA): rarely indicated; consider only at high-volume centers with vascular surgery support
- Ensure adequate inflow/outflow confirmation before completing reconstruction

5. Intraoperative Standards

- Frozen-section assessment of pancreatic neck margin, bile duct margin, and retroperitoneal (SMA/uncinate) margin
- Standard lymphadenectomy: stations 5, 6, 8a, 12b1, 12b2, 12c, 13, 14, 17 (pancreatic head); stations 10, 11, 18 (body/tail)
- Minimum 15 lymph nodes for adequate staging
- Specimen orientation and inking per institutional pathology protocol
- Drain placement: one or two closed-suction drains near pancreatic and biliary anastomoses

6. Postoperative Management

6.1 Complication Monitoring

- **Pancreatic fistula (POPF):** Monitor drain amylase POD 3; grade per ISGPS criteria. Manage grade A expectantly; grade B/C may require NPO, TPN, percutaneous drainage, or reoperation
- **Delayed gastric emptying (DGE):** Common after Whipple; manage with prokinetics (metoclopramide, erythromycin), NGT decompression, nutritional support
- **Post-pancreatectomy hemorrhage:** Early (< 24 h) — re-exploration; Late (> 24 h) — CT angiography ± embolization; sentinel bleed through drain warrants urgent evaluation
- **Bile leak:** Assess with drain bilirubin; percutaneous management preferred; reoperation if peritonitis

6.2 Drain Management

- Check drain amylase on POD 3
- Remove drains if amylase < 3× upper limit of serum amylase and output < 200 mL/day
- Maintain drains for elevated amylase; reassess with imaging

6.3 Recovery Milestones

- Advance diet as tolerated; pancreatic enzyme replacement therapy (PERT) with meals
- Glucose monitoring: endocrine consult for new-onset diabetes
- VTE prophylaxis: LMWH for 28 days post-discharge
- Discharge target: POD 7–10 if uncomplicated

7. Adjuvant Therapy

- Begin adjuvant therapy within 8–12 weeks of surgery
- Preferred: mFOLFIRINOX (if not given neoadjuvant) to complete 6 months perioperative therapy
- Alternative: Gemcitabine + capecitabine (ESPAC-4) or gemcitabine monotherapy
- Adjuvant chemoradiation: consider for R1 resection or positive lymph nodes (institutional preference)

8. Surveillance

- CA 19-9 and clinical exam every 3–6 months for 2 years, then every 6–12 months
- CT chest/abdomen/pelvis every 3–6 months for 2 years, then every 6–12 months to year 5
- MRI liver if CT equivocal
- Nutritional and endocrine follow-up ongoing

This protocol is intended as a clinical reference and should be adapted based on institutional guidelines, individual patient factors, and evolving evidence. All treatment decisions should be made in the context of multidisciplinary review.

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