Surgery for Chronic Pancreatitis
64 year old male presented with severe epigastric pain radiating to the back, nausea and vomiting

History of chronic pancreatitis with recurrent episodes of pain requiring admission to hospital
Medical History

- MRSA Endocarditis
- ESRD on HD x 4 years
- DM x 25 years
- HTN x 25 years
- PVD
- COPD
- CAD s/p stent
- Amputation of L hand 3rd phalynx at PIP
- Amputation of L 2nd toe
Social Hx

- ½ ppd x 30 years tobacco
- History of EtOH use, quit many years
- No drug use

Allergy

- Novocaine
Physical Exam

- T 98.4, P 87, BP 170/84, RR 19
- Weight: 217 lb, BMI-30
- Gen: AAOx3, moderate distress due to pain
- HEENT: no jaundice
- Lungs: CTA b/l, permacath right side
- Heart: S1, S2 RRR
- Abdomen: soft, normal BS, tenderness in the epigastric region, some guarding, no rebound, no organomegaly
Labs

- CBC: 14.9>13.2/42.9<297
- BMP: 141/5.5/102/25/44/7.5/174/10.5
- LFTs: 8.8/4.5/34/21/188/0.1
- Coags: 0.96/11.2
- Lipase: 1138
CT: dilated distal pancreatic duct
Imaging

CT: 2.2cm dilated duct with pancreatic duct stone
Imaging

T2 weighted MRI (transverse): dilated pancreatic duct with stone
Imaging

T2 weighted MRI (coronal): dilated pancreatic duct with stone
Exploratory laparotomy via bilateral subcostal incision

Lesser sac entered and pancreas inspected

Cholecystectomy

Cholangiogram

Pancreatic duct opened longitudinally and large stones removed

Roux-en-y pancreaticojejunostomy
POD 0: Extubated in OR, transferred to ICU

POD 1: Dialysis started per schedule

POD 2: Tachycardic, fluids replaced

POD 4: Clear liquid diet

POD 6: Full liquid diet

POD 7: JP removed, transferred to floor

POD 8: Regular diet

POD 9: Discharged home

POD 13, 20: Clinic visit, doing well
Surgery for Chronic Pancreatitis
Chronic pancreatitis is a progressive inflammatory disorder.

Each inflammatory episode causes fat necrosis leading to stricture and fibrosis.

Two forms are recognized:

- Large-duct calcifying type
- Small-duct variant

Pain may be due to main duct distension and/or perineural fibrosis.

Subtypes

<table>
<thead>
<tr>
<th>Lesions</th>
<th>Ordinary*</th>
<th>Cystic fibrosis†</th>
<th>Obstructive‡</th>
<th>Autoimmune§</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distribution</td>
<td>Patchy</td>
<td>Diffuse</td>
<td>Diffuse</td>
<td>Diffuse</td>
</tr>
<tr>
<td>Extent of gland</td>
<td>Variable</td>
<td>Total</td>
<td>Total</td>
<td>Total or focal</td>
</tr>
<tr>
<td>Duct system</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Main duct</td>
<td>Irregularly dilated</td>
<td>Minimally dilated</td>
<td>Smoothly dilated</td>
<td>Constricted</td>
</tr>
<tr>
<td>Protein plugs</td>
<td>All ducts</td>
<td>Intralobular and interlobular</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Calcifying tendency</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Epithelium destroyed</td>
<td>(Groove form)</td>
<td>No</td>
<td>Yes (type 2)</td>
<td>Yes (type 2)</td>
</tr>
<tr>
<td>Neutrophils</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Inflammatory cells</td>
<td>Mononuclear</td>
<td>No</td>
<td>No</td>
<td>Plasmalymphatic</td>
</tr>
<tr>
<td>Fibrosis</td>
<td>Mainly perilobular</td>
<td>Perilobular, intralobular</td>
<td>Perilobular, intralobular</td>
<td>Perilobular, intralobular, periductal</td>
</tr>
<tr>
<td>Pseudocyst</td>
<td>Frequent</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

*Excludes the small-duct variant (as in at least 30% of cases) wherein characteristic features are focal acinar cell damage and tubular complexes.† Groove pancreatitis is similar to the ordinary form, except for prominent destruction of ductal epithelium and cysts.‡ The earliest lesions occur in utero.§ Diffuse lesions occur upstream from the obstruction.△ See text for subtypes.

Table: Main histological features of chronic pancreatitis subtypes (at diagnosis in stable disease)

Two Pain Patterns

- **Type A**
  - short pain episodes separated by long pain free intervals
  - Manageable with short term analgesics

- **Type B**
  - Continuous nonresolving pain with or without recurrent pain exacerbations
  - Usually attributed to local complications
    - Pseudocysts
    - Cholestasis
    - Pancreatic ductal hypertension


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Causes

**Toxic**
- Alcohol **80-95%**
- Cigarette smoke
- Occupational volatile hydrocarbons
- Drugs: valproate, phenacitin, thiazide, oestrogen, and azathioprine

**Endogenous**
- Hypercalcaemia, hyperparathyroidism
- Hyperlipidaemia, lipoprotein lipase deficiency
- Chronic renal failure

**Infection or infestation**
- HIV, mumps virus, coxsackie virus
- *Echinococcus, Cryptosporidium*

**Genetic**
- CFTR mutation
- PRSS1 mutation
- SPINK1 mutation

**Obstruction of main pancreatic duct**
- Cancer
- Post-traumatic scarring
- Post-duct destruction in severe attack

**Recurrent acute pancreatitis**

**Autoimmune**

**Miscellaneous**
- Gall stones
- After transplant
- After irradiation
- Vascular disease

**Idiopathic**
- Early or late onset
- Tropical

Pathogenesis

- Ductal theory
  - Calcifying protein deposits
- Acinar theory
  - Injury to acinar cells directly
- Two-hits theory
  - Combination of the two above
- Electrophilic stress theory
  - Diversion of free radicals into interstitium
- Multiple-cause theory

Diagnostic Tests

- Routine labs may show diabetes, hyperlipidemia, or hypercalcemia
- Secretin stimulation test
- ERCP
- MRCP
- CT
- MRI
- EUS

Treatment

- Goal is to relieve pain
  - Prevent recurrence
  - Correct metabolic changes
  - Manage complications

- Medical treatment
  - Analgesics
  - Pancreatic enzymes, octreotide, CCK receptor antagonist may “allow pancreas to rest”
  - Micronutrient therapy

- Consider surgery if medical treatment fails

Surgical Options

- Celiac plexus block
- Thoracoscopic splanchnicectomy
- Endoscopic stent and drainage
- Extracorporeal shock-wave lithotripsy
- Pancreatic Surgery
  - Drainage type procedures
  - Resection type procedures
Celiac Plexus Block

- Final common pathway producing pain is the splanchnic nerve supply
- Effective for pain from pancreatic cancer
- Many approaches – CT-guided, fluoroscopy, in OR, transcutaneous ultrasound, EUS
- Agents used include alcohol and other sclerosing agents, local anesthetics, steroids

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Meta analysis of EUS guided celiac plexus block

9 studies met inclusion criteria

- 6 for CP (N=221)
- 3 for pancreatic cancer (N=119)

Pain relief in CP 51.46% (right open 95% CI, 0.3272-1)

Pain relief in panc CA 72.54% (right open 95% CI, 0.5062-1)

Absolute alcohol was used for CA but not CP because sclerosis limits future interventions.

Pain relief lasts weeks to months.

Lack of long term follow up.

Neurolysis for pancreatic cancer more effective than plexus block for CP.

Greater, lesser and least splanchnic nerves innervate upper abdominal viscera

**Table:**

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of patients</td>
<td>302</td>
</tr>
<tr>
<td>Age (yr): mean (range)</td>
<td>43.7 (31–51)</td>
</tr>
<tr>
<td>Sex: male, female, NR: n (%)</td>
<td>175 (57.9), 122 (40.4), 5 (1.7)</td>
</tr>
<tr>
<td>Bilateral TS, unilateral TS: n (%)</td>
<td>202 (66.9), 100 (33.1)</td>
</tr>
<tr>
<td>Conversion to open surgery: n (%)</td>
<td>4 (1.3)</td>
</tr>
<tr>
<td>Complications: n (%)</td>
<td>50 (16.6)</td>
</tr>
<tr>
<td>Reoperation rate: n (%)</td>
<td>4 (1.3)</td>
</tr>
<tr>
<td>Mortality</td>
<td>0</td>
</tr>
<tr>
<td>Postoperative hospital stay (days): mean (range)</td>
<td>2.7 (&lt;24 h–7)</td>
</tr>
<tr>
<td>Follow-up: mean (range)</td>
<td>24 mos (1.5 mos–5.7 yr)</td>
</tr>
<tr>
<td>Success rate (%): mean (range)</td>
<td>90 (47–100) at 6 mos</td>
</tr>
<tr>
<td></td>
<td>75 (60–94) at &gt;6–15 mos</td>
</tr>
<tr>
<td></td>
<td>49 (20–90) at &gt;15 mos to 5.7 years</td>
</tr>
<tr>
<td>Further intervention for pain relief: n (%)</td>
<td>39 (12.9)</td>
</tr>
</tbody>
</table>

Unilateral TS may fail in 30%

Long-term success is related to previous interventions

- Those with small duct disease who did not have endoscopic or open pancreatic procedures had better long term success

- Testing with epidural blockade may help select which patients to operate on

Enrolled patients with distal obstruction without inflammatory mass

Randomized 39 patients to endoscopic drainage vs pancreaticojejunostomy

2 years follow up

Surgical arm had lower pain score (P<0.001) and better physical health (P=0.003)

# Endoscopic versus Surgical Drainage of the Pancreatic Duct in Chronic Pancreatitis

## Table 3. Outcomes of Endoscopic and Surgical Treatment after 2 Years of Follow-up.*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Endoscopy (N = 19)</th>
<th>Surgery (N = 20)</th>
<th>Endoscopic Results vs. Surgical Results (95% CI)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Izbicki pain score†</td>
<td>51±23</td>
<td>25±15</td>
<td>24 (11 to 36)†</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Pain relief — no. (%)</td>
<td>6 (32)</td>
<td>15 (75)</td>
<td>-43 (-72 to -15)¶</td>
<td>0.007</td>
</tr>
<tr>
<td>Complete relief</td>
<td>3 (16)</td>
<td>8 (40)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Partial relief</td>
<td>3 (16)</td>
<td>7 (35)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No relief</td>
<td>13 (68)</td>
<td>5 (25)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conversion to surgery — no. (%)</td>
<td>4 (21)</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technical success — no. (%)</td>
<td>10 (53)</td>
<td>20 (100)</td>
<td>-47 (-70 to -25)¶</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Complications — no. (%)</td>
<td></td>
<td></td>
<td>23 (-8 to 53)¶</td>
<td>0.15</td>
</tr>
<tr>
<td>Major</td>
<td>0</td>
<td>1 (5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minor</td>
<td>11 (58)</td>
<td>6 (30)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Death — no. (%)</td>
<td>1 (5)</td>
<td>0</td>
<td>5 (-5 to 15)¶</td>
<td>0.49</td>
</tr>
<tr>
<td>Hospital stay — median no. of days (range)</td>
<td>8 (0–128)</td>
<td>11 (5–59)</td>
<td>-3 (-9 to 4)</td>
<td>0.13</td>
</tr>
<tr>
<td>Hospital readmittance — median no. of patients (range)</td>
<td>1 (0–5)</td>
<td>0 (0–7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Procedures — median no. (range)</td>
<td>8 (1–21)</td>
<td>3 (1–9)</td>
<td>5 (2 to 8)†</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Diagnostic</td>
<td>3 (0–11)</td>
<td>2 (0–8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Therapeutic**</td>
<td>5 (1–11)</td>
<td>1 (1–5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SF-36 quality-of-life scores††</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical health component</td>
<td>38±9</td>
<td>47±7</td>
<td>-8 (-13 to -3)‡</td>
<td>0.003</td>
</tr>
<tr>
<td>Mental health component</td>
<td>40±9</td>
<td>45±9</td>
<td>-3 (-8 to 1)‡</td>
<td>0.15</td>
</tr>
</tbody>
</table>
Endoscopic versus Surgical Drainage of the Pancreatic Duct in Chronic Pancreatitis

- Surgical drainage resulted in more rapid, effective, and sustained pain relief
- Terminated early due to significant difference in outcome favoring surgery
- Surgical drainage leads to more effective decompression
  - Stent may block side branches
  - Recurrence of stricture and formation of new stones is common
  - Stent itself may cause pancreatitis and permanent damage
  - Opening pancreatic capsule may alleviate interstitial pressure

Extracorporeal shock-wave lithotripsy

- ESWL + endoscopic drainage is used in some specialized centers in Europe
- Randomized 55 patients to ESWL vs. ESWL + endoscopy
- At 2 years, 38% in EWSL alone group had pain relapse, 45% in the combined group
- Difference not significant (p=0.759)
- Endoscopy group often required repeat endoscopy
- Overall high relapse rate

Open Surgical Procedures

- Drainage procedures
  - Partington-Rochelle (modified Peustow)

- Resectional procedures
  - Whipple
  - Distal or total pancreatectomy

- Hybrid procedures
  - Frey
  - Beger
  - Hamberg
  - Berne
History

Link’s Pancreatostomy, 1911

Duval’s caudal Pancreaticojejunostomy, 1954


Longitudinal Pancreaticojejunostomy

Peustow, 1958

Partington-Rochelle, 1960
Became the standard drainage for ~40 years

However, not all patients had dilated ductal disease

Up to 30% had recurrent pain after 3-5 years

- Usually attributed to recurrent disease in the head of the pancreas
- Lack of decompression in the proximal duct of Wirsung, uncinate, and tributary ducts in the head

Resectional Procedures

- Remove the diseased portion of pancreas and ductal system
- Excising more tissue increases risk of exocrine and endocrine dysfunction
  - Exocrine can be replaced exogenously
  - Endocrine dysfunction is difficult to overcome and can be fatal

Whipple Procedure

- Pain relief 4-6 years after operation in 71-89%
- Mortality rate has been reduced to 5%
- Morbidity still 40%
- Pylorus preservation is an option
  - Nutritional benefits not well established
  - Most studies report improved quality of life
- Useful if inflammatory mass in the head or cancer is suspected

Total Pancreatectomy

- Pain relief is no better than with pancreaticoduodenectomy
- Produces brittle diabetes
- Half of late deaths due to hypoglycemia
- Islet cell transplant is an option in those who are not yet diabetic
  - Intrahepatic engraftment by infusion through portal venous system
  - 1/3 become insulin independent

Distal Pancreatectomy

- Small percentage of CP is due to distal disease
  - Isolated stricture, pseudocyst or both
- DP leaves a major portion of the pancreas untreated
  - Associated with significant risk of recurrence
- Long term pain relief in 60%

Beger Procedure

- Duodenum-preserving pancreatic head resection

Beger Procedure

- Pain relief in 80-85% maintained at 5 years
- Technically demanding
  - Must preserve posterior branch of GDA
- Complications
  - Ischemia of duodenum
  - Leak from 2 pancreatic anastomoses
  - Delayed gastric emptying, ileus
- Results are equivalent or superior to all other procedures

Frey Procedure

Local resection of pancreatic head with longitudinal pancreaticojejunostomy

Frey Procedure

- Initial and long-term results equivalent to pancreaticoduodenectomy and DPPHR (Beger)

- Major complications
  - Frey 16%, zero mortality
  - Whipple 40%
  - Beger 25%

- Frey’s modification only cores out the head without longitudinal dochotomy is as effective for those with small MPD

Modifications

Hamburg

Berne

Whipple??

- Beger procedure is associated with (3-5 yr f/u)
  - Shorter hospital stay
  - Less endocrine and exocrine dysfunction
  - Greater weight gain
  - Same or better pain relief

- Frey procedure is associated with (2 yr f/u)
  - Lower postop complication rate
  - Better quality of life score
  - Same pain relief

- Long term rate of diabetes was similar for all 3

No significant long term difference in
- Global quality of life
- Pain scores
- Exocrine or endocrine insufficiency

One level 1 study showed initial reduction in morbidity associated with Frey procedure with no difference in the long term

Level 2 evidence supports Beger and Frey procedure with dilated or nondilated ducts
Summary

- Surgical treatment is more efficacious for long term pain control than medical treatment.
- Longitudinal pancreaticojejunostomy achieves excellent pain control but long term recurrence may be due to disease in pancreatic head.
- Head is the locus of disease in majority of CP.
- Combination of distal decompression and coring of pancreatic head is essential for optimal long term success.
- Early morbidity and mortality higher with Whipple.
- Long term outcomes similar.
- Excavation techniques are safer and easier to perform.
References


