

Beyond the Papilla: Use of Pancreatoscopy for Main Duct Stone

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My Pancreas got 99 Problems but a dilated PD ain't one

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Disclosures

- None

Case Report

56 M who presents to ED for abdominal pain, nausea, and SOB

- Reports that he developed SOB, CP, fever, and severe epigastric abdominal pain 1 day prior to arrival
- Drinks about 6-8 glasses of scotch per day but has not had a drink in last 24 hours due to pain
- 1 month prior hospitalized for abdominal pain, and underwent pancreatic duct stent placement for PD stones

Case Report

56 M who presents to ED for abdominal pain, nausea, and SOB

Past Medical History:

- CAD w DES
- HTN / HLD
- ETOH use disorder
- Hx of Chronic Pancreatitis with therapy for PD stones

Case Report

56 M who presents to ED for abdominal pain, nausea, and SOB

Presentation:

- Vitals notable for mild tachycardia 100s, with Tmax 37 C
- Labs notable for AST 93 , ALT 25 with normal T Bili and ALP
- Albumin 3.2 with Lipase 296
- Normal Triglycerides
- WBC 12.8, Hg 7.7, Plt 219 with MCW 94

Case Report

56 M who presents to ED for abdominal pain, nausea, and SOB

Panel:

Differentials?

- Cardiac
- Alcoholic Hepatitis
- Peptic ulcer disease
- Ascities/ SBP
- Stent complication
- Pancreatitis
 - Repeat episode
 - Chronic
 - Complicated
 - Necrosis, Hemorrhagic, Pseudocyst, Suppurative

Case Report

56 M who presents to ED for abdominal pain, nausea, and SOB

Presentation:

- CT AP:

Findings of

Acute ...on chronic pancreatitis.

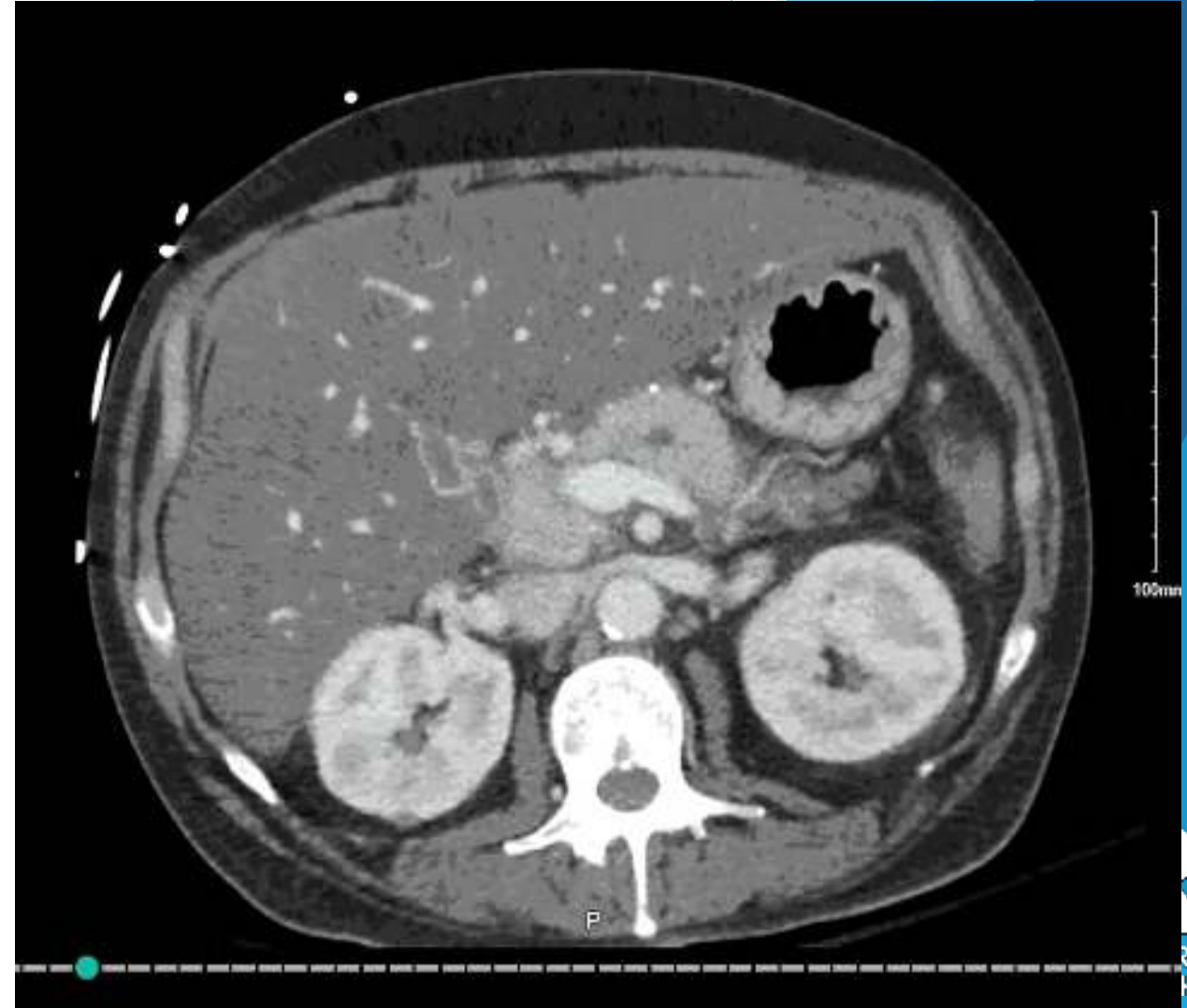
Pancreatic stent ...in the mid pancreatic body

Moderate dilatation of the pancreatic duct ...up to 9 mm.

A 6 mm calcification adjacent to the pancreatic stent ...

Case Report

56 M who presents to ED for abdominal pain, nausea, and SOB



Case Report

56 M who presents to ED for abdominal pain, nausea, and SOB

Panel:

- ▶ How to proceed?
- ▶ What is goal at endoscopy?

Our Concern-Suppurative Pancreatitis Without Necrosis

Case from 2016:



Trindade et al. CGH 2016; 14: e14-15

Endoscopic Management-2024 Guidelines

ASGE 2024 Guideline: Role of Endoscopy in the Management of Chronic Pancreatitis				ASGE American Society for Gastrointestinal Endoscopy Advancing Endoscopy	
Patient Selection Indications Interventions Outcomes Key Recommendations					
1 PATIENT SELECTION		2 INDICATIONS		3 ENDOSCOPIC INTERVENTIONS	
Consider endoscopic therapy in: - Symptomatic chronic pancreatitis with obstructive features (e.g., ductal stones, dominant strictures) - Recurrent acute pancreatitis due to obstructive chronic pancreatitis - Pain presumed to be related to ductal hypertension/obstruction - Patients who are reasonable candidates for endoscopic therapy and motivated for a minimally invasive approach Less likely to benefit: - Isolated parenchymal calcifications without a dilated duct - Minimal ductal change - Predominantly inflammatory mass or suspicion for malignancy (evaluate appropriately) - Patients unfit for endoscopic therapy		Pain Due to ductal obstruction (e.g., stones, strictures) Ductal stones Main pancreatic duct (MPD) or selected branch duct stones Dominant MPD stricture With maximum ductal dilation Symptomatic fluid collections Pancreatic or walled-off necrosis (long-term management) Pancreatic duct leaks (e.g., after acute pancreatitis or trauma) Concomitant biliary, duodenal, or gastric outlet obstruction When amenable to endoscopic therapy		Ductal stones - Extraction with balloons/baskets - Mechanical lithotripsy - Endoscopic shock wave lithotripsy (ESWL) for large or impacted stones (or endoscopic extraction) MPD strictures - Endoscopic dilation (graded dilation) - Place pancreatic duct stent(s) (multiple side-by-side or sequentially) - Consider long-term stenting for refractory strictures Fluid collections - Endoscopic transmural drainage (EUS-guided preferred) - Use lumen-apposing metal stents (LAMS) - Manage displaced duct when present Pancreatic duct leaks - Transpapillary stenting across the leak - Splincterotomy if needed Concomitant obstruction - Stenting for biliary, duodenal or gastric outlet obstruction	
4 EXPECTED OUTCOMES					
Pain improvement - Meaningful pain relief in selected patients, especially with ductal obstruction - May reduce opioid use Improved ductal drainage - Relief of obstruction and preservation of pancreatic function Better quality of life - Improved functional status and nutritional parameters Limitations - Endoscopic therapy is primarily palliative (not curative) - Multiple procedures often required - Variable durability of response - Surgery should be considered for patients who fail endoscopic therapy or have non-obstructive pain, inflammatory mass, or other surgical indications					
5 KEY RECOMMENDATIONS (2024 ASGE)		6 FOLLOW-UP AND LONG-TERM MANAGEMENT		7 KEY TAKEAWAY	
- Endoscopic therapy is recommended for symptomatic chronic pancreatitis with ductal obstruction (e.g., stones or dominant strictures). - Use step-up approach with endoscopic therapy as initial treatment in appropriate patients. - For large or impacted MPD stones, consider ESWL combined with endoscopic extraction. - For dominant MPD strictures, perform endoscopic dilation and place pancreatic duct stents. - EUS-guided transmural drainage is recommended for symptomatic pancreatic fluid collections. - Endoscopic pancreatic duct stent placement is recommended for pancreatic duct leaks. - Manage concomitant biliary or duodenal obstruction endoscopically when feasible. - Multidisciplinary care (gastroenterology, surgery, pain management, nutrition) is recommended.		- Review symptoms and stent patency - Planned stent exchanges or removal (depending on indication and response) - Address modifiable risk factors (e.g., alcohol, smoking, metabolic disease) - Ongoing multidisciplinary care - Consider surgery for persistent pain, failure of endoscopic therapy, or non-ductal pain		Endoscopy in chronic pancreatitis aims to relieve pain, improve ductal drainage, manage complications, and enhance quality of life using the least invasive, individualized, multidisciplinary approach. ASGE Guideline on Endoscopic Therapy in the Management of Chronic Pancreatitis, 2024	

Management of Pancreatic Duct Stones

Extracorporeal Shock Wave Lithotripsy (ESWL) vs. Pancreatostomy with Electrohydraulic Lithotripsy (EHL)

Extracorporeal Shock Wave Lithotripsy (ESWL)

Noninvasive fragmentation of pancreatic duct stones

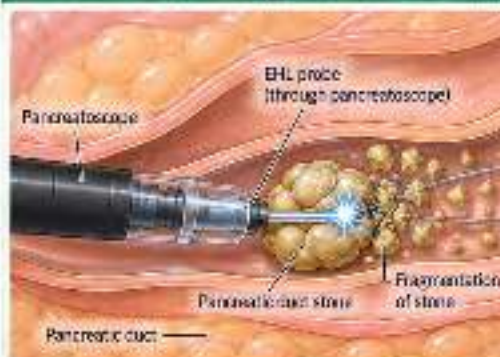


Key Points

- High-energy shock waves from outside the body fragment pancreatic duct stones
- Typically performed in 1-3 sessions
- Fragments pass spontaneously or are removed endoscopically (ERCP)
- Used for large (> 5-10 mm), multiple, or impacted stones

Pancreatostomy with Electrohydraulic Lithotripsy (EHL)

Direct endoscopic visualization and intraductal fragmentation



Key Points

- Direct visualization of the pancreatic duct with a cholangio-/pancreatoscope
- EHL probe delivered through the pancreatoscope working channel
- High-frequency electrohydraulic pulses fragment stones
- Allows targeted therapy and removal of fragments with baskets/balloons
- Can be performed in the same session as ERCP
- Particularly useful for smaller stones, residual fragments, or stones not amenable to ESWL

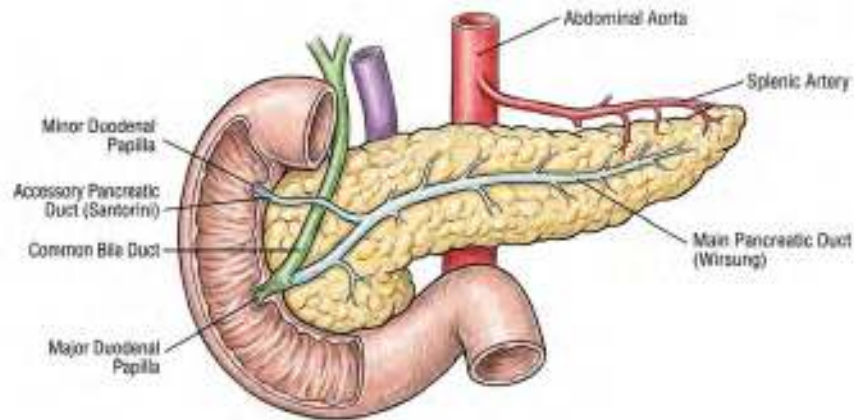
Feature	ESWL	Pancreatostomy + EHL
Approach	Noninvasive (external shock waves)	Intraductal, endoscopic (direct visualization)
Mechanism	High-energy shock waves fragment stones	Electrohydraulic pulses via probe to fragment stones
Ideal stone characteristics	Large (> 5-10 mm), multiple, or impacted stones	Smaller stones, residual fragments after ESWL, or stones accessible to endoscopy
Need for ERCP	Yes, to remove fragments (usually after ESWL)	Performed during ERCP (same session)
Number of sessions	Typically 1-3 sessions	Often single session (may require multiple)
Advantages	• Noninvasive • Effective for large/impacted stones • Facilitates subsequent endoscopic clearance	• Direct visualization • Targeted fragmentation • Allows immediate fragment removal • Useful for stones not amenable to ESWL or residual fragments
Limitations	• Requires access to ESWL equipment • Fragments may still require multiple ERCP sessions • Less effective for small or residual stones	• Requires pancreatoscopy expertise and equipment • Technically more demanding • May be limited by duct anatomy or tight strictures • Typically less effective for very large/impacted stones as initial therapy
Complications	Usually low, mild abdominal pain, transient pancreatitis	Similar to ERCP risks (pancreatitis, bleeding, duct injury)
Role in practice	First-line for large/impacted stones, often combined with ERCP	Adjunct or primary therapy for smaller stones or residual fragments, often complementary to ESWL

ESWL and pancreatoscopy with EHL are complementary techniques.

ESWL is preferred for large/impacted stones, while pancreatoscopy with EHL allows direct, targeted fragmentation and removal, particularly for smaller stones or residual fragments.

Based on AGA Guidelines
for the Management of
Pancreatic Duct Stones

Limitations of Traditional Pancreatосcopy



- Hard calcified stones are difficult for EHL
- Difficult to navigate tortuous pancreatic duct specifically at genu
- Often requires numerous procedures

New Technology

Table 1. Comparison of contemporary digital cholangioscopy platforms

Technical specifications of currently available digital single-operator cholangioscopy systems. Specifications are based on manufacturer-reported data.



Characteristic	Dragonfly™	SpyGlass™ DS II	eyeMAX™ 1.2	eyeMAX™ 2.0
Outer diameter, mm	3.5	3.5	3.2	3.9
Working length, mm	1760	2140	2200	2200
Working channel diameter, mm	1.7	1.2	1.2	2.0
Up/down angulation	90°	90°	90°	90°
Right/left angulation	Full shaft rotation	90°	90°	90°
Shaft flexibility*	Highly flexible	Improved maneuverability	Improved maneuverability	Improved maneuverability
Image resolution (K)	160	62.5	160	160
Biopsy forceps opening width, mm	6.0	4.1	3.0	4.5
Biopsy cup/jaw width, mm	1.5	1.0	1.0	1.6
Rotational biopsy forceps compatibility	Yes	No	No	No
Maximum lithotripsy probe compatibility, Fr	4.5	3†	3.0	4.5

Abbreviation: Fr, French size.

* Manufacturer-reported qualitative specification.

† Commercially supplied lithotripsy probe is 1.9 Fr despite a 3-Fr compatible channel.

Note: Objective technical specifications are shown where available; qualitative characteristics are reported according to manufacturer specifications.

Case Report

56 M who presents to ED for abdominal pain, nausea, and SOB



Case Report

If endoscopic therapy was not successful, what other options are available?

Panel:

- ▶ Role of ESWL?
- ▶ Role of Surgery?

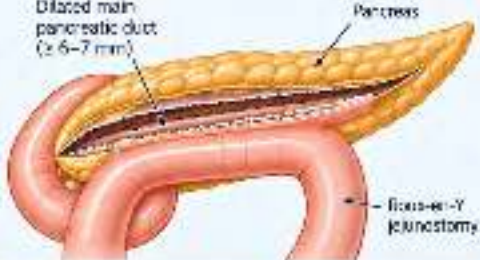
Types of Surgery

Major Surgical Procedures for Chronic Pancreatitis

Procedure selection is based on duct anatomy, location of disease, head enlargement, complications, and patient factors.

1. Longitudinal Pancreaticojejunostomy (Puestow Procedure)

Drainage procedure for a dilated main pancreatic duct



Indications

- Dominant main pancreatic duct dilatation (typically > 6–7 mm)
- Diffuse disease without a dominant inflammatory mass in the head
- Refractory pain despite medical/endoscopic therapy

Key features

- Longitudinal opening of the main duct along the body and tail
- Side-to-side anastomosis to a Roux-en-Y jejunal limb
- Relieves ductal hypertension and pain

Advantages

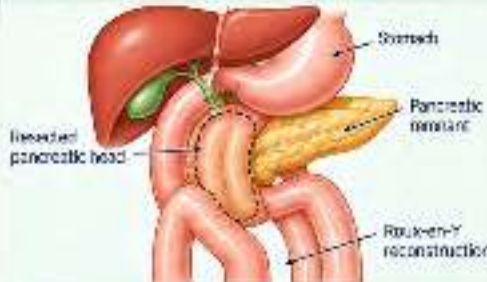
- Technically straightforward
- Preserves pancreatic parenchyma
- Effective pain relief in appropriately selected patients

Limitations

- Less effective if the duct is not dilated
- May not address an inflammatory mass in the head

2. Pancreaticoduodenectomy (Whipple Procedure)

Resection procedure for head-dominant disease



Indications

- Inflammatory mass in the pancreatic head
- Suspicion for malignancy (indeterminate mass)
- Disease confined primarily to the head
- Duodenal or biliary obstruction

Key features

- Resection of the pancreatic head, duodenum, distal bile duct, and sometimes distal stomach
- Reconstruction with pancreaticojejunostomy, hepaticojejunostomy, and gastrojejunostomy

Advantages

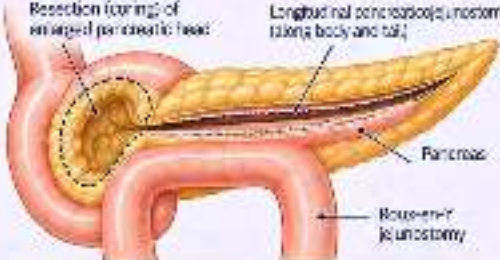
- Effective for head-dominant disease
- Addresses biliary and duodenal obstruction
- Provides definitive pathology (rules out cancer)
- Durable pain relief in appropriately selected patients

Limitations

- Major operation with higher morbidity
- Risk of endocrine and exocrine insufficiency

3. Frey Procedure

Local resection with longitudinal drainage



Indications

- Head-dominant disease with a dilated main pancreatic duct
- Diffuse disease with inflammatory mass in the head
- Refractory pain despite medical/endoscopic therapy

Key features

- Local resection (coring) of inflammatory pancreatic head tissue
- Longitudinal pancreaticojejunostomy to drain the duct (along the body and tail)
- Combines resection and drainage

Advantages

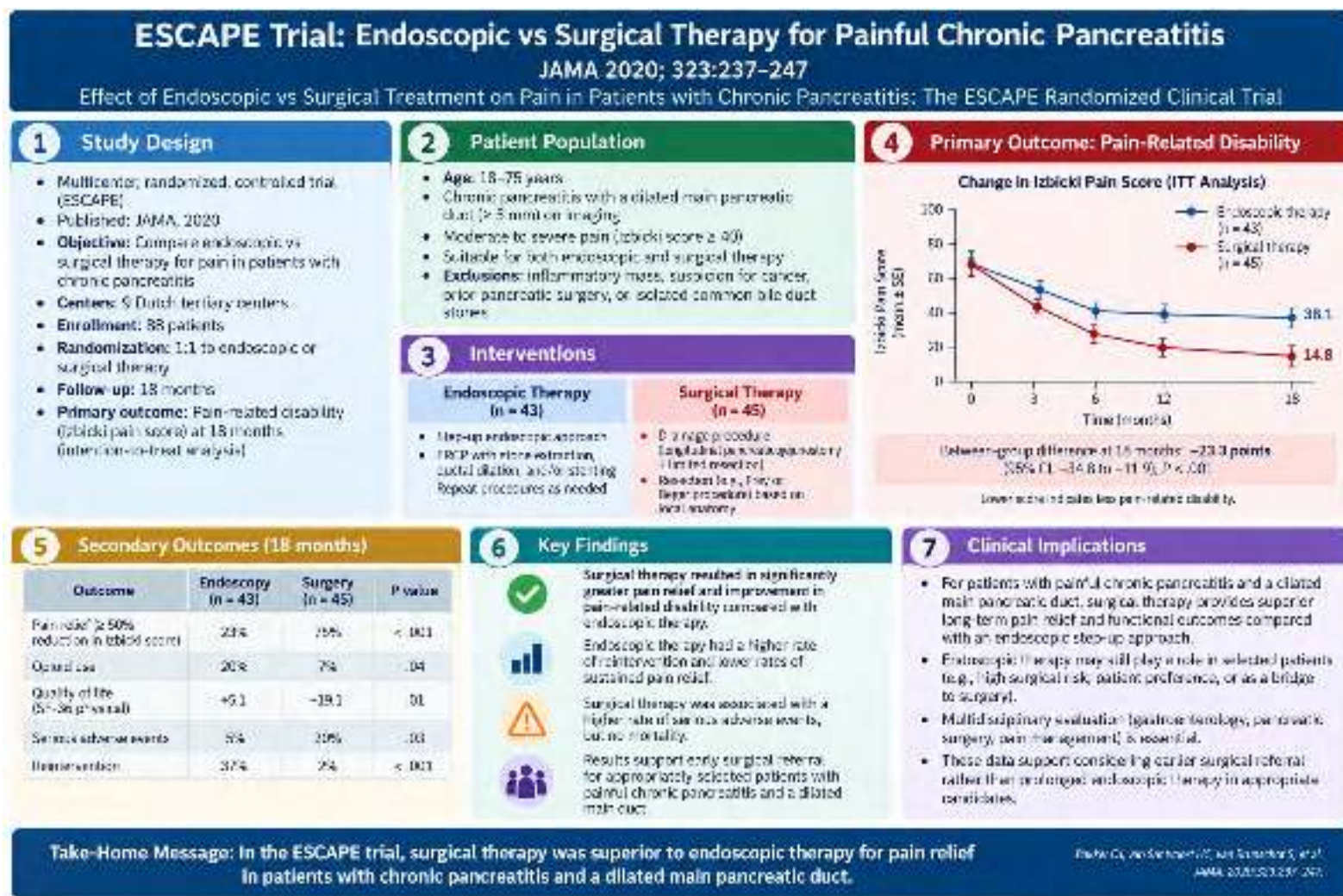
- Effective and durable pain relief
- Preserves duodenum and gastric function
- Lower risk of endocrine insufficiency compared with Whipple
- Useful for enlarged inflammatory head with ductal dilatation

Limitations

- Technically more complex than Puestow
- Not ideal if malignancy is strongly suspected

The goal of surgery in chronic pancreatitis is durable pain relief, improved quality of life, and management of complications, using the procedure best suited to the patient's anatomy and disease pattern.

Surgery-ESCAPE Trial



- Trial with older endoscopic technology
- If immediate symptoms can be solved with endoscopy, then Ok to proceed

Case Report

Our patient is discharged home and doing better but complaining of a chronic pain different from the acute pain in follow up. Imaging shows no obstructive lesions

Panel:

- ▶ How to proceed with pain management and medical management?

Chronic Pancreatitis : Etiology

Etiological Factors

Acinar Injury &
Protein Plug Formation

Sentinel
Inflammation Event

Cytokine Release
(TGF- β 1, PDGF)

PSC Activation &
Collagen Synthesis

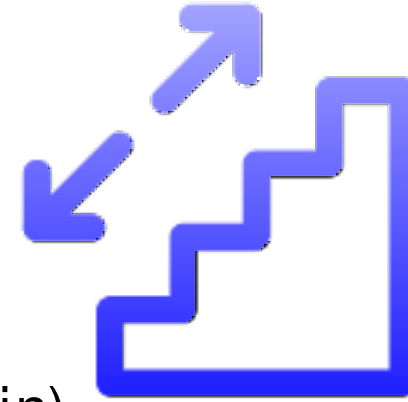
Ductal Obstruction &
Increased Pressure

Irreversible
Parenchymal Fibrosis

Chronic Pancreatitis Pain

First Line Therapies: Pharmacotherapy (4 A's)

- Analgesics
 - NSAIDs + Acetaminophen → opioids
- Adjunctive Agents
 - SSRIs, SNRIs, TCA, Gabapentinoids (pregabalin)
- Antioxidants/ Others
 - Vitamin E, C, Beta-carotene, Selenium, Methionine
- A Pancreatic Enzyme Replacement
 - Likely related to abdominal cramping



Diagnosing EPI

Evaluating for Pancreatic Exocrine Insufficiency (PEI)

Fecal Elastase-1 (FE-1): Interpretation and Clinical Approach

1 When to Check Fecal Elastase

- Symptoms suggestive of PEI**
 - Chronic diarrhea or steatorrhea
 - Weight loss
 - Bloating, excessive flatulence
 - Fat-soluble vitamin deficiency (A, D, E, K)
- Conditions associated with PEI**
 - Chronic pancreatitis (any etiology)
 - Pancreatic cancer
 - Post-pancreatectomy
 - Cystic fibrosis
 - Diabetes (type 3c)
 - Other pancreatic disorders

2 How to Test



Stool sample
(formed or semi-formed)

- Order: Fecal elastase-1 (FE-1)
- Single random stool sample (no special diet or pancreatic enzyme withdrawal needed)
- Use a solid or semi-solid stool (watery stools can give falsely low results)

3 Interpretation of Fecal Elastase-1

Fecal Elastase-1 (µg/g stool)	Interpretation	Likelihood of PEI and Recommended Action
> 200	Normal	PEI unlikely Consider alternative cause of symptoms
100 – 200	Borderline (or indeterminate)	Possible mild PEI Interpret in clinical context Consider repeat testing and/or trial of pancreatic enzyme replacement therapy (PERT) if high suspicion
< 100	Consistent with PEI	High likelihood of PEI Start pancreatic enzyme replacement therapy (PERT) Assess and monitor response

4 Clinical Approach

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graph TD
    A[Patient with symptoms or risk factors for PEI] --> B[Check fecal elastase-1]
    B --> C[> 200 Normal]
    B --> D[100 – 200 Borderline]
    B --> E[< 100 Consistent with PEI]
    C --> F[PEI unlikely  
Evaluate for other causes]
    D --> G[Consider repeat test  
(in non-watery stool)  
Consider trial of PERT  
if high clinical suspicion]
    E --> H[Start PERT  
Assess clinical response  
Consider nutritional assessment]
    
```

5 Important Considerations

-  Watery stools can give falsely low FE-1 results (if result is < 200 µg/g in a watery sample, repeat with a formed stool)
-  Pancreatic enzyme therapy does not need to be stopped before testing
-  FE-1 primarily detects moderate-to-severe PEI and may be less sensitive for mild disease
-  FE-1 can be low in other conditions (e.g., celiac disease, IBD, diabetes, small bowel disease). Interpret in clinical context
-  If clinical suspicion remains high despite a normal result, consider repeat testing, direct function tests (e.g., 72-hour fecal fat), or an empiric trial of PERT

6 Key Takeaways

- ✓ Fecal Elastase-1 is a simple, noninvasive test to evaluate for pancreatic exocrine insufficiency
- ✓ > 200 µg/g: PEI unlikely
- ✓ 100–200 µg/g: indeterminate — interpret in clinical context, consider repeat testing
- ✓ < 100 µg/g: consistent with PEI — start PERT
- ✓ Ensure formed or semi-formed stool sample to avoid false low results
- ✓ Use results in conjunction with clinical features, nutritional status, and response to therapy



Fecal elastase-1 is the most widely used noninvasive test for pancreatic exocrine insufficiency in clinical practice

Pancreatic Enzyme Replacement Therapy (PERT) Dosing

Practical guide for adults with exocrine pancreatic insufficiency (EPI)

1. INITIAL DOSING

Start with weight-based or standard dosing



Adults

25,000–50,000 units of lipase with each meal
10,000–25,000 units with snacks



Weight-based option

500–2,500 units of lipase/kg/meal
(commonly ~1,000 units/kg/meal)
Half the meal dose for snacks

2. TITRATION / ADJUSTMENT

Based on symptoms, stool quality, and nutrition



If symptoms persist

Increase by 10,000–25,000 units of lipase per meal



Continue to titrate

until symptomatic improvement
(less steatorrhea, bloating, diarrhea)



Most patients require

50,000–75,000 units per meal
(and 25,000–50,000 with snacks)

3. MAXIMUM DOSING

Do not exceed recommended limits



Usual maximum

2,500 units of lipase/kg/meal
or **10,000 units/kg/day**

Absolute maximum (FDA)

Not to exceed 10,000 units/kg/day
(due to risk of fibrosing colonopathy,
primarily reported in children
with cystic fibrosis)

4. ADDITIONAL CONSIDERATIONS

Optimize delivery and assess response



Timing

- Take enzymes with the first bite of the meal
- Split dose during longer meals
- Take with snacks containing fat/protein



Administration

- Use acid suppression (PPI) in selected patients (e.g., poor response, gastric hyperacidity)
- Ensure adequate hydration
- Use enteric-coated, microsphere formulations (e.g., pancrelipase)



Assess Response

- Improvement in stool frequency, consistency, and fat content
- Weight stabilization or gain
- Improved fat-soluble vitamin levels (A, D, E, K)
- Monitor for nutritional deficiencies (e.g., vitamin D, calcium)



Practical Tips

- Adjust dose based on fat content of the meal (larger/higher fat meals may require higher doses)
- Consider dose increase if ongoing symptoms despite adherence
- Evaluate for other causes of symptoms (e.g., SIBO, bile acid diarrhea, celiac disease)

Key Point: Start with 25,000–50,000 units of lipase per meal, titrate to symptoms, and do not exceed 10,000 units/kg/day.

Dosing should be individualized based on clinical response, nutritional status, and meal composition.

Case Report

Patient maximized on Tylenol, pregabalin, antioxidant, and PERT.

Panel:

- ▶ Any other thoughts? Role of EUS-guided celiac block?

EUS Guided Celiac Plexus Block

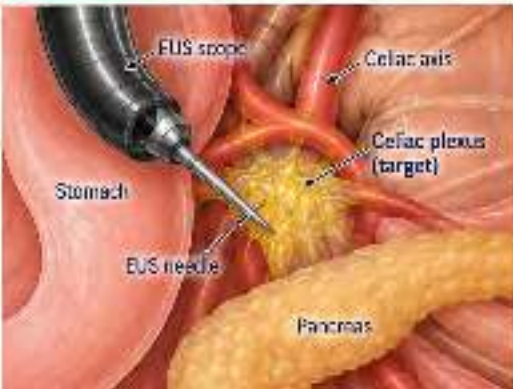
EUS-Guided Celiac Plexus Block for Pain in Chronic Pancreatitis

Technique, Steroid Injectate, and Evidence

1 Indication

- Chronic pancreatitis with persistent, debilitating abdominal pain despite optimal medical, endoscopic, or surgical therapy
- Part of a multidisciplinary pain management strategy

2 Technique (Transgastric Approach)



3 Injectate (Chronic Pancreatitis)

Steroid + Local Anesthetic (non-neurolytic)

- Common regimen:**
 - Triamcinolone 40–80 mg (or methylprednisolone 40–80 mg)
 - + Bupivacaine 0.25% (5–10 mL)
- Typically 10–20 mL total volume (divided bilaterally or unilateral)
- Steroid is used for chronic pancreatitis to reduce inflammation and pain
- Repeat injection can be considered if initial response and symptoms recur

4 Expected Benefits

- Pain relief in ~50–60% of patients
- Duration of benefit: median 2–3 months (range: weeks to several months)
- May reduce opioid requirements
- Can improve quality of life

5 Key Evidence in Chronic Pancreatitis

Study (Year)	Design / N	Injectate	Key Results	Duration of Relief
Wiersema et al. (1997)	Prospective (n = 12)	Steroid + local anesthetic	75% pain improvement	Median 10 weeks
Gress et al. (2001)	Prospective (n = 15)	Steroid + local anesthetic	60–80% pain relief	Median 3 months
Aabakken et al. (2004)	Prospective (n = 20)	Steroid + local anesthetic	60% pain improvement	Median 3 months
Ahmed et al. (2021) (meta-analysis)	Systematic review (21 studies)	Steroid-based CPB	Pooled response rate ~55% (95% CI 49–63%)	Median 2–3 months

6 Safety

- Generally well tolerated
- Most common adverse events: transient hypotension (5–20%), diarrhea (5–10%), transient abdominal pain
- Serious complications are rare (e.g., bleeding, infection, organ ischemia) (< 1%)

7 Key Takeaway

EUS-guided celiac plexus block with steroid and local anesthetic can provide short- to intermediate-term pain relief in ~50–60% of patients with chronic pancreatitis and is a safe adjunct in a comprehensive pain management plan.

Take Home Points

1. Pain management is challenging and usually requires multimodal approach
2. Endoscopic Celiac plexus block is a effective pain management modality
3. Surgery should be considered early for patients with dilated ducts
4. Endoscopic intervention depends on patient presenting factors (duct, stone, pancreas)
5. Advancement in endoscopic pancreatoscopy technology may allow increase efficacy in endoscopic management