ESTABLISHMENT BRANCH-I
PHONE No. 0172-2755538, 2755521

Postgraduate Institute of Medical Education and Research, Chandigarh
Institutional Ethics Committee (Intramural)

No: INT/IEC/2025/SPL-1146 Date: 17/10/2025

Dr. Saurabh Kumar Singh,
Dept. of Gastroenterology,
PGIMER, Chandigarh.

Title: - Nasojejunal feeding vs oral feeding following endoscopic drainage of walled off pancreatic necrosis: a randomized controlled pilot study.

Chief Guide: - Dr. Surinder Singh Rana

Reference No: - IEC-INT/2025/DM-3119

Dear Dr. Singh,

Your above-mentioned protocol was discussed in the meeting of the Institute Ethics Committee (Intramural) PGIMER, Chandigarh held on 30st September 2025.

The submitted version of the protocol has been **approved** from ethical angle subject to the following conditions:

- The approval is valid for the period of the conduct of the study as per the submitted protocol under the responsibility of Dr. Saurabh Kumar Singh.
- It is understood that the study will be conducted strictly as per the submitted protocol. If at any stage, any significant changes are required in the study plan, these should be submitted, along with a revised protocol, to the Institute Ethics Committee (Intramural) for re-approval, before implementation.
- Any adverse reaction or condition noted during the study period should be reported to the Institute Ethics Committee immediately.
- It is hereby confirmed that neither you nor any of the study team members participated in the decision-making process of the committee.
- Please ensure CTRI registration as per applicability.

For all future correspondence with respect to your protocol, please attach a photocopy of this letter.

(Dr. Suresh Kumar)
Convener, Instt. Ethics Committee (Intramural),
PGIMER, Chandigarh.

Copy forwarded for information to:

- Dr. Surinder Singh Rana (Chief Guide), Dept. of Gastroenterology, PGIMER, Chandigarh.
- Training Branch, PGIMER, Chandigarh

THESIS PROTOCOL

NASOJEJUNAL FEEDING VS. ORAL FEEDING FOLLOWING ENDOSCOPIC DRAINAGE OF WALLED OFF PANCREATIC NECROSIS: A RANDOMIZED CONTROLLED PILOT STUDY

PROTOCOL

Submitted in partial fulfilment of the requirement for the degree of DM (Gastroenterology)
Post Graduate Institute of Medical Education and Research,
Chandigarh, India

June 2025 Dr SAURABH KUMAR SINGH

CHIEF GUIDE

DR. SURINDER SINGH RANA
Professor
Department of Gastroenterology
PGIMER, Chandigarh

CO-GUIDES

Dr. Rajesh Gupta
Professor & Head,
Department of GI Surgery, HPB, Liver Transplantation

Dr. Mandeep Kang
Professor
Department of Radiodiagnosis
PGIMER, Chandigarh

Dr. Vikas Gautam
Professor
Department of Microbiology
PGIMER, Chandigarh

Dr. Nancy Sahni
Head
Department of Dietetics
PGIMER, Chandigarh

Dr. Jimil Shah
Associate Professor
Department of Gastroenterology
PGIMER, Chandigarh

Dr. Kamal Kishore
Associate Professor
Department of Biostatistics
PGIMER, Chandigarh

Dr. Pankaj Gupta
Associate Professor
Department of Radiodiagnosis
PGIMER, Chandigarh

Dr. Vaneet Jearth
Assistant Professor
Department of Gastroenterology
PGIMER, Chandigarh

Introduction:

Acute pancreatitis is one of most common acute gastrointestinal diseases requiring hospital admissions [1]. Acute pancreatitis is an inflammatory process which causes systemic and local inflammation. The spectrum of acute pancreatitis can range from interstitial pancreatitis (AIP) to necrotizing pancreatitis (ANP). AIP usually have a milder course but around 20% of patients develop ANP in whom there is an increased incidence of early organ failure (38%), need for intervention (38%) and death (15%) [2].

In ANP, necrosis most commonly involves both the pancreatic parenchyma and the peripancreatic tissues (75–80% of cases). In about 20% of patients, necrosis is limited to the peripancreatic tissues alone, while isolated pancreatic parenchymal necrosis without peripancreatic involvement is relatively rare, occurring in less than 5% of cases [3].

Revised Atlanta symposium best classifies the local complications of acute pancreatitis (AP)

Walled off necrosis (WON) usually develops 4 weeks following ANP.WON contains encapsulated partially liquified (peri)pancreatic necrotic tissue [4].

Most of the acute (peri)pancreatic fluid collections (PFC) resolve spontaneously with conservative management [5]. However, about 25% of patients with acute necrotic collections (ANC) and nearly 50% of those with walled-off necrosis (WON) eventually require intervention [6,7].

The management of PFC and WON had a paradigm shift over the last three decades. Open necrosectomy was considered standard of care [8] until 1991 when Bradley and Allen demonstrated that conservative management is associated with better outcomes compared to surgical intervention in patients with acute sterile necrotising pancreatitis in the absence of infection [9].Historically, open surgical necrosectomy was the standard approach for managing infected necrotising pancreatitis and symptomatic sterile peripancreatic fluid collections (PFCs). However, this approach is associated with substantial perioperative stress, collateral tissue injury, and long-term complications, including pancreatico-cutaneous fistulas, exocrine and endocrine insufficiency, and incisional hernias[10-12].

Subsequently, the step-up approach beginning with percutaneous drainage followed by video-assisted retroperitoneal debridement when necessary—emerged as the preferred management strategy, as established by the landmark PANTER trial [13].

Simultaneously there was emergence of endoscopic particularly endoscopic ultrasound (EUS) guided procedures. Multiple series from centres across Europe and the United States have

validated the efficacy of endoscopic transluminal necrosectomy [14,15]. Furthermore, a pilot multicentre randomized controlled trial involving 22 patients suggested that endoscopic transluminal necrosectomy may offer advantages over surgical necrosectomy, particularly with respect to reducing the risk of new-onset multiple organ failure and overall complication rates[16].

Subsequently, EUS-guided drainage and necrosectomy have been widely adopted as the standard and first line treatment for WON in most patients [17].

Nutritional support is important in management of severe acute and necrotizing pancreatitis.

Multiple randomized controlled trials and meta-analyses have demonstrated that enteral nutrition is superior to parenteral nutrition in reducing infections, surgical intervention rates, and mortality in patients with acute pancreatitis[18,19].These infections are thought to be mediated by bacterial translocation from the gut due to disturbed bacterial overgrowth and increased mucosal permeability. However, the timings to initiate enteral feeding is not clear.

Nonrandomized studies in acute pancreatitis have shown that initiating naso-enteric tube feeding within 48 hours of admission, as opposed to later initiation, is associated with a significant reduction in major infectious complications and, in some studies, a decrease in mortality [20-22].Based on these studies the European guidelines recommend early initiation of enteral feeding within 24-72 hours[23].

However, there are no studies to guide the feeding strategies in patients with pancreatic fluid collections undergoing endoscopic transluminal drainage with LAMS and Endoscopic necrosectomy.

Hence, we have designed an RCT to suggest feeding strategies in patients undergoing EUS-guided cystogastrostomy (EUS-CG) in WON.

Review of Literature

Gut dysfunction in Acute pancreatitis (AP)

The gastrointestinal tract has traditionally been viewed as an innocent bystander in critical illness, sustaining collateral damage. Reflex splanchnic vasoconstriction, aimed at preserving perfusion of vital organs, leads to ischemic injury, while subsequent resuscitation may exacerbate damage through reperfusion injury[24].One of the key pathological events following intestinal injury is the disruption of the epithelial barrier, leading to increased permeability. This breakdown permits the translocation of luminal bacteria and endotoxins into the portal venous system and mesenteric lymphatics, potentially triggering systemic inflammatory responses[25]. Gut barrier dysfunction in acute pancreatitis facilitates bacterial

translocation from the intestinal lumen into the systemic circulation, thereby playing a critical role in the development of secondary infections. This microbial translocation contributes to systemic inflammatory responses, increasing the risk of sepsis, multiorgan failure, and ultimately, mortality[26]. Studies have shown that the microorganisms implicated in sepsis and pancreatic infections in acute pancreatitis are predominantly of enteric origin [24,27]. On index endoscopy, the most commonly identified organisms were Enterococci (45%), followed by Enterobacteriaceae (42%) and fungi (22%) [28,29].

Nutrition in acute pancreatitis (AP)

Nutritional management in AP is an important aspect in treatment of AP.

1. **Malnutrition in AP and its impact on outcome**

   Patients with acute pancreatitis are in hypercatabolic state and are at nutritionally high risk especially those with moderately severe or severe disease. The persistent acute inflammatory response leads to enhanced protein catabolism, third-space fluid shifts, and increased oxygen extraction from the bloodstream, thereby compromising the perfusion of vital organs. Additionally, impaired gut barrier function or infected pancreatic necrosis—resulting from enzymatic leakage—may further progress to sepsis[23]. One study showed that malnutrition in acute pancreatitis is associated with higher rates of death, sepsis, severe sepsis, septic shock, and respiratory failure [46].

   Moreover, poor nutritional status is linked to adverse post-discharge outcomes, including increased dependence in activities of daily living, greater likelihood of requiring nursing home care, and higher mortality within one year following hospital discharge [47].

2. **Enteral feed versus TPN:**

   Enteral nutrition helps maintain gut mucosal integrity, promotes intestinal motility, prevents bacterial overgrowth, and enhances splanchnic blood flow [30]. Multiple randomized controlled trials, systematic reviews, and meta-analyses have consistently shown that enteral nutrition is safe and well-tolerated in patients with severe acute pancreatitis, leading to significant improvements in clinical outcomes such as reduced infectious and gastrointestinal complications, lower risk of tracheal aspiration, less pain exacerbation, earlier achievement of energy balance, decreased need for surgery, shorter hospital stays, reduced incidence of multi-organ failure, and lower mortality [31]. A recent meta-analysis by Wu et al., including 11 randomized controlled trials

and 562 patients with severe acute pancreatitis, compared the efficacy of enteral nutrition (EN) versus parenteral nutrition (PN). The study demonstrated that EN significantly reduced the relative risk of mortality (RR = 0.43; $P = 0.006$), infections and complications (RR = 0.53; $P< 0.001$), and was associated with a lower need for surgical intervention and a shorter duration of hospitalization compared to PN. No significant difference in the incidence of multiple organ failure (MOF) was observed between the EN and PN groups (RR = 0.63; $P = 0.059$) [32]. Enteral nutrition may prevent infection of pancreatic necrosis in patients with severe acute pancreatitis [33,34]. A Cochrane meta-analysis of eight randomized controlled trials concluded that, compared to parenteral nutrition, enteral nutrition significantly reduced mortality, systemic infections, and the incidence of multiorgan failure in patients with acute pancreatitis [19]. However, several randomized trials have linked total parenteral nutrition (TPN) with an increased risk of infections and other complications. Therefore, PN should be used cautiously and only when enteral nutrition is not feasible, not tolerated, or insufficient to meet caloric needs [35].

3. Limitations of oral feeding in ANP and WON patients:

Oral feeding intolerance (OFI) is a well-recognized clinical complication in the management of acute pancreatitis (AP). It is defined by the recurrence of gastrointestinal symptoms—including abdominal pain, nausea, and vomiting on reintroduction of oral nutrition. OFI is frequently associated with biochemical derangements and increased analgesic requirements during hospitalization. Several previous studies have demonstrated that patients with oral feeding intolerance (OFI) experience a significantly prolonged length of hospitalization (LOH), with hospital stays averaging 5 to 35 days longer compared to those without OFI [36]. An international prospective cohort study conducted to evaluate the incidence, clinical predictors, and outcomes of oral feeding intolerance (OFI) in patients with acute pancreatitis (AP) reported that OFI developed in 13% of the study population [37]. Bevan et al. reported an overall incidence of OFI at 16% in a meta-analysis including centres from multiple continents [36].

The same meta-analysis identified the risk factors for OFI which includes peripancreatic fluid collection (PFC). The patient with peripancreatic fluid collection are at risk of OFI 3.5 times more than those without them. These symptoms may be attributed to the mass effect of the fluid collection, which can exert compressive pressure on the stomach, duodenum, and

jejunum, leading to early satiety, vomiting, abdominal pain, and bloating. Other risk factors are pleural effusion and higher Balthazar and Ransom score [36].

4. How to improve enteral nutrition role of NJ feeds

Three randomized controlled trials comparing nasojejunal and nasogastric feeding routes in patients with severe acute pancreatitis found no significant differences in terms of feeding tolerance, complication rates, or mortality [38-40]. Four meta-analyses [41–44] have concluded that nasogastric tube feeding is a feasible, safe, and well-tolerated approach in patients with severe acute pancreatitis. Compared to nasojejunal feeding, it does not lead to higher rates of complications, mortality, recurrence of refeeding pain, or extended hospital stay. Unfortunately, to date, there have been no published studies specifically addressing the topic of nutritional support in patients with pancreatic collections treated using minimally invasive approaches. In a large Dutch trial demonstrating the superiority of the endoscopic approach over the surgical step-up strategy [84], specific data on nutritional support were not reported. However, all patients were provided with oral nutrition when tolerated. In cases of oral intolerance, enteral nutrition was delivered via a nasojejunal feeding tube, and parenteral nutrition was administered when enteral nutrition was contraindicated [45].

Aims and Objectives:

Aim:

To compare outcomes of Nasojejunal feeding vs oral feeding following endoscopic transluminal drainage in patients with symptomatic walled-off necrosis

Primary Objectives:

1. To compare the rate of nutritional failure at Day 14 between Nasojejunal and oral feeding post endoscopic transmural drainage of WON.

Secondary Objectives:

1. To compare infection rates, need for antibiotic escalation and new onset organ failure
2. To compare re-intervention needs and hospital stay duration
3. To compare patient weight, serum albumin and inflammatory markers (CRP)
4. To compare GI complications (Vomiting, diarrhoea, aspiration pneumonia, feeding intolerance)
5. To compare patient reported outcomes (appetite, pain ,quality of life)

Materials and Methods:

Study design

The study will be a prospective, open label, single centre, randomized controlled trial. It will be conducted in the Department of Gastroenterology, PGIMER, from July 2025 to December 2026

Study Population:

All patients presented to PGIMER with WON due to acute pancreatitis requiring EUS guided transluminal drainage will be screened for inclusion criteria.

Inclusion criteria

1. Patients of acute pancreatitis (AP) with 18-75 years of age
2. Patients with symptomatic WON requiring EUS guided transluminal drainage
3. Provision of written informed consent

Exclusion criteria

1. Patients with collection not amenable for EUS guided drainage (distance of WON >1 cm from the gastrointestinal lumen)
2. Known malignancy or immunocompromised state
3. Previous upper gastrointestinal(GI) surgery interfering with absorption
4. Active GI bleeding
5. GI obstruction, ileus or persistent vomiting
6. Patients moribund to undergo endoscopic procedure (Glasgow coma scale <8 or patients on ventilatory support)
7. Patients with irreversible coagulopathy like platelets <50,000/mm3 and/or INR>1.5
8. Pregnant or lactating female

WON: WON will be defined as a mature, encapsulated collection of pancreatic and/or peripancreatic necrosis that has developed a well-defined inflammatory wall. [3]

Symptomatic WON: It will be defined by any of the following: 1) Infected WON, or 2) Presence of pressure symptoms like abdominal pain, early satiety, weight loss or biliary duct compression or 3) persistent pain abdomen

Infected WON: It will be defined by any of the following: 1) As evident on by a positive Gram's stain or culture from a fine-needle aspiration or 2) the presence of gas configurations within collection on contrast-enhanced computed tomography (CT) or 3) clinical signs of infection; defined as persistent organ failure or persistence of two inflammatory variables (temperature >38.5°C or elevated C-reactive protein levels or leukocyte counts) during 3 consecutive days.

SIRS: Presence of ≥ 2 out of the following parameters: Temperature < 36C or >38C, Total leukocyte count < 4000/mm3or >12000/mm3, Respiratory rate > 20/min or PaCO2 of < 32mmHg, Heart rate > 90/minute [41]

Organ failure- It will be defined as per modified Marshall criteria [4]

Technical success: Successful placement of metal stent with EUS guided transluminal drainage.

Clinical success: Post endoscopic treatment collection size ≤ 3 cm on any cross-sectional imaging before removal of metal stent along with resolution of initial symptoms requiring drainage.

Randomization: Patients needing EUS guided drainage with LAMS for symptomatic WON will be randomized once they fulfil inclusion criteria. Computer generated randomization assignments will be provided in advance using block randomisation and placed in sequentially numbered sealed envelopes. They will be opened during the procedure to determine treatment allocation.

Study flow:

Patients of AP with infected WON who are planned for EUS guided transluminal drainage by LAMS will be screened for inclusion criteria. Patients who fulfilled inclusion criteria will be randomized into either Nasojejunal (NJ) feeding or oral feeding after informed consent.

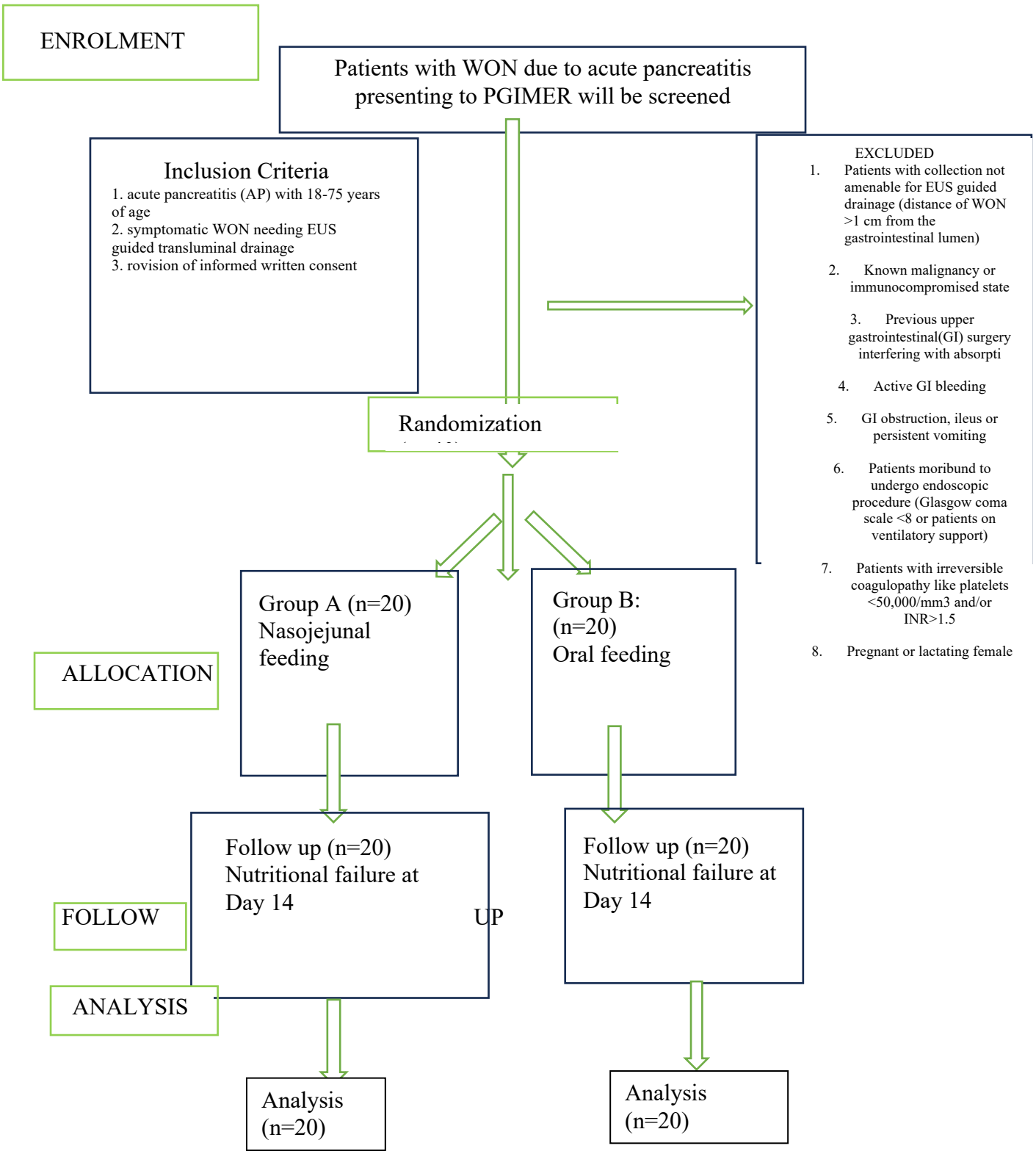
Sample size:

Since it is a pilot study and in a year the unit treats approximately 80-100 patients with WON and therefore considering exclusions a feasibility sample size of 20 in each arm will be taken.

Techniques:

Initial diagnostic EUS:

EUS examination will be done under conscious sedation using intravenous midazolam. Linear scanning echoendoscope (EG-3870 UTK linear echoendoscope, Pentax Inc., Tokyo, Japan or


ENROLMENT
Patients with WON due to acute pancreatitis presenting to PGIMER will be screened
Inclusion Criteria
1. acute pancreatitis (AP) with 18-75 years of age
2. symptomatic WON needing EUS guided transluminal drainage
3. rovision of informed written consent
EXCLUDED
1. Patients with collection not amenable for EUS guided drainage (distance of WON >1 cm from the gastrointestinal lumen)
2. Known malignancy or immunocompromised state
3. Previous upper gastrointestinal(GI) surgery interfering with absorpti
4. Active GI bleeding
5. GI obstruction, ileus or persistent vomiting
6. Patients moribund to undergo endoscopic procedure (Glasgow coma scale <8 or patients on ventilatory support)
7. Patients with irreversible coagulopathy like platelets <50,000/mm3 and/or INR>1.5
8. Pregnant or lactating female
Randomization
ALLOCATION
Group A (n=20) Nasojejunal feeding
Group B: (n=20) Oral feeding
FOLLOW UP
Follow up (n=20) Nutritional failure at Day 14
Follow up (n=20) Nutritional failure at Day 14
ANALYSIS
Analysis (n=20)
Analysis (n=20)

UCT180 linear echoendoscope, Olympus Optical Co Ltd, Tokyo, Japan) will be used at a frequency of 7.5 MHz. The WON and surrounding areas will be first carefully scanned on EUS with special emphasis on size as well as detailed morphology of WON. Colour Doppler will be used to detect any intervening vascular collaterals.

Quantification of solid necrotic debris on EUS:

The echogenic material present in the WON is suggestive of solid necrotic debris. An attempt to quantify the amount of solid debris as percentage of total size of collection will be done. The quantification of the solid debris will be an approximate visual judgment of the endoscopist.

Randomization:

A. Nasojejunal (NJ) feeding group:

- Patients randomized to this group will have NJ placement within 24 hours post-drainage.
- NJ will be placed endoscopically
- NJ position will be confirmed by Abdominal X-ray (AXR)
- Standard formula feed will be initiated immediately after placing and confirming the NJ position with a rate of
    - First 24 hours : 25 ml/hr
    - Between 24-48 hours : 50 ml/hr
    - Between 48-72 hours: increase to full nutrition
    - After 72 hours: Full nutrition
- Full nutrition is defined as an energy target of 30kcal/kg/day

.

B. Oral feeding group:

- Patients randomized to this group will initiated on oral feed post procedure as tolerated.
- Patient will be started on oral liquid then on soft diet. Escalation will be guided based on feed tolerance. Oral diet will be supplemented with parenteral nutrition if caloric intake is <60% of target calorie at Day 5.

Nutritional failure at Day 14:

Definition:

- <75% calorie requirements are met
- Need for parenteral nutrition
- Severe GI intolerance requiring feed modification

Infectious complications:

The patient should have signs of bacterial infections/fungal infections i.e. body temperature $>100^0$ F and raised leukocytes, CRP, Procalcitonin, beta-D glucan and galactomannan.

Infection	Definition
Infected pancreatic necrosis	Positive culture after first percutaneous drainage procedure of collection with (peri-) pancreatic necrosis
Bacteremia	Positive blood culture Positive culture in 1 blood culture. In case of coagulase negative staphylococci or other non-virulent micro-organisms at least 2 blood culture bottles are mandatory.
Pneumonia	Coughing, dyspnoea, radiography with infiltrative abnormalities and positive culture in sputum. On the intensive care unit, a positive endotracheal culture is mandatory
Sepsis	SIRS and positive blood culture

Statistical analysis:

All patients after randomization will be evaluated for primary and secondary endpoints. Data will be explored for any outliers, errors and missing values. When data will be normally distributed, continuous variables will be compared using Student's t-test. For skewed data, Mann-whitney test will be used. Quantitative data will be described as median with range and mean with standard deviation. Categorial data will be shown as proportions. Multiple linear regression analysis will be performed to identify risk factors for requirement of additional intervention after initial drainage procedure. 95% confidence interval will be taken as a cut-off for significance. Intention to treat and per-protocol analysis will be performed. The analysis was performed using Statistical Packages for the Social Sciences (SPSS Inc, Chicago, IL, version 22.0 for windows).

1. Yadav D, Lowenfels AB. The epidemiology of pancreatitis and pancreatic cancer. Gastroenterology. 2013 Jun;144(6):1252–61

2. van Santvoort HC, Bakker OJ, Bollen TL, Besselink MG, Ahmed Ali U, Schrijver AM, Boermeester MA, van Goor H, Dejong CH, van Eijck CH, van Ramshorst B, Schaapherder AF, van der Harst E, Hofker S, Nieuwenhuijs VB, Brink MA, Kruyt PM, Manusama ER, van der Schelling GP, Karsten T, Hesselink EJ, van Laarhoven CJ, Rosman C, Bosscha K, de Wit RJ, Houdijk AP, Cuesta MA, Wahab PJ, Gooszen HG; Dutch Pancreatitis Study Group. A conservative and minimally invasive approach to necrotizing pancreatitis improves outcome. Gastroenterology. 2011 Oct;141(4):1254-63. doi: 10.1053/j.gastro.2011.06.073. Epub 2011 Jul 8. PMID: 21741922.

3. Wang M, Wei A, Guo Q et al. Clinical outcomes of combined necrotizing pancreatitis versus extrapancreatic necrosis alone. Pancreatology 2016; 16: 57– 65.

4. Banks PA, Bollen TL, Dervenis C et al. Classification of acute pancreatitis-2012: revision of the Atlanta classification and definitions by international consensus. Gut 2013; 62: 102–111.

5. Lenhart DK, Balthazar EJ. MDCT of Acute Mild (Nonnecrotizing) Pancreatitis: abdominal complications and fate of fluid collections. AJR Am J Roentgenol. 2008;190:643–9. https://www.ajronline.org/doi/10.2214/AJR.07.2761.

6. Cui ML, Kim KH, Kim HG, et al. Incidence, risk factors and clinical course of pancreatic fluid collections in acute pancreatitis. Dig Dis Sci. 2014;59:1055–62. http://link.springer.com/doi.org/10.1007/s10620-013-2967-4.

7. Sarathi Patra P, Das K, Bhattacharyya A, et al. Natural resolution or intervention for fluid collections in acute severe pancreatitis. Br J Surg. 2014;101:1721–8. https://academic.oup.com/bjs/article/101/13/1721-1728/6138067.

8. Kivilaakso E, Lempinen M, Mäkeläinen A, Nikki P, Schröder T. Pancreatic resection versus peritoneal lavation for acute fulminant pancreatitis. Ann Surg. 1984;199:426–31. http://journals.lww.com/00000658-198404000-00009.

9. Bradley EL, Allen K. A prospective longitudinal study of observation versus surgical intervention in the management of necrotizing pancreatitis. Am J Surg. 1991;161:19–25. https://linkinghub.elsevier.com/retrieve/pii/000296109190355H.

10. Freeman ML, Werner J, van Santvoort HC, et al. Interventions for necrotizing pancreatitis. Pancreas. 2012;41:1176–94. https://journals.lww.com/00006676-201211000-00004.

11. Werner J, Hartwig W, Hackert T, Büchler MW. Surgery in the treatment of acute pancreatitis — open pancreatic necrosectomy. Scand J Surg. 2005;94:130–4. http://journals.sagepub.com/doi.org/10.1177/145749690509400209.

12. Banks PA, Freeman ML. Practice guidelines in acute pancreatitis. Am J Gastroenterol. 2006;101:2379–400. https://journals.lww.com/00000434-200610000-00031.

13. van Santvoort HC, Besselink MG, Bakker OJ, Hofker HS, Boermeester MA, Dejong CH, van Goor H, Schaapherder AF, van Eijck CH, Bollen TL, van Ramshorst B, Nieuwenhuijs VB, Timmer R, Laméris JS, Kruyt PM, Manusama ER, van der Harst E, van der Schelling GP, Karsten T, Hesselink EJ, van Laarhoven CJ, Rosman C, Bosscha K, de Wit RJ, Houdijk AP, van Leeuwen MS, Buskens E, Gooszen HG; Dutch Pancreatitis Study Group. A step-up approach or open necrosectomy for necrotizing pancreatitis. N Engl J Med. 2010 Apr 22;362(16):1491-502. doi: 10.1056/NEJMoa0908821. PMID: 20410514.

14. Gardner TB, Coelho-Prabhu N, Gordon SR, Gelrud A, Maple JT, Papachristou GI, et al. Direct endoscopic necrosectomy for the treatment of walled-off pancreatic necrosis: results from a multicenter U.S. series. Gastrointest Endosc 2011;73:718e26.

15. Haghshenasskashani A, Laurence JM, Kwan V, Johnston E, Hollands MJ, Richardson AJ, et al. Endoscopic necrosectomy of pancreatic necrosis: a systematic review. Surg Endosc 2011;25:3724e30.

16. Bakker OJ, Van Santvoort HC, van BS, Geskus RB, Besselink MG, Bollen TL, et al. Endoscopic transgastric vs surgical necrosectomy for infected necrotizing pancreatitis: a randomized trial. JAMA 2012;307:1053e61.

17. Working Group IAP/APA Acute Pancreatitis Guidelines. IAP/APA evidence-based guidelines for the management of acute pancreatitis. Pancreatology. 2013 Jul-Aug;13(4 Suppl 2):e1-15. doi: 10.1016/j.pan.2013.07.063. PMID: 24054878.

18. Petrov MS, van Santvoort HC, Besselink MGH, et al. Enteral nutrition and the risk of mortality and infectious complications in patients with severe acute pancreatitis: a meta-analysis of randomized trials. Arch Surg 2008; 143:1111–1117.

19. Al-Omran M, Albalawi ZH, Tashkandi MF, et al. Enteral versus parenteral nutrition for acute pancreatitis. Cochrane Database Syst Rev 2010;1:CD002837.

20. Li, JY, Yu, T, Chen, GC, et al. Enteral nutrition within 48 hours of admission improves clinical outcomes of acute pancreatitis by reducing complications: a meta-analysis. PLoS One 2013;8:e64926-e64926.

21. Petrov, MS, Pylypchuk, RD, Uchugina, AF. A systematic review on the timing of artificial nutrition in acute pancreatitis. Br J Nutr 2009;101:787-793.

22. Wereszczynska-Siemiatkowska, U, Swidnicka-Siergiejko, A, Siemiatkowski, A, Dabrowski, A. Early enteral nutrition is superior to delayed enteral nutrition for the prevention of infected necrosis and mortality in acute pancreatitis. Pancreas 2013;42:640-646.

23. Arvanitakis M, Ockenga J, Bezmarevic M, Gianotti L, Krznarić Ž, Lobo DN, Löser C, Madl C, Meier R, Phillips M, Rasmussen HH, Van Hooft JE, Bischoff SC. ESPEN practical guideline on clinical nutrition in acute and chronic pancreatitis. Clin Nutr. 2024 Feb;43(2):395-412. doi:10.1016/j.clnu.2023.12.019. Epub 2023 Dec 27. PMID: 38169174.

24. Capurso G, Zerboni G, Signoretti M, Valente R, Stigliano S, Piciucchi M etal. Role of the gut barrier in acute pancreatitis. JClinGastroenterol2012; 46: S46–S51.

25. Fanous MY, Phillips AJ, Windsor JA. Mesenteric lymph: the bridge to future management of critical illness. JOP2007; 8: 374–399.

26. Liu H, Li W, Wang X, Li J, Yu W. Early gut mucosal dysfunction in patients with acute pancreatitis. Pancreas2008; 36: 192–196.

27. Ohland CL, MacNaughton WK. Probiotic bacteria and intestinal epithelial barrier function. AmJPhysiol2010; 298: G807–G819.
28. Negm, A.A., et al., Microbiologic analysis of peri-pancreatic fluid collected during EUS in patients with pancreatitis: impact on antibiotic therapy. Gastrointest Endosc, 2013. 78(2): p. 303-11.
29. Wurstle, S., et al., Changes in pathogen spectrum and antimicrobial resistance development in the time-course of acute necrotizing pancreatitis. J Gastroenterol Hepatol, 2019. 34(12): p. 2096-2103.

30. Wu LM, Sankaran SJ, Plank LD, Windsor JA, Petrov MS. Meta-analysis of gut barrier dysfunction in patients with acute pancreatitis. Br J Surg 2014;101: 1644e56.
31. Capurso G, Coluccio C, Rizzo GEM, Crinò SF, Cucchetti A, Facciorusso A, et al. The 1st i-EUS consensus on the management of pancreatic fluid collections – Part 2. Digestive and Liver Disease. 2024 Nov 1;56(11):1819–27.
32. Wu P, Li L, Sun W. Efficacy comparisons of enteral nutrition and parenteral nutrition in patients with severe acute pancreatitis: a meta-analysis from ran- domized controlled trials. Biosci Rep 2018;38(6).
33. Petrov MS, Whelan K. Comparison of complications attributable to enteral and parenteral nutrition in predicted severe acute pancreatitis: a systematic review and meta-analysis. Br J Nutr 2010;103(9):1287–95.
34. Li W, Liu J, Zhao S, et al. Safety and efficacy of total parenteral nutrition versus total enteral nutrition for patients with severe acute pancreatitis: a meta-anal- ysis. J Int Med Res 2018;46(9):3948–58.
35. Pan LL, Li J, Shamoon M, Bhatia M, Sun J. Recent Advances on Nutrition in Treatment of Acute Pancreatitis. Front Immunol. 2018 Apr 23;9:849. doi: 10.3389/fimmu.2018.00849.

36. Incidence and predictors of oral feeding intolerance in acute pancreatitis: A systematic review, meta-analysis, and meta-regression Bevan, Melody G. et al. Clinical Nutrition, Volume 36, Issue 3, 722 - 729.
37. Pothoulakis, I., Nawaz, H., Paragomi, P., Jeong, K., Talukdar, R., Kochhar, R., Goenka, M.K., Gulla, A., Singh, V.K., Gonzalez, J.A., Ferreira, M., Barbu, S.T., Stevens, T., Gutierrez, S.C., Zarnescu, N.O., Capurso, G., Easler, J., Triantafyllou, K., Pelaez-Luna, M., Thakkar, S., Ocampo, C., de-Madaria, E., Wu, B.U., Cote, G.A., Abebe, K., Tang, G., Lahooti, A., Phillips, A.E. and Papachristou, G.I. (2021), Incidence and risk factors of oral feeding intolerance in acute pancreatitis: Results from an international, multicenter, prospective cohort study. United European Gastroenterol J, 9: 54-62. https://doi.org/10.1177/2050640620957243.
38. Eatock FC, Chong P, Menezes N, Murray L, McKay CJ, Carter CR, et al. A randomized study of early nasogastric versus nasojejunal feeding in severe acute pancreatitis. Am J Gastroenterol 2005;100:432e9.

39. Kumar A, Singh N, Prakash S, Saraya A, Joshi YK. Early enteral nutrition in severe acute pancreatitis: a prospective randomized controlled trial comparing nasojejunal and nasogastric routes. J Clin Gastroenterol 2006;40: 431e4.
40. Singh N, Sharma B, Sharma M, Sachdev V, Bhardwaj P, Mani K, et al. Evaluation of early enteral feeding through nasogastric and nasojejunal tube in severe acute pancreatitis: a noninferiority randomized controlled trial. Pancreas 2012;41:153e9.
41. Nally DM, Kelly EG, Clarke M, Ridgway P. Nasogastric nutrition is ef cacious in severe acute pancreatitis: a systematic review and meta-analysis. Br J Nutr 2014;112:1769e78.

42. Petrov MS, Correia MI, Windsor JA. Nasogastric tube feeding in predicted severe acute pancreatitis. A systematic review of the literature to determine safety and tolerance. JOP 2008;9:440e8.
43. Chang YS, Fu HQ, Xiao YM, Liu JC. Nasogastric or nasojejunal feeding in predicted severe acute pancreatitis: a meta-analysis. Crit Care 2013;17:R118.

44. Zhu Y, Yin H, Zhang R, Ye X, Wei J. Nasogastric nutrition versus nasojejunal nutrition in patients with severe acute pancreatitis: a meta-analysis of randomized controlled trials. Gastroenterol Res Pract 2016;2016:6430632.

45. Van Brunschot S, van Grinsven J, van Santvoort HC, et al. Endoscopic or surgi- cal step-up approach for infected necrotising pancreatitis: a multicentre ran- domised trial. Lancet 2018;391(10115):51–8.

46. Le A, Shaikh A, Ali M, Khrais A, Abboud Y. Malnutrition Imparts Worse Outcomes in Patients Admitted for Acute Pancreatitis. Cureus. 2023 Mar 6;15(3):e35822. doi: 10.7759/cureus.35822. PMID: 37033570; PMCID: PMC10075145.

47. Malnutrition at hospital admission-contributors and effect on length of stay: a prospective cohort study from the Canadian malnutrition task force. Allard JP, Keller H, Jeejeebhoy KN, et al. JPEN J Parenter Enteral Nutr. 2016;40:487–497. doi: 10.1177/0148607114567902.

Thesis Proforma

Name: Age (years): Gender: (M/F)

CR No: Admission No: Phone number:

Date of Pain: Date of admission: Date of Discharge/Death:

Etiology: Severity: BMI:

Details Organ Failure:

Type of Organ failure	Date of Onset	Date of resolution	Maximum organ support
Acute lung injury			
Acute kidney injury			
CVS Failure			

Baseline reports at inclusion:

Date			
Hemoglobin		S.Ca/Po4	
TLC		Fasting TG	
Platelets		TC/LDL/HDL	
Urea/Creatinine		IgA tTG	
TB/DB		iPTH	
AST/ALT/ALP		HbA1c	
TP/Albumin		CRP	
APACHE II		Stool R/M	
BISAP Score		Vitamin D3	

Date				
Procalcitonin				
Beta-D Glucan				
Galactomannan				

Baseline Nutritional assessment:

Date	
Weight	
Height	
BMI	
Calorie intake /day	
Protein intake/day	
Current route of nutrition	

Imaging:

	Index imaging (before procedure)	**Index Imaging (After procedure)**
USG/CT/MRI:		
Date/ PGI No.		
Collections: PN/EPN/PN+EPN		
Location of collection:		
Size of collection:		
Extension:		
Gas configuration within collection:		
Vascular complications:		
Pleural effusion/ ascites:		
CTSI/ modified CTSI		
Clinical success (Y/N)		

Follow up Imaging:

	1	2	3	4
CT/MRI				

Date/ PGI No.				
Collections: PN/EPN/PN+EPN				
Location of collection:				
Size of collection:				
Extension:				
Gas configuration within collection				
Vascular complications:				
Pleural effusion/ ascites:				
Clinical success (Y/N)				

Indication of Drainage:

1. Positive gram stain/culture
2. Gas configuration within collection
3. Clinically suspected infection
4. Compressive symptoms (gastric outlet obstruction or biliary obstruction)
5. Pressure symptoms (early satiety, weight loss)
6. Persistent pain abdomen

Disease characteristics at time of drainage:

Days from onset of acute pancreatitis:

Days from hospitalization:

Ongoing Fever: (Y/N); Days:

Ongoing SIRS: 1/2/3/4: Days:

Ongoing OF: (Y/N); Type of organ failure (ALI/AKI/CVSF); Days of ongoing OF:

Index drainage by EUS:

Date	
Size of collection	
Percentage of necrosis	
Stent used	
Any Periprocedural complications	

Randomization:

A. Oral feed:

Nutritional assessment:

Date	**Day 0**	**Day 1**	**Day 2**	**Day 5**	**Day 8**	**Day 11**	**Day 14**
Calorie intake							
Protein intake							
Change in route							

Weight	**Day 0**	**Day 14**

Date	**Day 0**	**Day 7**	**Day 14**
Albumin			
CRP			
Total length of hospitalization			

Date	**Adverse events related to feed**

Date	Indication	NCD used	Stent migration/ Blockage	Stent removal/ PS placement	Complete necrosectomy	Complication
DEN 1						
DEN 2						
DEN 3						

B. Metal Stent NJ feed:

Nutritional assessment:

Date	**Day 0**	**Day 1**	**Day 2**	**Day 5**	**Day 8**	**Day 11**	**Day 14**
Calorie intake							
Protein intake							
Change in route							

Weight	**Day 0**	**Day 14**

Date	**Day 0**	**Day 7**	**Day 14**
Albumin			
CRP			
Total length of hospitalization			

Date	**Adverse events related to feed**

Date	Indication	Stent migration/ Blockage	Stent removal/ PS placement	Complete necrosectomy	Complication
DEN 1					
DEN 2					
DEN 3					

Parameters after Index Procedure:

		Day 0	Day 3	Day 7	Day 14	Day 21	Day 28
Fever							
SIRS							
OF	ALI						
	AKI						
	CVSF						
Hemoglobin							
TLC							
CRP							
APACHE II							
BISAP							
Urea/Crt							
T. Bil/ D. Bil							
Albumin							
AST/ALT/ALP							
Procalcitonin							
Blood Culture							
NCD culture							
PCD culture							

Fluid Analysis:

	Total cells/ Differential cells	Glucose	Protein/ Albumin	Amylase/ Lipase	LDH	CA 19.9	Culture
Ascitic fluid							
NCD / WON fluid							
PCD fluid							

Antibiotics:

No	Antibiotics/ Antifungal	Culture based (Y/N)	Duration	No	Antibiotics/ Antifungal	Culture based (Y/N)	Duration
1				4			
2				5			
3				6			

Requirement of Percutaneous drainage catheter: (Y/N)

Indication: Site: Size:

Duration:

Requirement of surgical intervention: (Y/N)

Indication: Site: Size:

Duration:

Complications during any intervention:

Technical success: (Y/N)

Clinical success: (Y/N)

Time duration at clinical success: (Y/N)

Metal stent exchanged with plastic stent: (Y/N)