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Outcome of Management of Walled-Off Necrosis: An Experience from University Hospital of Nepal

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ABSTRACT

Introduction
The patients with walled-off necrosis after acute necrotizing pancreatitis may require multiple interventions and may be associated adverse outcomes. Intensive care unit admission for organ failure and multistage step-up approaches are the cornerstones of optimal management. This study was conducted to evaluate the clinical characteristics and outcomes of the different strategies for the management of walled-off necrosis.

Methods
This is a retrospective cross-sectional study of the patients with walled-off necrosis, managed from July 2022 to January 2024. The demographic data, clinical parameters and outcomes of different strategies including percutaneous and endoscopic drainage and laparoscopic and open necrosectomy were analyzed.

Results
Twenty-five patients diagnosed with walled-off necrosis were evaluated. The mean age of those patients was 41.64±12.44 years, and 13 (52%) were females. The median time interval between the onset of acute pancreatitis and percutaneous drainage was 31 (28-42) days. Seventeen (68%) patients were managed with percutaneous transgastric drainage. Among four (16%) patients requiring step-up approach, one required endoscopic ultrasound guided drainage, two (8%) underwent open necrosectomy, one underwent laparoscopic necrosectomy. The median length of hospital stay was 16 (3-60) days. There were four (16%) mortalities, two (8%) after percutaneous drainage only, one after endoscopic ultrasound guided drainage and one after open necrosectomy, all due to sepsis and multiple organ failure.

Conclusion
Initial percutaneous transgastric drainage is feasible, safe and effective in the management of majority of patients with walled-off necrosis, thereby reducing further invasive interventions and improving the overall outcomes of the patients.

Keywords
Acute necrotizing pancreatitis; percutaneous drainage; step-up approach; walled-off necrosis

INTRODUCTION

Acute necrotizing pancreatitis (ANP) is diffuse or focal nonviable pancreatic parenchyma, larger than 3 cm and affects more than 30% of the gland. It accounts for 2% to 10% of pancreatitis cases.[1] It takes four weeks to develop walled-off necrosis (WON).[2] The secondary infection of necrosis leading to sepsis and multiple organ failure is associated with mortality rate up to 20%–30%.[3,4]

Ranson score, Acute Physiology and Chronic Health Examination (APACHE) II, and Bedside Index for Severity in Acute Pancreatitis (BISAP) are most commonly used clinical scoring systems[5] and Modified Computed tomography severity index (CTSI) is a radiologic grading system to predict the severity of disease.[6]

The three well established approaches for drainage of WON are radiological, endoscopic and surgical. The step-up approaches include percutaneous drainage (PCD) or endoscopic ultrasound (EUS) guided drainage initially; video assisted retroperitoneal drainage (VARD); laparoscopic and open necrosectomy at last. These strategies may require fewer interventions, minimize major complications and improve overall outcomes of the patients.[7]

The PANTER trial showed that a minimally invasive step-up approach leads to lower rate of adverse outcomes when compared to open necrosectomy.[8]

Ideally, any intervention should be postponed to at least for four weeks after development of ANP. POINTER trial did not show any added advantages of immediate drainage over postponed drainage.[9]

Being a tertiary referral centre, we encounter significant number of patients with WON. Hence, we conducted this study to evaluate the demographics, clinical characteristics and outcomes of strategies for the management of WON.

METHODS

This study is a retrospective cross-sectional study done at Tribhuvan University Teaching Hospital (TUTH), Institute of Medicine (IOM), Maharajgunj, Kathmandu. We analysed the prospectively maintained data of patients with WON. We included all the patients above 18 years of age, who were diagnosed with acute necrotizing pancreatitis with WON and managed from July 1 2022 to January 30, 2024, in the Department of Surgical Gastroenterology. Ethical approval was obtained from the Institutional Review Committee of the Institute of Medicine with reference number 604(6-11)E2.

A structured proforma was used to collect the data including patients' demographic details, laboratory investigations including complete blood count (CBC), renal function test (RFT), liver function test (LFT), Prothrombin time (PT), serum amylase, lipase, C reactive protein (CRP) and radiological investigations including transabdominal ultrasonography (USG), contrast enhanced computed tomography (CECT) abdomen and pelvis.

Diagnosis of ANP and WON was made and severity was graded as per Revised Atlanta classification, 2012 and organ failure was defined as per Modified Marshal score.[2,10]

The findings on CECT abdomen and pelvis including location and number of WON, extent of pancreatic and peripancreatic necrosis, features of sterile or infected WON, and modified CTSI were also recorded (Figure 1 and 2).

Different strategies were used for the management of WON as per step-up approach and detail relevant data were recorded.

1. Patients with sterile WON were managed symptomatically
2. For symptomatic or infected WON, following different strategies were used, starting initially

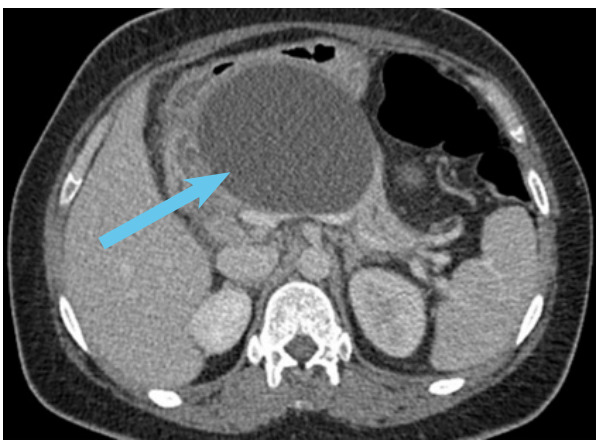

Figure 1. Sterile WON in lesser sac

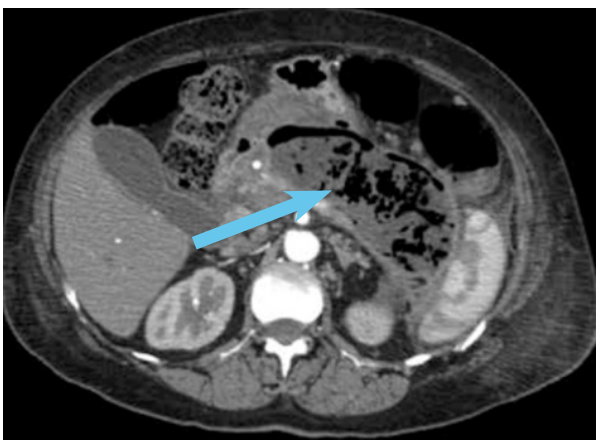

Figure 2. Infected WON in lesser sac with air foci

with less invasive approach:

- Initially, USG guided PCD was done in all cases, most commonly through transgastric route for lesser sac WON. Drain upsizing was done, when required and multiple PCD were done depending on the other location of WON.
- Laparoscopic or open necrosectomy

EUS guided drainage could not be done at our centre, due to unavailability of EUS guided intervention during the study period.

The patients, who improved with one strategy were continued with the same expectant treatment. However, the patients who did not improve after one strategy leading to ongoing sepsis and persistent or new organ failure, were managed with step- up approaches.

However, we did not have any patient managed with VARD or mini-incision necrosectomy in this study period.

The primary outcomes of step-up approach in terms of complications, any intervention required, 90-day mortality and secondary outcomes including readmission, reintervention, length of ICU stay and total hospital stay were recorded.

SPSS 26 (IBM SPSS Statistics for Windows, Version 26.0. Armonk, NY: IBM Corp.) was used for statistical analysis. Number and percentages were calculated for categorical variables while median, mean and standard deviation (SD) were used for continuous data where appropriate.

RESULTS

A retrospective analysis of a total of 25 patients with diagnosis of WON, managed between July 1, 2022 and January 30, 2024, was done in the study. The mean age of those patients was 41.64 ± 12.44 years, and 13 (52 %) were females. Gallstone was the most common cause (n=12, 48 %).

Majority of the patients (n= 15, 60%) were the cases referred from other centres. The median duration patient presented since the onset of acute pancreatitis was 26 days (range, 6-90 days). (Table 1).

Out of 25 patients, eight (32%) patients had >30% pancreatic necrosis. Majority of the patients (n=21, 84 %) had infected WON and seven (28 %) had multiple pockets of collection. Lesser sac was the most common site of WON (n=17, 68%). Time interval between the onset of pancreatitis and PCD was 31 days (range, 28-42 days). (Table 2)

Most of the patients (n= 23, 92%) were managed with USG guided PCD as initial step of step-up management requiring median two (range, 1-4) drains and it was upsized up to 24 Fr requiring maximum four sessions in seven (28%) patients. The most common route of drainage was transgastric route (n= 17, 68 %). The median duration of drainage was 24 (range, 11-60) days. The median duration of hospital stay was 16 (range, 3-60) days.

Nineteen (76%) were successfully managed with PCD only. Among those, two (8%) patients who developed GDA pseudoaneurysm were successfully managed by angioembolization in one and laparotomy due to unstable hemodynamics in

Table 1. Demographic characteristics of the patients with WON

Characteristics	Number	Percent
Age in years (Mean ± SD)	41.64 ± 12.44	-
Sex		
Male	12	48
Female	13	52
Comorbidities		
Diabetes	4	16
Other	4	16
Etiology		
Biliary	12	48
Alcohol	10	40
Idiopathic	2	8
Post ERCP	1	4
Recurrent Acute Pancreatitis	4	16
Time of presentation after the onset of acute pancreatitis in days, Median (Range)	26 (16-90)	-
Referred cases from other centres after initial management	15	60

Table 2. Demographic characteristics of the patients with WON

Characteristics	Number	Percent
BISAP Score, Median (Range)	2 (1-4)	-
Disease Severity		-
Moderate	18	
Severe	7	
Extent of Pancreatic/Peripancreatic necrosis (%)		
Peripancreatic only	5	20
Pancreatic <30 %	12	48
Pancreatic > 30	8	32
Sterile Walled-of necrosis	4	16
Infected Walled-off necrosis	21	84
No of pockets of necrotic collection		
Single	18	
Multiple	7	
Location of Necrosis		
Lesser sac	17	68
Paracolic region (Right or left)	6	24
Right subhepatic region	6	24
Pelvis and Perisplenic	2	8
Modified CTSI, Median (Range)	6 (4-10)	-
Time interval between onset of acute pancreatitis and PCD in days, Median (Range)	31 (28-42)	-

BISAP: Bedside index for severity in acute pancreatitis, CTSI: Computed tomography severity index, PCD: Percutaneous drainage

another patient. However, two (8 %) patients who developed new onset organ failures, had mortality. Four (16 %) patients required step- up approach. One patient referred to another centre for EUS guided drainage with necrosectomy and placement of lumen apposing metallic stent (LAMS) (Figure 3), later developed multiple organ failure and had mortality at our centre. Three (12 %) patients underwent necrosectomy, among which one treated with open necrosectomy due to unresolved sepsis even after four PCD, had mortality. (Table 3)

DISCUSSION

Historically, open necrosectomy was the treatment of choice for WON.[11] This morbid approach led to high rates of complications (34 to 95%) and death (11 to 39%).[12] The novel approach with initial use of less invasive and then to open approach when required only as the last resort, is called as "The step-up approach".[13] This approach aimed to control the source of infection, but not to completely debride the infected necrotic tissue. The initial step is PCD or endoscopic drainage of infected collection,

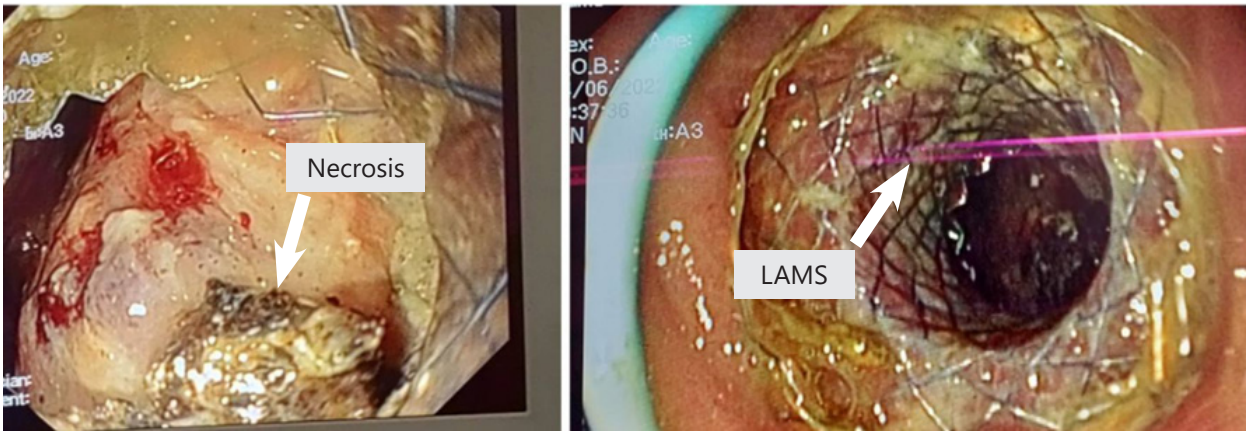

Figure 3. EUS guided necrosectomy and placement of LAMS

Table 3. Outcomes of management of patients with WON

Characteristics	Number	Percent
Number of patients treated without any interventions	2	8
Total number of patients treated initially with USG guided PCD	23	92
Total number of patients successfully treated with PCD only	19	76
Number of patients requiring PCD with > one tube	7	28
Number of drains, median (range)	2 (1-4)	
Routes of PCD		
Transgastric	17	68
Paracolic	6	24
Right subhepatic	4	16
Pelvic	2	8
Perisplenic	1	4
Tube diameter in Fr, Median (range)	10 (8-24)	-
Sessions of drain upsizing, Medina (range)	2 (1-4)	-
Patients requiring upsizing of drain	7	28
Drainage duration in days, Median (range)	24 (11-60)	-
Number of patients requiring Step-up approach after PCD	4	16
EUS guided drainage	1	4
Necrosectomy	3	12
Open	2	8
Laparoscopic	1	4
Total ICU stay in days, Median (range)	12 (2-60)	-
Total duration of hospital stays, Median (range)	16 (3-60)	-
Readmission within 90 days for additional tube drainage	1	4
Complications		
New onset multiple organ failure	4	16
Bleeding requiring interventions	2	8
Mortality within 90 days	4	16

USG: Ultrasonography, PCD: Percutaneous drainage, Fr: French, EUS: Endoscopic ultrasound, ICU: Intensive care uni

preferably through the transgastric route. This less invasive initial approaches may postpone or even prevent surgical necrosectomy, which is associated with higher rate of complications.[14] In case of failure of clinical improvements, the next step is VARD and then stepping up to open necrosectomy.[15] This approach, thus reduce the overall complications and also death by minimizing surgical stress response in critically ill patients.[8]

We analyzed the demographics, clinical characteristics and outcomes of 25 patients with WON managed with different strategies of step-up approach in this study. Gallstone is the most common cause worldwide with female predominance in forth-fifth decade of life.[16] This study also showed that 48 % of cases was due to gallstone followed by alcohol in 40% and majority were female.

Li et al[17] in their study found that large areas of pancreatic necrosis, multiple infected collections, higher modified CTSI and organ failure were the predictors of failure of PCD requiring VARD in 35 %, but none of the patients required open necrosectomy. In this study also, four (16 %) patients who required step-up approach after initial PCD had pancreatic necrosis > 30 %, high modified CTSI 8-10, had persistent and new onset of organ failure and multiple collections.

Ideally, any intervention should be done after at least four weeks to allow for better demarcation of the necrosis and infected collection gets largely or fully encapsulated to the stage of WON. POINTER trial failed to show the added advantages of immediate drainage within 24 hours after randomization once infected necrosis was diagnosed over postponed drainage.

However, postponed drainage strategy led to successful treatment with antibiotics and fewer invasive interventions during follow up and thus, decreasing adverse long-term outcomes.[9] In this study also, PCD was done after median duration of 31 (range, 28-42) days after the patients developed ANP. Only one patient was readmitted for additional PCD once, within 90 days of discharge.

Lesser sac is the most common site of WON and can be easily accessed through the transgastric route for EUS guided drainage. The transgastric route can subsequently be dilated, drainage tube can be placed and upsized when required and nasocystic tube can be placed for repeated flushing. Moreover, through the same route, EUS guided necrosectomy can be done and LAMS can be kept.[18] Keane et al, did a retrospective cohort study comparing EUS versus PCD of symptomatic pancreatic fluid collection of more than four weeks. A total of 109 patients underwent EUS guided drainage and 55 had PCD alone. The success rate was higher in EUS group (70 versus 31%). The EUS group had more complications compared to the PCD group (10 versus 1 %). However, the EUS group had better outcomes, requiring less frequent interventions (median of 1.8 vs. 3.3), having lower rates of residual collections (21 versus 67%) and requiring less frequent open necrosectomy (4 versus 11%).[19]

Zhang et al,[20] in his study found that endoscopic transgastric fenestration (ETGF) group had a higher success rate than those in the PCD group (97.1 vs 76.3%), but no significant differences in terms of recurrence, reintervention and overall complications. In this study, out of 23 patients who had PCD as initial strategy of step-up management of WON, 19 (76%) patients were successfully managed with PCD only, did not require other drainage modality. The most common site of WON was in lesser sac, in 17 (68%) patients and all those were drained by PCD through transgastric route. Presently, we do not have the facility of EUS guided drainage of WON at our centre. Thus, all the patients with WON at lesser sac were managed with PCD as the initial step and only one patient was referred to another centre after PCD, where she underwent EUS guided drainage and then managed further at our centre.

There were two (8 %) asymptomatic patients, who had solitary < 5 cm, sterile WON confined to lesser sac, and thus did not require any form of treatment. On subsequent follow up within 90 days in outpatient department (OPD), USG abdomen and pelvis review showed resolution of collection, thus did not require intervention. Among 23 (92%) symptomatic patients with WON, managed with PCD, only seven (28%) patients required multiple PCD tubes for adequate drainage. In this study, VARD was not done as a part of step-up approach in that study period. Four (16%) patients required step up approach, one required EUS guided drainage, two (8%) required open necrosectomy and one (4%) had undergone laparoscopic necrosectomy.

Those findings are similar with the results of PANTER trial[8] in which 95 % of 43 patients assigned to step-up approach were managed with PCD and half of them underwent second drainage procedure and concluded that PCD can be performed in almost every patient who has WON. Their study had mortality of 19% in step up approach group due to multiple organ failure and bleeding, which is similar to this study where there were four (16 %) mortalities, two (8%) after PCD only and one (4%) each after EUS drainage and open necrosectomy, all due to sepsis and multiple organ failure. However, two (8 %) patients, who had intrabdominal bleeding from GDA pseudoaneurysm after PCD, were managed successfully by angioembolization in one case and laparotomy in another case.

There are few limitations in this study. First, it is a retrospective study with a small sample size and short follow up and hence the results cannot be generalized to the population. Second, we did not analyze how many patients with acute necrotic collection developed WON ultimately. Third, all the patients underwent PCD after at least four weeks and hence, the outcomes between early and postponed drainage of WON could not be analyzed. Fourth, due to logistic issue, we did PCD (transgastric), as initial less invasive strategy for all symptomatic patients with WON, which could be effectively managed with EUS guided drainage also and may have influenced our results.

CONCLUSION

Percutaneous transgastric drainage of walled-off necrosis, as the initial choice among different strategies of step-up approach, is feasible, safe and effective in majority of patients, thereby requiring other interventions less frequently and has improved the overall outcomes. However, large prospective and multicenter studies in the future are required to assess the overall outcomes of those strategies for the management of walled-off necrosis.

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CONFLICT OF INTEREST

The author(s) declare that they do not have any conflicts of interest with respect to the research, authorship, and/or publication of this article.

AUTHOR CONTRIBUTIONS

Study concept and design: PT, BPK, RSB, PJL. Data collection: PT, SB. Analysis and interpretation of data: PT, DS, NM, SP, PJL. Drafting of the manuscript: PT, PJL. All authors read and approved the final manuscript.

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