



PREDICTING CLINICAL EFFECTIVENESS OF PERITONEAL LAVAGE IN SEVERE ACUTE PANCREATITIS IN A CENTRAL INDIAN POPULATION

General Surgery

Manik C. Gedam Associate Professor, Dept Of General Surgery, IGGMC, Nagpur

Vrushabh B. Petkar* Resident Surgeon, Dept Of General Surgery, IGGMC, Nagpur *Corresponding Author

Deepti Gujral Saha Assistant Professor, Dept Of General Medicine, Rama Medical College, Pilkuiwa

Kishor B. Jeughale Assistant Professor, Dept Of General Surgery, BJMC, Pune

ABSTRACT

Purpose: This study aims to predict the clinical effectiveness of peritoneal lavage in severe acute pancreatitis (AP) in a Central Indian population. **Materials and Methods:** We studied 32 patients with severe AP who were admitted from July 2020 to December 2022 in our tertiary care center in Central India. These patients received peritoneal lavage with conventional therapy (study group n=32). Laboratory parameters and severity scores were studied before and 5 days after therapy. Effect over the incidence of local complications, mortality rate and length of hospital stay was also studied. **Results:** There were no adverse events (bowel perforation and bleeding) associated with abdominal drain insertion procedure for peritoneal lavage. The level of all parameters (serum lipase and amylase, drain fluid lipase and amylase, white blood cell [WBC], C reactive protein [CRP], lactate dehydrogenase [LDH], serum urea, serum creatinine and base excess) and all the severity scores (systemic inflammatory response syndrome [SIRS], Bedside Index for Severity in Acute Pancreatitis [BISAP]) were significantly improved 5 days after treatment. The levels of blood glucose and serum calcium were similar pre lavage and post lavage. The incidence of local complication had a significant reduction. Mortality rate and the length of hospital stay were too decreased significantly in the study group. **Conclusion:** Peritoneal lavage can significantly reduce morbidity, mortality, complications and duration of hospital stay in severe AP.

KEYWORDS

Severe acute pancreatitis, peritoneal lavage, pancreatic ascites

INTRODUCTION:

Acute Pancreatitis (AP) is the inflammation of the pancreatic parenchyma resulting from glandular auto-digestion initiated by its own pancreatic enzymes, leading to multi-organ failure or death. It is characterized by acute abdominal pain in epigastrium or right upper quadrant, along with three-fold raised levels of serum pancreatic enzymes.¹ Gall stones and alcohol are the commonest causative factors involved. Although 80% of the patients have a mild, self-limiting disease course, recovering without complications, with <5% mortality; remaining 20% have a severe course with local and systemic complications and a high mortality rate of 20%.²

The revised Atlanta Criteria (2012)³ classifies AP as mild, moderate and severe. Severe AP has an early phase (1st week), characterized by development of systemic inflammatory response syndrome (SIRS) and organ failure, with associated high mortality; and a late phase (>1 week), characterized by local complications and deaths due to infected necrosis⁴. Thus, severe AP is a disease known to have potential to be fatal. In India, the prevalence is 8.6 per 100,000 men and 8.0 per 100,000 women, respectively⁵.

Early resuscitation and treatment in cases of severe AP play a vital role in preventing morbidity and mortality. Surgical necrosectomy is reserved for patients with acute necrotizing pancreatitis, however, is associated with high rate of complications and death, with a long-term risk of pancreatic insufficiency⁶. Hence, less invasive alternatives to open necrosectomy are being explored, such as percutaneous catheter drainage, endoscopic transgastric procedures, and minimally invasive retroperitoneal approaches. Peritoneal lavage can be an alternative to laparotomy and an adjunct to conventional conservative management of severe AP as a recent study demonstrated its anti-inflammatory effects in patients with acute pancreatitis.⁷

Peritoneal lavage was introduced in the treatment of AP, based on the theory that the elimination of ascites containing inflammatory cytokines and infectious mediators decrease the inflammation and the severity of the disease.¹²

Earlier studies in 70s as well as recent studies had advocated its use in treating severe AP.¹¹⁻¹⁶ However, there is no Indian literature available regarding same. This study addresses the role of peritoneal lavage in the management of severe AP and its effect on disease morbidity and mortality in Central India.

MATERIALS AND METHODS

Study Design:

This hospital based, prospective, intervention study included 32 cases of severe AP admitted in our tertiary care center in Central India from July 2020 to December 2022. Patients were included as per pre-defined criteria for severity of acute pancreatitis according to Revised Atlanta Criteria (2012)³. All patients received peritoneal lavage along with conventional therapy.

Thorough history with socio-economic status (as per Modified Kuppuswamy scale-2021¹⁷) was noted followed by detailed clinical examination for each case. Vitrally unstable cases were resuscitated, if required, were admitted ICU. All following baseline hematological and biochemical investigations such as: CBC, LFT, KFT, RBS, ABG, serum lipase and amylase, peritoneal fluid lipase and amylase, serum calcium, CRP, LDH; were done on admission as well as after completion of the peritoneal lavage.

CECT A+P was undertaken on or within 48 hours of admission and modified CT severity score was estimated.¹⁸ SIRS and BISAP scores¹⁹ were estimated prior to and after the lavage therapy.

Methodology Proper:

All patients were treated with peritoneal lavage, along-with conventional therapy, which included: nil per oral with intravenous fluid therapy, nasogastric tube insertion, oxygen therapy, IV proton pump inhibitor therapy, IV analgesics and IV antibiotics.

All patients were subjected to intervention of abdominal drain insertion, with prior consent. Abdominal drain kit no. 32 was inserted into peritoneal cavity, directing towards the pelvis, 1 cm away right rectus muscle of abdomen using 1-1.5 cm incision under local anaesthesia. The first drained peritoneal fluid was sent for investigation.

All cases received peritoneal lavage as early as possible. The fluid was 0.9% normal saline. A volume of 1000 ml NS was run into the peritoneal cavity twice a day over a period of 30 minutes and patient was subjected to in bed change of postures. The fluid was drained out by gravity.

Peritoneal lavage ended in most patients in 5 days or when following manifestations were observed:

- Relief of abdominal pain.
- Change in colour of peritoneal fluid (clear fluid)
- Improvement of SIRS score ≤ 1 .

Study Factors

1. Demographics: Age, gender, socio-economic status, etiology, duration of initial symptoms to admission and peritoneal lavage and CT scores with percentage necrosis of pancreas were studied.
2. Laboratory parameters: Pre-lavage and post-lavage following lab parameters were studied: serum lipase and amylase, peritoneal fluid lipase and amylase, TLC, CRP, LDH, blood glucose, serum urea, serum creatinine, base excess (ABG) and serum calcium.
3. Severity scores of SIRS and BISAP were noted and compared, pre and post lavage
4. Other parameters included: NPO days, duration of peritoneal lavage, duration of hospital stay, complications and mortality..

TABLE 1.: CLINICAL CHARACTERISTICS OF STUDY POPULATION

Characteristic	N	%
Age (Mean±SD, in years)	34.75 ± 8.31	
Sex (Male: Female)	25:7	
Socioeconomic status		
1. Upper	0	0
2. Upper middle	3	9.38
3. Lower middle	8	25
4. Upper lower	11	34.38
5. Lower	10	31.25
Etiology		
1. Alcohol	22	68.75
2. Gall stones	3	9.38
3. Hyperlipidaemia	2	6.25
4. Drug induced	1	3.13
5. Idiopathic	4	12.5
Duration of initial symptoms to admission		
1. <24 h	23	71.88
2. 24-72 h	6	18.75
3. >72 h	3	9.38
Duration of initial symptoms to peritoneal lavage		
1. 24-48 h	17	53.13
2. 48-72 h	11	34.38
3. >72 h	4	12.5
Modified CTSI on CECT (here, n=27)		
1. 0-6	9	33.33
2. 8-10	18	66.66
Percentage pancreatic necrosis (here, n=27)		
1. <30%	13	48.15
2. >30%	14	51.85
N: Total no. of patients (N=32), h: hours, n: No. of patients who underwent CECT, %: Percentage, CTSI: CT severity Index, CECT: Contract Enhanced Computed Tomography		

Statistical Analysis:

Continuous variables were expressed as means and ranges. The paired t-test was used to evaluate the significance of differences in the continuous variables between pre-lavage and post-lavage samples. Dichotomous variables were compared using the Chi-square test. $P < 0.05$ was considered as statistically significant.

RESULTS**Demographics:**

(see table 1) The demographic characteristics, etiology, duration of initial symptom to admission and peritoneal lavage and CT findings were studied.

The mean age of the study population was 34.75 ± 8.31 years, ranging from 20 to 56 years. Males were more affected than female with a male to female ratio of 25:7. Majority patients had upper lower class as socio economic status. Majority of our subjects were young to middle aged labourers or unemployed men.

Alcohol was found to be most common cause of severe AP. Most of the study subjects (71.88%) were admitted within 24 hours of first symptom and were started with peritoneal lavage as early as possible (within first 48 hours). 27 out of 32 underwent CECT A+P, as rest 5 were not able to scanned due to poor general condition. Majority i.e. 66.66% of the patients had a Modified CTSI of 8 or 10. 14 patients (51.85%) had > 30% pancreatic necrosis on CT.

Pre-lavage And Post-lavage Laboratory Parameters:

Most of the pre-lavage and post-lavage laboratory variables showed significant decrease when compared with paired t-test (p -value < 0.05) (See table 2).

Pre-lavage And Post-lavage Severity Scores:

There was significant improvement in SIRS and BISAP scores after completion of peritoneal lavage therapy (p -value < 0.05), (see table 3).

TABLE 3.: PRE-LAVAGE AND POST-LAVAGE SEVERITY SCORES

Severity Score	Pre-lavage Mean ± SD	Post-lavage	p-value
SIRS	2.94 ± 0.62	1.16 ± 1.05	0.0001
BISAP	2.5 ± 0.95	0.44 ± 0.76	0.0001

SIRS: Systemic Inflammatory Response Syndrome score, BISAP: Bedside Index of Severity of Acute Pancreatitis score

TABLE 2.: PRE-LAVAGE AND POST-LAVAGE LABORATORY PARAMETERS

Laboratory parameters	Pre-lavage Mean ± SD	Post-lavage	p-value
Serum lipase (U/L)	570.06 ± 303.21	109.28 ± 39.57	0.0001
Serum amylase (U/L)	582.75 ± 277.68	124.59 ± 46.04	0.0001
Drain fluid lipase (U/L)	1190.1 ± 485.81	248.72 ± 155.28	0.0001
Drain fluid amylase (U/L)	1302.5 ± 632.69	194.94 ± 107.28	0.0001
TLC (/mm3)	17978 ± 7722.4	8831.3 ± 3835.3	0.0001
CRP (mg/mL)	253.7 ± 158.4	75.3 ± 30.3	0.0001
LDH (U/L)	520.12 ± 169.77	178.66 ± 48.22	0.0001
Blood glucose (mg/dL)	114.97 ± 16.32	109.03 ± 10.97	0.0211
Serum urea (mg/dL)	54.75 ± 31.83	36.19 ± 17.23	0.0001
Serum creatinine (mg/dL)	2.08 ± 1.29	1.13 ± 0.36	0.0001
Base excess (mmol/L)	4.44 ± 1.7	2 ± 1.13	0.0001
Serum calcium (mg/dL)	7.97 ± 1.49	8 ± 0.84	0.9157

TLC: Total Leucocyte count, CRP: C-Reactive Protein, LDH: Lactate Dehydrogenase

Other Parameters

Table 4 describes post-lavage outcomes of the study. The nil per oral period was 7.53 ± 3.25 days. The mean period of peritoneal lavage was 5.34 ± 1.03 days as lavage was continued in most of the patients till 5th day. Morbidity was studied in terms of duration of hospital stay and incidence of complications. Mean duration of hospital stay was 13.25 ± 4.39 days. There was no incidence of complications such as bowel injury or bleeding during the procedure of drain insertion for peritoneal lavage in any of the study subjects.

The complications, occurred in 10 patients, were related to the disease process, out of which peripancreatic abscess formation was seen in 12.5% patients, which required image guided pigtail and drainage. Other complications were MODS (9.38%), GI complications (6.25%) and septicemia (3.13%). 21.43% was the survival rate in the 10 patients which had complications.

Mortality rate in the current study was 12.5%, with overall survival rate of 87.5%. Out of 4 deaths, 50% were due to one or more organ failure, 25% due to septicemia and 1 death was caused by DIC. Alcohol was associated with 75 % mortality while 25 % was seen in 1 patient of gall stone pancreatitis.

The duration of first symptom to peritoneal lavage was compared with mortality rate. It was observed that no patients had died who were started with early peritoneal lavage (24-48 hours). 25% of the dead cases were lavaged within 48-72 hours while rest 75% who were lavaged after 72 hours, had shown maximum mortality.

All 4 patients who had developed peripancreatic abscess were having >30% pancreatic necrosis in CT. Out of 4 deaths, 2 had >30% pancreatic necrosis while no CT was possible in rest 2, due to poor general condition, thus their relationship with percentage pancreatic necrosis could not be established.

TABLE 4.: POST-LAVAGE CLINICAL OUTCOME

PARAMETER	OUTCOME	
Nil per oral period (mean $\pm$ SD days)	7.53 $\pm$ 3.25	
Period of peritoneal lavage (mean $\pm$ SD days)	5.34 $\pm$ 1.03	
Duration of hospital stay (mean $\pm$ SD days)	13.25 $\pm$ 4.39	
Complications	n	%
1. Peripancreatic abscess	10	31.25
2. MODS		
3. Gastrointestinal complications	4	12.5
4. Septicaemia	3	9.38
	2	6.25
	1	3.13
Mortality Cause of death	4	12.5
1. MODS	2	50
2. Sepsis	1	25
3. DIC	1	25
Associated etiology		
1. Alcohol	3	75
2. Gall stones	1	25
Duration of initial symptom to peritoneal lavage	0	0
1. 24-48 h	1	25
2. 48-72 h	3	75
3. >72 h		
SD: Standard Deviation, MODS: Multiple Organs Dysfunction Syndrome, DIC: Disseminated Intravascular Coagulation		

DISCUSSION

Though 80% of acute pancreatitis cases have mild self-limiting course without complications, the remaining 20% with severe AP have local and systemic complications, associated with high mortality rate². Peritoneal fluid in the early course of disease contains activated pancreatic enzymes, inflammatory cytokines and vascular endotoxins, which are absorbed into circulation and deteriorate SIRS.^{21,22} Thereby evacuating peritoneal fluid during the early phase of the disease could be beneficial. Many previous studies on this therapy had contrasting views regarding its benefits affecting overall morbidity and mortality of the disease process.^{11-17, 22-25} Besides, there are as such no literature available regarding same in an Indian population.

Considering aforementioned bemusing aspects of its role in treating severe AP, we performed peritoneal lavage in 32 cases of severe AP, as a single center study in a tertiary care hospital in Central India, to predict its clinical effectiveness. Although 32 patients formed a small sample size, it is very close to that of other previous related studies such as Ranson et al, 1990¹³ (29 patients), Matsumoto et al, 2014¹¹ (23 patients), in the peritoneal lavage group and Jong et al, 2019¹⁶ (27 patients). Alcohol was overall most common cause followed by gallstones and other etiologies in current study, similar to majority of previous studies.

Being a study in a developing nation, we considered socio-economic aspect of the study population and it was found that acute pancreatitis is associated more with lower middle and lower classes, likely due to illiteracy, low income, alcohol abuse and less access to higher centers for early treatment.

In our study, the puncture site for drain insertion was 1 cm lateral to right rectus muscle of the abdomen unlike other literatures (Douglas pouch) to prevent adverse event including bowel injury without using ultrasound.^{11,15} In fact, there were no adverse events (bowel perforation and bleeding) associated during abdominal drain insertion. This parameter was identical to the study by Jong et al, 2019.¹⁷

We, like others, preferred early peritoneal lavage i.e. within 24 to 72 hours of the initial symptom of pancreatitis. The results of lavage were better if started early as mortality was found high in patients with delayed peritoneal lavage. The mean period of lavage was 5.34 days, comparable to that of previous studies.

Laboratory parameters (serum lipase and amylase, drain fluid lipase and amylase, TLC, CRP, LDH, serum urea and creatinine and base excess) and the severity scores (SIRS, BISAP) were significantly improved 5 days after therapy (p-value <0.05), whereas blood glucose and serum calcium did not show significant change post lavage. Significant improvement of inflammatory parameters (TLC, CRP and SIRS) suggests anti-inflammatory effect of peritoneal lavage, which goes with a previous report.⁷ Serum urea and creatinine reflect renal function while base excess is indicator of respiratory system. Improvement in these variables likely suggests prevention of organ-system failure and thus reduction in overall severity scores as well as mortality. It suggests that peritoneal lavage decreases the severity of the disease process and improve multiple organ failure by evacuating inflammatory cytokines.¹⁶

The overall morbidity showed significant improvement. Mean duration of hospital stay was 13.25 days. The incidences of systemic and local complications were 12.5% each. Most patients who already had >30% pancreatic necrosis in CT, presented late and were started peritoneal lavage later, had developed more complications and also suffered death. Mortality was seen in 4 patients with overall survival rate of 87.5%.

CONCLUSION

Acute pancreatitis, in around 20% cases, may have a severe disease course and could be fatal. Conservative therapeutic measures not always suffice for the cases to survive. Peritoneal lavage, an old and easy but less opted measure, can prove beneficial to not only prevent severe pancreatitis associated deaths, but also reduce its morbidity.

Supporting previous studies, with our experience, we too advocate that peritoneal lavage is beneficial as an adjunct to conservative management in cases of severe AP. Besides, we also speculate that its early instillation can significantly prevent mortality in the disease course.

However, a small sample size and single centred study count as limitations. Randomised Controlled Trials and Meta-analyses are required for further clearance.

Source Of Funding

None.

Conflicts Of Interest

None.

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