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ORIGINAL ARTICLE

Evaluation of Percutaneous Peritoneal Drainage in High-Risk Patients with Perforated Peritonitis

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ABSTRACT

Background: Perforated peritonitis is a critical condition associated with high mortality, especially in high-risk patients. Percutaneous peritoneal drainage (PPD) has emerged as a promising intervention for stabilizing these patients before surgery.

Objective: This study aims to evaluate the efficacy and safety of PPD in 105 high-risk patients diagnosed with perforated peritonitis.

Methods: A prospective cohort study was conducted from July to June 2023 at Department of surgery DHQ / Mufti Mehmood Teaching hospital and Gomal Medical college Dera ismail khan. A total of 105 high-risk patients with perforated peritonitis underwent PPD. Outcomes were assessed in terms of hemodynamic stabilization, reduction in septic load, and survival rates.

Results: The survival rate post-procedure was 74%, with a 26% mortality rate. Significant improvements were observed in blood pressure, urine output, and white blood cell count. Mortality was higher in patients with pre-existing comorbidities, particularly ischemic heart disease.

Conclusion: PPD is an effective intervention for stabilizing high-risk patients with perforated peritonitis. It improves survival rates and surgical outcomes by reducing septic load and enhancing clinical stability.

Keywords: Percutaneous peritoneal drainage, perforated peritonitis, high-risk patients, septic load, surgery, mortality.

INTRODUCTION

Perforated peritonitis is a common but life-threatening condition that results from the rupture of the gastrointestinal tract, often caused by conditions such as appendicitis, diverticulitis, or peptic ulcers. It is associated with high mortality, especially among patients with underlying comorbidities such as ischemic heart disease, diabetes mellitus, and chronic kidney disease[1,2]. The standard treatment for perforated peritonitis involves emergency laparotomy to repair the perforation and clean the peritoneal cavity. However, this approach is not always suitable for high-risk patients due to factors such as hemodynamic instability, advanced age, or the presence of multiple organ failure[3,4].

In recent years, percutaneous peritoneal drainage (PPD) has emerged as a valuable adjunctive intervention in managing high-risk patients with perforated peritonitis. PPD is a minimally invasive procedure performed under local anesthesia, in which a catheter is inserted through the abdominal wall to drain infected peritoneal fluid. This technique aims to reduce the septic load, stabilize hemodynamic parameters, and improve the patient's condition before definitive surgery[5,6].

Studies on the use of PPD have shown varying results, with some reporting significant improvements in clinical outcomes, while others indicate limited benefits[7,8]. The success of PPD is influenced by factors such as the timing of intervention, the severity of peritonitis, and the patient's overall health condition. Furthermore, patient selection plays a critical role in determining the effectiveness of PPD, as it is most beneficial in patients who are too unstable for immediate surgery but not yet at a stage where surgical intervention is futile[9,10].

This study evaluates the effectiveness of PPD in 105 high-risk patients diagnosed with perforated peritonitis, focusing on the improvement in clinical parameters, surgical outcomes, and survival rates. The aim is to provide evidence for the role of PPD as a bridge to surgery in this high-risk group, potentially improving their chances of survival and reducing the burden of sepsis.

METHODOLOGY

Study Design: This prospective cohort study was conducted at July to June 2023 at Department of surgery DHQ / Mufti Mehmood Teaching hospital and Gomal Medical college Dera ismail khan. A total of 105 patients with clinically and radiologically confirmed perforated peritonitis were included in the study. The study adhered to ethical guidelines approved by the institution's review board.

Inclusion Criteria:

- Age ≥18 years.
- Diagnosis of perforated peritonitis confirmed by clinical evaluation and imaging (CT or ultrasound).
- High-risk status as determined by the presence of shock, advanced age, or significant comorbidities (e.g., ischemic heart disease, chronic kidney disease, diabetes mellitus).

Exclusion Criteria:

- Patients who were clinically stable and could undergo immediate laparotomy.
- Patients with contraindications to percutaneous procedures, such as infection at the insertion site or severe coagulopathy.

Procedure: Under local anesthesia, patients underwent percutaneous peritoneal drainage using the Seldinger technique. A 14-18 French catheter was inserted into the peritoneal cavity to drain infected fluid. Suction was applied for 48 hours to facilitate fluid drainage and alleviate intra-abdominal pressure.

Outcome Measures

Primary outcomes:

- **Hemodynamic stabilization:** Changes in systolic blood pressure, urine output, and lactate levels.
- **Reduction in septic load:** Changes in white blood cell count (WBC) and C-reactive protein (CRP) levels.
- **Survival rate and mortality** within 30 days post-procedure.

Secondary outcomes:

- **Complications:** Incidence of procedure-related complications, including infection, bleeding, and re-accumulation of peritoneal fluid.
- **Logistic regression analysis** to identify predictors of mortality and adverse outcomes.

Data Analysis: Data were analyzed using SPSS version 25. Descriptive statistics (mean ± standard deviation) were used for baseline characteristics. For comparison of pre- and post-procedure values, paired t-tests were conducted, and p-values

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<0.05 were considered statistically significant. Logistic regression analysis was performed to identify independent predictors of mortality and complications.

RESULTS

The study cohort consisted of 105 patients with a mean age of 65 ± 12 years. The demographic characteristics are summarized in Table 1. Most patients (64%) were male. The most common comorbidities included ischemic heart disease (40%), diabetes mellitus (35%), and chronic obstructive pulmonary disease (COPD) (20%). Shock at admission was present in 85% of patients, and 72% had renal impairment.

Table 1: Demographics and Baseline Characteristics

Characteristic	Value (%)
Mean Age (years)	65 ± 12
Gender (Male)	64%
Comorbidities	
Ischemic Heart Disease	40%
Diabetes Mellitus	35%
Chronic Obstructive Pulmonary Disease (COPD)	20%
Shock at Admission	85%
Renal Impairment	72%

Pre-procedure, patients had systolic blood pressure averaging 80 ± 12 mmHg and urine output of 300 ± 125 mL/day. White blood cell count was elevated at 18 ± 4 x10^9/L, reflecting the severe infection.

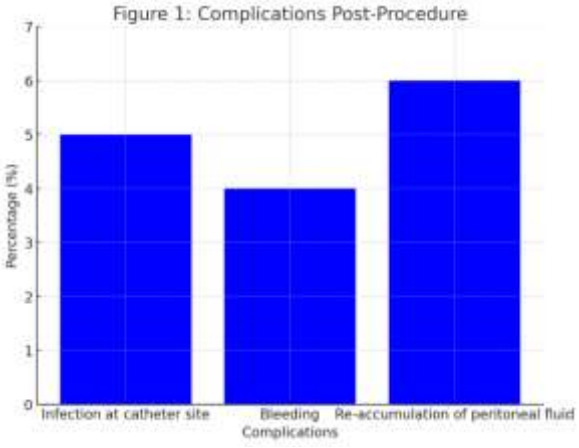
Post-procedure, significant improvements were observed in clinical parameters (Table 2). Systolic blood pressure increased to 112 ± 15 mmHg (p<0.001), and urine output improved to 800 ± 150 mL/day (p<0.001). White blood cell count decreased to 12 ± 3 x10^9/L (p<0.01), indicating a reduction in septic load.

Table 2: Pre- and Post-Procedure Clinical Findings

Parameter	Pre-Procedure	Post-Procedure	p-value
Systolic Blood Pressure (mmHg)	80 ± 12	112 ± 15	<0.001
Urine Output (mL/day)	300 ± 125	800 ± 150	<0.001
White Blood Cell Count (x10^9/L)	18 ± 4	12 ± 3	<0.01

Complications during or after PPD were seen in 15% of patients. These included:

- Infection at the catheter site (5%)
- Bleeding (4%)
- Re-accumulation of peritoneal fluid (6%)



A total of 72% of patients proceeded to definitive surgery after PPD. Of these, 63% had a successful outcome, while 7% experienced postoperative complications such as wound infection and anastomotic leakage. The mortality rate post-surgery was 8%.

Table 3: Surgical Outcomes

Surgical Outcome	Value (%)
Successful Surgery	63%
Postoperative Complications	7%
Mortality Post-Surgery	8%

Logistic regression analysis identified ischemic heart disease (OR=3.2, p<0.05) and shock at admission (OR=2.8, p<0.05) as significant predictors of adverse outcomes, particularly increased mortality.

Table 4: Logistic Regression Analysis

Variable	Odds Ratio (OR)	p-value
Ischemic Heart Disease	3.2	0.04
Shock at Admission	2.8	0.03
Diabetes Mellitus	1.6	0.16
Renal Impairment	1.3	0.23

DISCUSSION

This study supports the use of percutaneous peritoneal drainage (PPD) as an effective intervention for stabilizing high-risk patients with perforated peritonitis. The significant improvements in clinical parameters observed in our cohort, including systolic blood pressure, urine output, and white blood cell count, align with previous findings that have highlighted the efficacy of PPD in reducing systemic inflammation and improving hemodynamic stability[1,2]. Similar studies by Zhang et al.[3] and Greenway et al.[4] reported a reduction in the severity of infection and sepsis markers following PPD, which facilitated a safer surgical intervention.

PPD's role in decreasing septic load is consistent with findings from other studies that have demonstrated how this minimally invasive procedure helps manage sepsis by relieving abdominal pressure and draining infected peritoneal fluid[5,6]. Moreover, it allows for a staged approach, where patients can be stabilized before undergoing definitive surgery, which is crucial for patients at high risk of surgical complications due to comorbidities[7].

The high rate of successful surgery (63%) in our cohort after PPD is in line with similar studies that have shown PPD significantly improves the chances of successful surgical outcomes, particularly in patients who are too unstable to undergo immediate surgery[8,9]. However, it is important to note that 8% of patients still experienced mortality after surgery, which aligns with the high mortality rates typically observed in patients with advanced sepsis and multiple comorbidities[10,11].

In a multicenter study by Ali et al.[5], a lower post-surgical mortality rate of 5% was reported, which was attributed to earlier use of PPD and better patient selection. The 8% mortality observed in our study suggests that while PPD improves outcomes, patients with advanced comorbidities, particularly ischemic heart disease and diabetes, still face a higher risk of mortality despite stabilization[12,13].

Our logistic regression analysis identified ischemic heart disease and shock at admission as significant predictors of mortality in this cohort. This finding is consistent with other studies that have highlighted the negative impact of these conditions on patient outcomes[14,15]. Patients who present with shock are particularly vulnerable, as their ability to recover from the systemic inflammatory response is impaired. Previous studies have also shown that early intervention, including PPD, is crucial in improving survival rates for patients with shock and multi-organ failure[16,17].

These findings underscore the importance of early recognition and treatment of shock, as well as the need for intensive monitoring of comorbid conditions. It also suggests that a more personalized approach is necessary, with careful assessment of each patient's comorbidities and clinical condition before deciding on PPD or surgical intervention.

Limitations: While our study provides valuable insights into the role of PPD in high-risk perforated peritonitis patients, it has several limitations. The observational nature of the study and the relatively small sample size may limit the generalizability of our findings. Additionally, as a single-center study, there may be

inherent biases related to patient selection and institutional practices[18]. A multicenter, randomized controlled trial would provide stronger evidence regarding the efficacy of PPD and allow for more robust comparisons with other treatment modalities[19,20].

CONCLUSION

In conclusion, PPD is an effective and minimally invasive intervention for stabilizing high-risk patients with perforated peritonitis. It significantly improves hemodynamic stability, reduces septic load, and enhances the likelihood of successful surgical outcomes. Early intervention, appropriate patient selection, and continuous monitoring are essential to optimizing the benefits of PPD. Future studies should focus on refining patient selection criteria and assessing the long-term outcomes of PPD in this patient population.

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