

Risk Factors for Perineal Wound Infection after Abdominoperineal Excision of Rectum in Rectal Cancer: A Prospective Observational Study

Rajib Kumar Shil¹, Md. Tahir Hossain², Md. Abdullah Yusuf Jamil³, Jaynul Abedin⁴, Sumona Sarker⁵, Rahnema Tasnim⁶

¹Assistant Professor, Surgical Oncology, National Institute of Cancer Research & Hospital (NICRH), ²Assistant Professor, Surgical Oncology, Enam Medical College Hospital, Savar, Dhaka, ³Assistant Professor, Surgical Oncology, NICRH, Dhaka, ⁴Assistant Professor, Medical Oncology, NICRH, Dhaka, ⁵Senior Consultant, Paediatrics, District Hospital, Natore, ⁶Assistant Professor, Dept of Anaesthesia Analgesia and Intensive Care Medicine, BMU, Dhaka.

Corresponding Author: Dr. Rajib Kumar Shil, E-mail: rajibshil55@gmail.com

Abstract

Background: Perineal wound infection (PWI) remains a frequent and morbid complication following abdominoperineal excision of rectum (APER) for rectal cancer. This study aimed to identify independent risk factors for PWI in a South Asian population.

Methods: A prospective observational study was conducted at a tertiary cancer center in Bangladesh between January 2021 and March 2022. Forty-one patients with histologically confirmed rectal adenocarcinoma undergoing elective APER were enrolled. Demographic, clinical, laboratory, oncological, and operative variables were analyzed. Univariate analysis followed by multivariate logistic regression was performed to identify independent predictors of PWI.

Results: PWI occurred in 13 patients (31.7%), at a median of 8 postoperative days. On univariate analysis, diabetes mellitus, hypoalbuminemia (<3.5 g/dl), anemia (≤ 11 g/dl), and neoadjuvant chemoradiotherapy were significantly associated with PWI. Multivariate analysis identified hypoalbuminemia (adjusted OR 6.45, 95% CI 1.52–27.38; $p=0.011$) and diabetes mellitus (adjusted OR 11.87, 95% CI 1.89–74.52; $p=0.008$) as independent predictors. Patients with PWI had significantly prolonged hospital stays (18.3 ± 4.2 vs. 12.1 ± 2.8 days; $p<0.001$).

Conclusion: Hypoalbuminemia and diabetes mellitus are independent risk factors for perineal wound infection following APER. Preoperative nutritional optimization and strict perioperative glycemic control may reduce postoperative morbidity and improve outcomes.

Keywords: Rectal cancer; Abdominoperineal excision; Perineal wound infection; Risk factors; Hypoalbuminemia; Diabetes mellitus.

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Introduction

Introduction

Rectal cancer accounts for approximately one-third of colorectal malignancies worldwide. Abdominoperineal excision of rectum (APER), first described by Miles in 1908,^x remains an essential surgical option for low rectal cancers when sphincter preservation is not feasible.^{3,11,12} Despite advances in surgical technique and perioperative care, perineal wound infection (PWI) continues to

be a common postoperative complication, with reported incidences ranging from 29% to 64%.^{4,7,14}

PWI is associated with delayed wound healing, prolonged hospital stay, increased healthcare costs, delayed initiation of adjuvant therapy, and impaired quality of life.^{2,5,24} Multiple patient-related, disease-related, and treatment-related factors have been implicated, including malnutrition, diabetes mellitus, anemia, obesity, smoking, neoadjuvant radiotherapy, and prolonged operative

duration.^{2,7,15,22} However, data from South Asian populations remain limited. This prospective study aimed to identify independent risk factors for PWI following APER in rectal cancer patients treated at a tertiary referral center in Bangladesh.¹⁹

Materials and Methods

Study Design and Setting

This prospective observational cohort study was conducted at the Department of Surgical Oncology, National Institute of Cancer Research and Hospital (NICRH), Dhaka, Bangladesh, from January 2021 to March 2022. Ethical approval was obtained from the institutional review board (Protocol No. NICRH/EC/2020/245), and written informed consent was secured from all participants.

Patient Selection

Patients aged 20–80 years with histologically confirmed rectal adenocarcinoma undergoing elective APER with curative intent were included. Exclusion criteria were emergency surgery, distant metastasis, prior pelvic surgery or radiotherapy, active perineal infection, and chronic immunosuppressive therapy.

Perioperative Management

All patients followed a standardized perioperative protocol including mechanical bowel preparation,

prophylactic antibiotics (cefuroxime and metronidazole), maintenance of intraoperative normothermia, extralevator APER technique,^{1p, 23} and primary perineal wound closure with closed suction drainage.¹⁷

Data Collection

Collected variables included demographics, comorbidities, laboratory parameters (hemoglobin, serum albumin), oncological characteristics, operative details, and postoperative outcomes. PWI was defined according to CDC criteria. Performance status was assessed using ECOG criteria.¹⁶

Statistical Analysis

Statistical analysis was performed using IBM SPSS Statistics version 26. Continuous variables were compared using Student's t-test or Mann–Whitney U test, and categorical variables using chi-square or Fisher's exact test.¹⁸ Variables with $p < 0.20$ on univariate analysis were entered into multivariate logistic regression. A p -value < 0.05 was considered statistically significant.

Results

Patient Characteristics

The study included 41 patients with a mean age of 49.1 ± 11.5 years; 63.4% were male. Diabetes mellitus was present in 22.0% of patients, and 39.0% had hypoalbuminemia. Neoadjuvant chemoradiotherapy was administered to 80.5%.

Table I. Baseline characteristics of patients undergoing abdominoperineal excision (N=41)

Variable	Overall (N=41)	PWI (n=13)	No PWI (n=28)	p-value
Age (years), mean $\pm$ SD	49.1 $\pm$ 11.5	53.8 $\pm$ 9.2	46.9 $\pm$ 11.9	0.065
Age $\geq$ 50 years, n (%)	22 (53.7)	11 (84.6)	11 (39.3)	0.005
Male sex, n (%)	26 (63.4)	6 (46.2)	20 (71.4)	0.114
Body mass index (kg/m ²), mean $\pm$ SD	22.8 $\pm$ 3.2	22.1 $\pm$ 2.9	23.2 $\pm$ 3.3	0.312
Diabetes mellitus, n (%)	9 (22.0)	7 (53.8)	2 (7.1)	<0.001
Hemoglobin (g/dl), mean $\pm$ SD	11.8 $\pm$ 1.6	10.9 $\pm$ 1.4	12.2 $\pm$ 1.5	0.014
Hemoglobin $\geq$ 11.0 g/dl, n (%)	14 (34.1)	8 (61.5)	6 (21.4)	0.011
Serum albumin (g/dl), mean $\pm$ SD	3.6 $\pm$ 0.5	3.1 $\pm$ 0.4	3.8 $\pm$ 0.4	<0.001
Albumin $<$ 3.5 g/dl, n (%)	16 (39.0)	11 (84.6)	5 (17.9)	<0.001
Neoadjuvant chemoradiotherapy, n (%)	33 (80.5)	12 (92.3)	21 (75.0)	0.185

Incidence of Perineal Wound Infection

PWI developed in 13 patients (31.7%), consistent with rates reported in the literature.^{4,14,24} Most infections were superficial; however, four patients required surgical debridement.¹ The most common isolated organisms were *Escherichia coli* and *Enterococcus* species.¹⁵

Risk Factor Analysis

Table II. *Univariate analysis of risk factors for perineal wound infection*

Variable	Category	PWI n/N (%)	No PWI n/N (%)	Risk Ratio (95% CI)	p-value
Age	≥50 years	11/22 (50.0)	11/22 (50.0)	3.13 (1.24–7.91)	0.002
Sex	Female	7/15 (46.7)	8/15 (53.3)	1.91 (0.96–3.79)	0.024
Diabetes mellitus	Present	7/9 (77.8)	2/9 (22.2)	14.22 (1.20–18.80)	0.007
Hemoglobin	≤11.0 g/dl	8/14 (57.1)	6/14 (42.9)	2.85 (0.73–11.13)	0.024
Serum albumin	<3.5 g/dl	11/16 (68.8)	5/16 (31.2)	7.76 (1.97–30.63)	0.001
Neoadjuvant CCRT	Received	12/33 (36.4)	21/33 (63.6)	2.84 (0.72–24.07)	0.023

Table III. *Multivariate logistic regression analysis of independent predictors of PWI*

Variable	Category	Adjusted OR	95% CI	p-value
Serum albumin	<3.5 g/dl	6.45	1.52–27.38	0.011
Diabetes mellitus	Present	11.87	1.89–74.52	0.008

Patients who developed PWI had significantly longer hospital stays (18.3 ± 4.2 vs. 12.1 ± 2.8 days; $p < 0.001$) & delayed initiation of adjuvant chemotherapy.^{2,5,22}

Discussion

This prospective study demonstrates that hypoalbuminemia and diabetes mellitus are independent risk factors for perineal wound infection following APER. The observed PWI rate of 31.7% is consistent with international literature.^{4,7,14,23}

Hypoalbuminemia reflects poor nutritional and inflammatory status and adversely affects wound healing through impaired collagen synthesis and immune dysfunction.^{2,15,20} Diabetes mellitus compromises wound healing via microvascular disease and impaired leukocyte function.^{7,22} These findings emphasize the importance of preoperative nutritional assessment and perioperative glycemic control.^{5,15}

Although anemia and neoadjuvant chemoradiotherapy were significant on univariate analysis, they did not retain significance on multivariate analysis, possibly due to limited sample size.^{2,4,23} Prior studies have similarly noted that neoadjuvant radiotherapy poses a considerable wound-healing burden, particularly with primary perineal closure.^{4,17} Extralevator APER, while reducing circumferential resection margin positivity,²¹ has been associated with larger perineal defects and may increase wound complication risk when not supplemented by reconstructive techniques.^{1,23}

Limitations

The main limitations include small sample size, single-center design, and limited ability to adjust for all potential confounders.^{2,22} Nevertheless, the

prospective design and standardized protocols strengthen the validity of the findings.

Conclusion

Perineal wound infection remains a significant postoperative complication after abdominoperineal excision of rectum.^{14,24} Hypoalbuminemia and diabetes mellitus are independent predictors of infection. Targeted preoperative optimization of nutritional status and glycemic control may reduce postoperative morbidity.^{2,5,25}

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