Scientific Research Publishing

Open Journal of Nursing, 2026, 16(7), 401-407
https://www.scirp.org/journal/ojn
ISSN Online: 2162-5344
ISSN Print: 2162-5336

Analysis of Factors Influencing Postoperative Wound Infection in Patients with Pelvic Tumors

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How to cite this paper: Liang, X.Y. and Li, Y. (2026) Analysis of Factors Influencing Postoperative Wound Infection in Patients with Pelvic Tumors. *Open Journal of Nursing*, **16**, 401-407.
https://doi.org/10.4236/ojn.2026.167029

Received: May 18, 2026
Accepted: June 30, 2026
Published: July 3, 2026

Abstract

Objective: To investigate factors associated with postoperative wound infection in patients undergoing surgery for pelvic tumors, thereby providing a reference for clinical practice and reducing the incidence of wound infection in this population. **Methods:** Clinical data of 152 patients with pelvic tumors who underwent surgery in the Department of Musculoskeletal Oncology at Sun Yat-sen University Cancer Center from January 1, 2023, to March 1, 2026, were selected for retrospective analysis. Univariate analysis of variance was used to identify risk factors associated with wound infection, and the selected factors were further examined using multivariate logistic regression analysis. **Results:** Among the 152 patients who underwent pelvic tumor surgery, 28 developed wound infections with positive bacterial cultures, including 11 cases of Gram-positive bacteria, 12 cases of Gram-negative bacteria, and 5 cases of mixed infections. A history of diabetes, low preoperative albumin, and postoperative fecal incontinence were identified as independent risk factors for wound infection after pelvic tumor surgery ($P < 0.05$). The effects of age, sex, BMI, hypertension, reoperation, and a history of radiotherapy at the surgical site on the occurrence of wound infection were not statistically significant ($P > 0.05$). **Conclusion:** When formulating the surgical plan for pelvic tumors and during the postoperative treatment and care of wound infections in patients with pelvic tumors, attention should be paid to these risk factors to reduce the occurrence of wound infections.

Keywords

Pelvic Tumor, Wound Infection, Influencing Factors

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1. Introduction

Pelvic tumors (Pelvic Tumor) refer to neoplastic lesions that originate primarily in, or secondarily involve, the pelvic ring skeleton (ilium, ischium, pubis, and sacrum), cartilage, and soft tissues of the pelvic wall, excluding tumors arising from intrapelvic organs such as the bladder, rectum, and ovaries. According to biological behavior, they can be classified as benign, borderline (intermediate), or malignant; according to origin, they can be divided into primary tumors arising from pelvic tissues and secondary tumors resulting from distant malignant tumors metastasizing to the pelvis [1]. Owing to the large tumor volume and the complex anatomy of adjacent pelvic viscera and major vessels, surgical resection of malignant pelvic tumors requires advanced techniques, is highly challenging, and is associated with numerous postoperative complications [2]. Postoperative wound infection is one of the common complications after pelvic tumor surgery. Wound infection prolongs the overall disease course, increases clinical workload, and imposes additional financial burdens on patients and their families; it also increases the likelihood of secondary debridement surgery and exacerbates psychological stress in patients and their families, leading to negative emotions. In this study, we retrospectively analyzed the experience in preventing, diagnosing, and treating postoperative wound infection after pelvic tumor surgery, and examined the associated risk factors for wound infection.

2. Materials and Methods

2.1. General Information

A total of 152 patients with pelvic tumors who underwent surgery and were admitted to the Department of Musculoskeletal Oncology at Sun Yat-sen University Cancer Center from January 1, 2023, to March 1, 2026, were selected as the study subjects, and they were followed up postoperatively until discharge. The retrospective review comprised patients' general clinical characteristics, surgical information, postoperative wound status, and bacterial culture results. Inclusion criteria were as follows: 1) all patients underwent pelvic tumor surgery; 2) age ≥ 18 years and informed consent obtained from family members; 3) complete medical records. Exclusion criteria: 1) age < 18 years; 2) abnormal coagulation function; 3) indeterminate wound infection; 4) comorbid psychiatric disorders that prevented cooperation.

2.2. Surgical Procedure

All patients with pelvic tumors underwent preoperative bowel preparation, skin preparation, and indwelling urinary catheterization. Prophylactic antibiotics were administered preoperatively, with additional dosing if the procedure exceeded 3 h. Intraoperatively, patients were positioned in the lateral decubitus or supine position, followed by routine skin disinfection and draping. Before skin closure at the end of surgery, the wound was irrigated with Andofu and distilled water, hemostasis was achieved thoroughly, the prosthesis was implanted, and one or two

silicone drainage tubes were placed. The incision was then closed in layers and dressed. Drainage tubes were removed when the daily drainage volume was <30 ml. Systemic antibiotics were continued until drain removal. During postoperative nursing care, excreta were promptly cleaned to prevent fecal contamination of the wound, and an air mattress or pressure-relieving mattress was used with assistance in regular turning to prevent sacrococcygeal pressure injury. The color and characteristics of the drainage fluid were closely monitored; if the drainage fluid became turbid or the patient's temperature exceeded 38.5˚C, this was reported immediately and bacterial culture of the drainage fluid and blood cultures were obtained.

2.3. Statistical Analysis

Using the wound infection criteria proposed by Horan *et al.* [3], we retrospectively analyzed 11 potential risk factors for wound infection: 1) patient age; 2) sex; 3) BMI; 4) history of reoperation; 5) history of diabetes; 6) prior radiotherapy to the surgical site; 7) preoperative serum albumin level; 8) preoperative hemoglobin concentration; 9) intraoperative blood loss; 10) operative duration; and 11) postoperative fecal incontinence. Data were analyzed using SPSS 27. Univariate analyses were performed using t/χ^2 tests, with $P < 0.05$ considered statistically significant. Multivariate analysis was conducted using logistic regression, with a significance level of $\alpha = 0.05$; differences were considered statistically significant at $P < 0.05$.

3. Results

3.1. Basic Information on Postoperative Wound Infections Following Pelvic Tumor Surgery

A total of 152 patients were included, comprising 86 males and 66 females, with an age range of 18 - 80 years and a mean age of 47.4 years. Postoperative infection rate: 28 cases (18.4%), including 17 cases of single-strain infection (11.18%) and 11 cases of mixed-strain infection (7.24%). Among these, there were 11 cases of Gram-positive bacteria (7.24%), 12 cases of Gram-negative bacteria (7.89%), and 5 cases of mixed infection (3.29%). The distribution of pathogens showed that the main causative bacteria were: Escherichia coli (the most predominant pathogen), Enterococcus faecalis, Staphylococcus epidermidis, Proteus mirabilis, Klebsiella pneumoniae, etc.

3.2. Analysis of Clinically Relevant Indicators

Statistical analysis of all patient data showed that a history of diabetes, low preoperative albumin, postoperative fecal incontinence, were three risk factors for postoperative wound infection following pelvic tumor surgery ($P < 0.05$); these are shown in Table 1.

3.3. Multivariate Analysis

The multifactor logistic regression analysis indicated that a history of diabetes,

low preoperative albumin, and postoperative fecal incontinence were independent risk factors for postoperative wound infection after pelvic tumor surgery ($P < 0.05$), as shown in (see Table 2).

Table 1. Analysis of clinically relevant indicators in the two patient groups.

Influencing factors		Observation group (28)	Control group (n = 124)	The t/χ^2 value	p-value
Age	<60	21	89	0.119	0.730
	≥60	7	21		
Gender	Male	17	70	0.170	0.680
	Female	11	54		
BMI	<18.5	2	10	0.328	0.849
	18.5 - 24	15	59		
	≥24	11	55		
Hypertension	Yes	2	16	0.279	0.394
	No	26	108		
Diabetes mellitus	Yes	7	6	9.434	0.002
	No	21	118		
Reoperation	Yes	1	4	0.009	0.926
	No	27	120		
Low preoperative albumin levels	Yes	13	28	6.595	0.010
	No	15	96		
Low preoperative hemoglobin.	Yes	8	30	0.233	0.629
	No	20	94		
History of radiotherapy	Yes.	1	5	0.013	0.910
	None	27	119		
Postoperative fecal incontinence	Yes	21	31	23.199	<0.001
	No	7	93		
Surgical duration (h)	<6 h	15	96	6.595	0.065
	≥6 h	13	28		
Blood loss (mL)	<500 mL	5	38	6.187	0.103
	500 - 1500 mL	9	50		
	1500 - 2000 mL	4	16		
	>2000 mL	10	20		

Table 2. Multivariate retrospective analysis of postoperative wound infection occurrence.

Multifactorial				
	The β value	OR value	95% CI	p-value
Diabetes mellitus	1.18	3.25	1.48 - 7.14	0.003
Low preoperative albumin levels	1.35	3.86	1.72 - 8.66	0.001
Postoperative fecal incontinence	1.86	6.42	2.91 - 14.16	<0.001

4. Discussion

Main conclusions of this study: A history of diabetes mellitus, hypoalbuminemia before operation and postoperative fecal incontinence are independent risk factors for surgical site infection after pelvic tumor resection. The above risk factors should be considered when designing surgical resection protocols for pelvic tumors and implementing postoperative treatment and nursing management for surgical site infection.

Given the unique anatomical location and complexity of the pelvis, surgery for patients with pelvic tumors is often more challenging than that for other conditions. Moreover, resection of malignant pelvic tumors entails higher technical requirements and greater operative difficulty. Therefore, when formulating preoperative surgical plans for this specific patient population, clinicians should more comprehensively evaluate all patient information and physical conditions and determine whether relevant indicators are favorable for surgery. Clinicians should monitor for the development of fecal incontinence throughout postoperative treatment and nursing care.

Preoperative hyperglycemia and elevated glycated hemoglobin are independent risk factors for postoperative incisional infection, delayed wound healing, prosthesis-related infection, and prolonged hospitalization in orthopedic patients [4]. For patients with a history of diabetes mellitus, rigorous preoperative screening and optimization of glycemic control, along with individualized adjustment of glucose-lowering regimens, can significantly reduce perioperative infection risk, promote wound healing, and improve the medium- to long-term prognosis of prostheses [5]. Blood glucose levels should be closely monitored in strict accordance with medical orders before and after surgery. Patients and their caregivers are instructed to regularly monitor blood glucose, adopt a small and frequent meal pattern, and watch for nocturnal hypoglycemic manifestations. Timely health education shall be provided for patients with poor treatment compliance.

Routine preoperative nutritional risk screening is performed in all patients with pelvic tumors (NRS2002), malnutrition and low serum albumin levels in patients are independent risk factors for postoperative complications [6]. For those with low preoperative albumin and hemoglobin levels, timely intravenous hyperalimentation can be provided, and nutritional supplementation can be strengthened as prescribed (e.g., erythropoietin, polysaccharide iron, multivitamin tablets). Patients should be encouraged to eat small, frequent meals and consume high-protein, high-calorie, easily digestible foods to enhance appetite. Patients with pelvic tumors may also receive a carbohydrate-loading intervention 1 day before surgery; the routine recommendation is to consume 800 mL of a 12.5% carbohydrate beverage, which can effectively mitigate postoperative insulin resistance [7]. Prophylactic placement of air mattress and pressure-relieving mattress can be implemented preoperatively for patients undergoing pelvic surgery. Gel pads are additionally applied in malnourished patients to prevent pressure injuries. For patients confined to bed postoperatively, nursing staff shall strengthen ward rounds

and assist family members with regular turning every day. Attention should be paid to all indwelling catheters during position shifting to avoid kinking or compression. For patients wearing anti-thromboembolic compression stockings and pelvic orthoses, patients and their caregivers are instructed to regularly remove the orthoses and adjust the stockings daily, with skin assessment over pressure-prone sites performed. Mepilex dressings are applied prophylactically over areas at high risk of pressure injury; dressings are checked routinely and abnormal findings are managed promptly.

After tumor resection and partial sacral nerve excision during pelvic tumor surgery, the surgical incision is anatomically close to the anus, leading to postoperative fecal incontinence in some patients and increasing the risk of wound contamination [8]. Therefore, postoperative patients should be closely monitored for the occurrence of fecal incontinence. The bed unit shall be kept clean and breathable daily, and the contaminated impermeable underpad shall be replaced promptly. Bedridden patients require regular positional changes to improve local ventilation around the perianal area and prevent skin lesions caused by prolonged compression and a moist environment. Stool-contaminated bedding of incontinent patients should be replaced immediately to prevent prolonged skin maceration by feces. For patients with frequent watery stool, ostomy bags can be applied around the anus to collect excreta. Diets prone to intestinal gas production are restricted, and relevant precautions for ostomy bag application are informed to patients. Close dynamic assessment and refined nursing of perianal skin are required postoperatively. Excreta should be promptly removed to keep the perianal skin clean and dry. Skin barrier films and pressure-relieving dressings are used to isolate fecal irritation for the prevention of incontinence-associated dermatitis and pressure injuries. Meanwhile, standardized dietary management is conducted to regulate intestinal rhythm; cold and irritant foods are restricted to reduce predisposing factors for diarrhea. Antidiarrheal agents and probiotic preparations are supplemented when necessary to regulate intestinal flora, and pelvic floor muscle training plus regular defecation training are carried out to improve anal continence function. In addition, combined nutritional support and individualized positional nursing can alleviate local tissue compression and fecal maceration, thereby effectively lowering the incidence of perianal skin breakdown, secondary infection and pressure injuries [9]. For patients with incontinence-associated dermatitis, health education and privacy protection measures should be implemented, nursing guidance should be intensified for patients and their caregivers, and relevant knowledge regarding skin care, dietary control and condition monitoring should be popularized [10].

5. Reflections and Future Directions

The number of pelvic tumor surgeries performed at our center is currently limited, resulting in an insufficient sample size. In the future, we aim to include more clinical cases to provide stronger evidence for reducing the risk of infection asso-

ciated with such procedures. For infected wounds, timely surgical debridement is also required to improve patients' quality of life.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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