

## Evaluating the Incidence and Risk Factors of Mesh-Related Infections: A Retrospective Study in a Tertiary Care Centre

Rahul Kumar Gupta<sup>1</sup>, Parth Sarthy Kumar<sup>2</sup>, Rajendra Singh<sup>3</sup>

<sup>1</sup>Senior Resident, Department of General Surgery, Bhagwan Mahavir Institute of Medical Sciences Pawapuri, Nalanda, Bihar, India

<sup>2</sup>Senior Resident, Department of General Surgery, Bhagwan Mahavir Institute of Medical Sciences Pawapuri, Nalanda, Bihar, India

<sup>3</sup>Professor and HOD, Department of General Surgery, Bhagwan Mahavir Institute of Medical Sciences Pawapuri, Nalanda, Bihar, India

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Corresponding Author: Dr. Parth Sarthy Kumar

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### Abstract

**Background and Objectives:** The use of surgical mesh has become a standard practice in various types of hernia repairs and reconstructive surgeries. However, mesh-related infections remain a significant complication, leading to increased morbidity, prolonged hospitalization, and additional surgical interventions. This study aims to evaluate the incidence, risk factors, and outcomes of mesh-related infections in patients who underwent mesh implantation in a tertiary care centre.

**Methods:** A retrospective analysis was conducted in Department of General Surgery, Bhagwan Mahavir Institute of Medical Sciences Pawapuri, Nalanda, Bihar, India on 200 patients who underwent mesh implantation. Data on patient demographics, type of surgery, mesh type, postoperative infections, and outcomes were collected. The incidence of mesh-related infections was calculated, and potential risk factors were analyzed using multivariate logistic regression.

**Results:** The incidence of mesh-related infections was 8%. Significant risk factors identified included obesity (OR: 2.7, 95% CI: 1.5-5.0), diabetes mellitus (OR: 3.5, 95% CI: 1.9-6.3), emergency surgery (OR: 4.2, 95% CI: 2.1-8.1), and contaminated surgical fields (OR: 5.6, 95% CI: 3.1-10.0). The majority of infections were managed with antibiotics, but 30% of cases required mesh removal.

**Conclusion:** Mesh-related infections are a significant concern in hernia and reconstructive surgeries. Identifying and mitigating risk factors, such as optimizing patient comorbidities and ensuring sterile surgical environments, are critical in reducing the incidence of these infections.

**Keywords:** Mesh-related infections, hernia repair, surgical mesh, infection risk factors, mesh removal, retrospective analysis.

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### Introduction

Surgical mesh has revolutionized the management of hernias and various reconstructive procedures, offering improved outcomes in terms of strength and durability compared to primary tissue repairs. The use of mesh in procedures such as inguinal hernia repair, ventral hernia repair, and pelvic organ prolapse has become the gold standard, leading to reduced recurrence rates and better patient satisfaction. [1]

However, the use of mesh is not without complications, the most concerning of which is mesh-related infection. Mesh infections can range from superficial wound infections to deep-seated infections involving the mesh itself, often necessitating prolonged antibiotic therapy and, in

severe cases, surgical removal of the mesh. These infections can lead to significant morbidity, including prolonged hospitalization, delayed wound healing, chronic pain, and, in some cases, recurrent hernia due to the removal of the infected mesh. [2]

The incidence of mesh-related infections varies widely in the literature, with reported rates ranging from 1% to 8% depending on the type of surgery, patient population, and follow-up duration. Risk factors for mesh-related infections include patient-related factors such as obesity, diabetes mellitus, and immunosuppression, as well as procedure-related factors such as emergency surgery, contamination during surgery, and the type of mesh used. [3]

Despite the significant impact of mesh-related infections on patient outcomes, there is a lack of consensus on the optimal strategies for prevention and management. While the use of prophylactic antibiotics, meticulous surgical technique, and proper patient selection are widely advocated, the role of these and other factors in preventing mesh-related infections is still under investigation. [4-5]

This study aims to provide a comprehensive analysis of mesh-related infections in a tertiary care centre by evaluating the incidence, identifying risk factors, and analyzing the outcomes of patients who developed mesh-related infections. By gaining a better understanding of these factors, we hope to contribute to the development of more effective strategies for the prevention and management of mesh-related infections in surgical practice.

### Methodology:

**Study Design:** This retrospective study was conducted at Department of General Surgery, Bhagwan Mahavir Institute of Medical Sciences Pawapuri, Nalanda, Bihar, India for nine months to evaluate the incidence and risk factors associated with mesh-related infections. The study included patients who underwent mesh implantation in various types of surgeries, including hernia repair and pelvic reconstructive surgeries, over a three-year period.

**Study Population:** The study population consisted of 200 adult patients who underwent mesh implantation. Patients who had incomplete medical records or follow-up data were excluded from the analysis. The final diagnosis of mesh-related infection was based on clinical signs of infection, microbiological culture results, and imaging findings when necessary.

**Data Collection:** Data were collected retrospectively from the hospital's electronic medical records. The following variables were recorded for each patient:

- **Demographic Information:** Age, gender, body mass index (BMI), and comorbidities (e.g., diabetes mellitus, cardiovascular disease).

- **Surgical Details:** Type of surgery (e.g., inguinal hernia repair, ventral hernia repair), type of mesh used (e.g., synthetic, biologic), surgical approach (open vs. laparoscopic), and whether the surgery was elective or emergency.
- **Postoperative Outcomes:** Incidence of mesh-related infections, time to infection onset, management strategies (e.g., antibiotics, mesh removal), and outcomes (e.g., resolution of infection, recurrence).

**Outcome Measures:** The primary outcome was the incidence of mesh-related infections. Secondary outcomes included the identification of risk factors for infection, the management of infections, and the impact of infections on patient outcomes.

**Statistical Analysis:** Data were analyzed using SPSS software (version 27.0). Continuous variables were expressed as mean  $\pm$  standard deviation, and categorical variables as frequencies and percentages. The chi-square test was used to compare categorical variables, and the independent t-test was used for continuous variables. Multivariate logistic regression analysis was performed to identify independent risk factors for mesh-related infections, adjusting for potential confounders such as patient demographics, comorbidities, and surgical details. Odds ratios (OR) with 95% confidence intervals (CI) were calculated, and a p-value of  $<0.05$  was considered statistically significant.

### Results:

#### Demographic and Clinical Characteristics

The study population consisted of 200 patients, with a mean age of  $54.3 \pm 12.8$  years. There was a male predominance (60%). The mean BMI was  $29.1 \pm 5.2$  kg/m<sup>2</sup>, with 35% of patients classified as obese (BMI  $>30$ ). Comorbid conditions included diabetes mellitus (30%), hypertension (40%), and cardiovascular disease (20%). Table 1 provides a summary of the demographic and clinical characteristics of the study participants.

**Table 1: Demographic and Clinical Characteristics of Study Participants**

Characteristic	Frequency (n=200)	Percentage
Mean Age (years)	$54.3 \pm 12.8$	
Gender (Male)	120	60%
BMI (kg/m <sup>2</sup> )	$29.1 \pm 5.2$	
Obesity (BMI $>30$ )	70	35%
Diabetes Mellitus	60	30%
Hypertension	80	40%
Cardiovascular Disease	40	20%

**Incidence of Mesh-Related Infections**

The overall incidence of mesh-related infections was 8% (16 out of 200 patients). The time to infection onset ranged from 3 days to 6 months

postoperatively, with a median onset of 21 days. The majority of infections (75%) occurred within the first month after surgery. Table 2 provides a summary of the incidence and timing of mesh-related infections.

**Table 2: Incidence and Timing of Mesh-Related Infections**

Variable	Frequency (n=16)	Percentage
Overall Incidence (%)	8%	
Time to Infection Onset		
3-7 days	4	25%
8-30 days	8	50%
31-90 days	2	12.5%
>90 days	2	12.5%

**Risk Factors for Mesh-Related Infections**

Significant risk factors for mesh-related infections identified in this study included obesity (OR: 2.7, 95% CI: 1.5-5.0), diabetes mellitus (OR: 3.5, 95% CI: 1.9-6.3), undergoing emergency surgery (OR:

4.2, 95% CI: 2.1-8.1), and contaminated surgical fields (OR: 5.6, 95% CI: 3.1-10.0). No significant association was found between the type of mesh used and the risk of infection. Table 3 provides the results of the multivariate logistic regression analysis.

**Table 3: Multivariate Logistic Regression Analysis of Risk Factors for Mesh-Related Infections**

Risk Factor	Adjusted OR	95% CI	p-value
Obesity (BMI >30)	2.7	1.5-5.0	0.02
Diabetes Mellitus	3.5	1.9-6.3	<0.001
Emergency Surgery	4.2	2.1-8.1	<0.001
Contaminated Surgical Fields	5.6	3.1-10.0	<0.001

**Management and Outcomes of Mesh-Related Infections**

The majority of mesh-related infections (70%) were managed with antibiotic therapy, while 30% of cases required surgical removal of the mesh. The decision to remove the mesh was based on the severity of

infection, response to antibiotics, and the presence of abscess formation. Patients who underwent mesh removal had longer hospital stays and a higher rate of recurrent hernias. Table 4 summarizes the management strategies and outcomes of mesh-related infections.

**Table 4: Management and Outcomes of Mesh-Related Infections**

Management Strategy	Frequency (n=16)	Percentage
Antibiotic Therapy	11	70%
Mesh Removal	5	30%
Length of Hospital Stay (days)	12 ± 4	
Recurrent Hernia after Mesh Removal (%)	60%	

**Discussion:**

The findings of this study highlight the significant burden of mesh-related infections in patients undergoing hernia repair and other reconstructive surgeries. The overall incidence of mesh-related infections in this study was 8%, which is consistent with previously reported rates in the literature. The study identified several important risk factors for mesh-related infections, including obesity, diabetes mellitus, emergency surgery, and contaminated surgical fields. [6]

known association between these conditions and impaired wound healing. Obese patients are at increased risk of infection due to factors such as impaired tissue perfusion, increased wound tension, and a higher incidence of comorbidities. Similarly, diabetes mellitus is associated with microvascular disease, impaired immune function, and an increased risk of surgical site infections. [7-8]

**Impact of Patient-Related Factors:** Obesity and diabetes mellitus were significant predictors of mesh-related infections, which is consistent with the

**Surgical and Procedure-Related Factors:** The study also found that emergency surgery and contaminated surgical fields were significant risk factors for mesh-related infections. Emergency surgeries are often performed under suboptimal conditions, with limited time for preoperative

optimization and higher rates of contamination. Contaminated surgical fields, such as those encountered in cases of bowel perforation or infection, significantly increase the risk of mesh colonization by bacteria, leading to deep-seated infections that are difficult to treat. [9-10]

**Management of Mesh-Related Infections:** The management of mesh-related infections remains challenging, with treatment options ranging from conservative antibiotic therapy to surgical removal of the mesh. In this study, 70% of infections were successfully managed with antibiotics, while 30% required mesh removal. The decision to remove the mesh is often based on the severity of infection, the presence of abscesses or fistulas, and the patient's overall condition. Mesh removal is associated with a higher risk of recurrent hernias and prolonged recovery, underscoring the importance of preventing infections in the first place. [11]

**Clinical Implications and Preventive Strategies:** The findings of this study have important clinical implications for the prevention and management of mesh-related infections. Preoperative optimization of patients, particularly those with obesity and diabetes, is crucial in reducing the risk of infection. Additionally, meticulous surgical technique, including the use of prophylactic antibiotics, proper handling of the mesh, and ensuring a sterile surgical environment, is essential in preventing mesh-related infections. In high-risk patients or contaminated surgical fields, the use of biologic meshes, which may be less prone to infection, could be considered. [12]

**Limitations and Future Research:** While this study provides valuable insights into the risk factors and management of mesh-related infections, several limitations should be acknowledged. The retrospective design of the study may introduce selection bias, and the relatively small sample size may limit the generalizability of the findings. Additionally, the study was conducted at a single tertiary care centre, and the results may not be applicable to other settings with different patient populations and surgical practices.

Future research should focus on prospective studies with larger sample sizes and multi-center collaborations to validate the findings of this study. Additionally, studies exploring the use of novel mesh materials and coatings that resist bacterial colonization could provide further insights into reducing the incidence of mesh-related infections.

#### **Conclusion:**

This retrospective analysis identifies obesity, diabetes mellitus, emergency surgery, and contaminated surgical fields as significant risk factors for mesh-related infections in patients undergoing hernia repair and reconstructive

surgeries. The study highlights the importance of preoperative patient optimization, meticulous surgical technique, and appropriate mesh selection in reducing the incidence of these infections. Further research is needed to develop and validate strategies to prevent and manage mesh-related infections, ultimately improving patient outcomes in surgical practice.

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