

Assessing the Incidence of Surgical Site Infections and Their Determinants in Elective Inguinal Hernia Surgery

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Abstract:

Background and Aim: Surgical site infections (SSIs) pose a considerable risk for individuals undergoing surgery. Various strategies for preventing surgical site infections (SSI) have been proposed, encompassing preoperative, intraoperative, and postoperative considerations. This paper seeks to provide a thorough examination of the incidence, risk factors, microbiology, prevention strategies, and management of surgical site infections in elective inguinal hernia surgery.

Material and Methods: The research included a comprehensive analysis of all elective adult inguinal hernioplasty procedures (n=800) performed within the designated timeframe. Data on patient demographics, surgical characteristics, and outcomes were gathered and examined.

Results: In a Present study, 25 surgical site infections (SSIs) were documented among 800 patients within 30 days following mesh repair for inguinal hernia. This data indicates an overall SSI rate of 3.1% (25 out of 800 patients). Every documented case of infection was classified as a superficial surgical site infection. During the original admission, surgical site infections (SSIs) were noted to occur within an average timeframe of 4.52 days following the procedure, with a significant majority (76%) identified within the initial week after surgery. The predominant microorganism identified was *Staphylococcus aureus*.

Conclusion: The findings underscore the critical need to identify high-risk patients and to implement preventive strategies aimed at reducing the occurrence of surgical site infections (SSIs). Future research must prioritise the creation of effective strategies aimed at preventing surgical site infections in this specific patient demographic.

Keywords: Inguinal Hernia, Hernioplasty, Surgical site infections, *Staphylococcus Aureus*.

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Introduction

Inguinal hernia repair ranks among the most frequently conducted surgical interventions worldwide. [1] The surgical intervention for adults involves the careful repositioning of the hernia contents, followed by the reinforcement of the posterior wall through suturing, known as herniorrhaphy, or the application of non-absorbable mesh, referred to as hernioplasty. The laparoscopic approach has recently demonstrated promising outcomes. [2] Surgical site infections (SSIs) refer to infections that develop at the incision site following surgical procedures and the placement of implants. Such occurrences may take place within a 30-day window following the completion of the surgical procedure. [3] Surgical site infections (SSIs) have a profound effect on patient outcomes and the allocation of healthcare resources, highlighting the importance of comprehending their

incidence and effective management strategies. Several risk factors for surgical site infections following elective inguinal hernia repair have been identified, including diabetes and current smoking status. [4] Research into the risk factors for surgical site infections (SSIs) has often overlooked the potential influences of the type of mesh and the surgical techniques employed. Various strategies for preventing surgical site infections (SSI) have been suggested, encompassing preoperative, intraoperative, and postoperative considerations. [5] In 2007, a meta-analysis was published that examined six randomised clinical trials (RCTs). The findings revealed that the rate of surgical site infections (SSI) following inguinal hernia surgery with mesh repair was 2.89%. [6] In 2018, a recent Cochrane meta-analysis reported that the rate of surgical site infections (SSI) stood at 2.59%. [7]

This paper seeks to provide a thorough examination of the incidence, risk factors, microbiology, prevention strategies, and management of surgical site infections in elective inguinal hernia surgery.

Material and Methods

An observational study was carried out in the department of general surgery at a Tertiary Care Teaching Institute in India, spanning a duration of one year following approval from the institutional ethical committee. The research included a total of 800 elective adult inguinal hernioplasty procedures performed within the designated timeframe. It specifically excluded individuals under the age of 18, cases where mesh was not employed, and instances of considerable contamination, including any breaches of the gastrointestinal tract.

On the day of surgery, the skin at the surgical site is prepared by removing hair and is then cleaned using ioprep. The Lichtenstein repair was performed using the standardised technique via an open approach.⁸ Patients underwent daily examinations until their discharge from the hospital, monitoring for any local signs of infection. Follow-up appointments were scheduled every other day in the outpatient department until the removal of sutures. Subsequently, patients were monitored on postoperative days 15 and 30. Infections that were identified were appropriately addressed, and all relevant details were meticulously documented. Records were maintained regarding hospitalisation, follow-up visits, and any further hospital admissions occurring within 30 days post-surgery. Individuals who had an additional surgery performed simultaneously were not included in the study.

Data regarding postoperative surgical site infections occurring within one month following the procedure were gathered. Factors related to demographics encompassed age, gender, body mass index (BMI), smoking habits, and alcohol consumption status. Coexisting conditions such as diabetes mellitus, hypertension, pulmonary disease, and any signs of an immunocompromised state.

The collected operative data included the American Society of Anaesthesiologists (ASA) score, the type and characteristics of the hernia, the duration of inguinal hernia presentation, any prior history of inguinal hernia repairs, as well as the lengths of preoperative hospital stay and operative time. Superficial surgical site infection (SSI) is

characterised as an infection that develops within 30 days following surgery, affecting only the skin or subcutaneous tissue.

Statistical analysis

The collected data was organised and input into a spreadsheet application (Microsoft Excel 2019) before being transferred to the data editor interface of SPSS version 19 (SPSS Inc., Chicago, Illinois, USA). Quantitative variables were characterised using means and standard deviations or medians and interquartile ranges, depending on their distribution. Qualitative variables were reported in terms of counts and percentages. The confidence level for all tests was established at 95%, while the level of significance was set at 5%.

Results

The final analysis comprised a total of 800 patients, selected according to established inclusion and exclusion criteria. Tables 1 and 2 present demographic data and information related to the surgery. Analysing each variable independently through univariate logistic regression reveals several factors linked to a heightened risk of surgical site infections (SSI): age over 65 years, a body mass index (BMI) of 24.6 kg/m² or higher, the presence of diabetes, ASA classifications 3 and 4, and extended surgical duration. All other variables were omitted from subsequent analysis.

In a recent study, 25 surgical site infections (SSIs) were documented among a cohort of 800 patients within 30 days following mesh repair for inguinal hernia, resulting in an overall SSI rate of 3.1% (25/800). Every documented case of infection was classified as a superficial surgical site infection. During the original admission, surgical site infections (SSIs) were noted to occur within an average timeframe of 4.52 days following the procedure, with a significant majority (76%) identified within the initial week after surgery. The predominant microorganism identified was *Staphylococcus aureus* (15). The additional microorganisms identified were *Staphylococcus epidermidis* (5), *Pseudomonas aeruginosa* (4), *Enterococcus faecalis* (2), and methicillin-resistant *Staphylococcus epidermidis* (1). All these patients experienced recovery through the administration of intravenous antibiotics and/or local wound management techniques, including dressings and, when necessary, drainage, all while retaining the mesh in place.

Table 1: Age and gender Distribution of study population

Variables	Mean±SD
Age (Years)	50.6±14.23
Gender	
Male	790 (98.75)
female	10 (1.25)

Table 2: ASA score

ASA grade	Number	Percentage (%)
I	160	20
II	590	73.75
III	44	5.5
IV	2	0.25

Discussion

Complications that may arise shortly after surgeries for inguinal and femoral hernias encompass recurrence, superficial surgical site infections, seroma or haematoma formation, urinary retention, and potential bladder injury. [1] Among the late complications that may arise are recurrence, deep surgical site infections (such as mesh infection), sexual dysfunction or pain, and intestinal obstruction. Advancements in surgical techniques for the treatment of inguinal and femoral hernias have been implemented to minimize the risk of complications.

This study seeks to explore the occurrence, contributing factors, microbial involvement, preventive measures, and treatment approaches for surgical site infections in elective inguinal hernia procedures. The findings offer important information regarding the occurrence and factors associated with SSIs in this specific group of patients. The overall SSI rate of 3.1% observed in our study aligns closely with the rates documented in earlier research efforts. [9]

In our study, the predominant microorganism identified in surgical site infections was *Staphylococcus aureus*. This was closely followed by *Staphylococcus epidermidis*, *Pseudomonas aeruginosa*, *Enterococcus faecalis*, and methicillin-resistant *Staphylococcus epidermidis*. This aligns with existing research indicating that *S. aureus* is the predominant pathogen linked to surgical site infections (SSIs). [10] Previous research corroborates these findings, indicating that factors such as advanced age, obesity, smoking, diabetes, and existing medical conditions independently contribute to the risk of surgical site infections (SSIs).- [8,9]

In 2022, Kohno et al reported that the incidence of postoperative surgical site infections following hernia surgery has been observed to range from 3.1% to 4.5%. [11] A comprehensive cohort analysis examining predictive factors for surgical site infections following inguinal hernia surgery in clean wounds has identified a notable correlation with a history of diabetes, a body mass index of 35 kg/m² or greater, and current smoking status. [11] The latest analysis involving 54,951 cases from the American College of Surgery National Surgical Quality Improvement Program (ACS NSQIP), as reported by Sereysky et al., concentrated exclusively on elective open repairs. A recent

extensive analysis involving 17,388 patients from the Herniated database revealed statistically significant differences in surgical site infection rates between total extra peritoneal repair (TEP repair via laparoscopy) and the Lichtenstein technique (open repair). [12]

The findings of our study highlight the critical role of adequate skin preparation and the use of antibiotic prophylaxis in minimising the incidence of surgical site infections (SSIs). Topical antimicrobial agents and antibiotic prophylaxis have demonstrated effectiveness in lowering the occurrence of surgical site infections across different surgical environments. [13]

Further investigation is essential to establish the ideal duration and specific type of antibiotic prophylaxis for inguinal hernia repair. Given that this research is a descriptive cross-sectional study conducted at a single institution, the findings may not be fully applicable to other contexts.

Conclusion

The findings highlight the importance of identifying high-risk patients and implementing preventive measures to reduce the incidence of SSIs. Future studies should focus on developing effective strategies for preventing SSIs in this patient population.

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