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Prophylactic Gentamicin in Inguinal Hernia Surgery- A Comparative Study

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ABSTRACT

Objective: To compare the development of surgical site infections in elective inguinal hernia procedure (Lichtenstein tension-free mesh repair) between topical gentamicin instillation over prolene mesh, and to no antibiotics over mesh.
Study Design: Quasi-Experimental study.
Place and Duration of Study: Surgical Department, Combined Military Hospital, Gujranwala Pakistan from Jan 2022 to Oct 2024.
Methodology: There were 162 patients in all. Group-A patients (131) were given topical gentamicin (one ampoule) over prolene Mesh per operatively, while Group-B patients (31) were subjected to no antibiotics topically per operative. Up until the 30th post-operative day, the development of surgical site infections was monitored.
Results: A total of 162 patients with mean age 47.96±17.84 years were studied. A significant difference between Group-A patients who experienced 3(2.29%) postoperative surgical site infections as compared to 6(19.35%) patients in Group-B was observed (p=0.002). Group-A patients were less sensitive to surgical site infections (SSI) than Group-B.
Conclusion: Per operative instillation of gentamicin over prolene mesh in elective inguinal hernia reduces surgical site infection following mesh repair (Lichtenstein tension free mesh repair) of inguinal hernia.

Keywords: Drug Instillation, Inguinal Hernias, Surgical Wound Infection.

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INTRODUCTION

The inguinal area is where over 70% of abdominal wall hernias occur. There are multiple methods for repairing inguinal hernias as open and laparoscopic methods.[1] Lichtenstein tension-free mesh repair swiftly emerged as the most often used method for inguinal hernia repair and has been embraced by an increasing number of methods.[2] Both techniques (open and laparoscopic) offer a clean surgical procedure with a 2% risk of surgical site infection (SSI).[3] This is one of the reasons why antibiotic prophylaxis is generally thought to be unnecessary.[4] However, in certain institutions, prophylactic antibiotics are necessary if their postoperative (SSI) rate is higher than 5%. This will decrease morbidity and the rate of wound infection.[5] SSI is one of the most frequent and significant post-operative complications of any surgical surgery, including inguinal hernia surgery.[6] Antibiotic prophylaxis has been found to reduce the risk of SSI in clean or infected wounds by about 60%.[7] The goal of prophylactic antibiotic administration is to attain a specific blood medication concentration at the surgical site in order to stop infection brought on by bacteria from the epidermis and other sources colonizing the wound.[8]

According to recent research, postoperative SSI rates can be affected by even small differences in surgical skill, operating time, and mesh-handling procedures.[9,10] A higher risk of wound infections following hernia surgeries has been also linked to patient-related risk factors as diabetes, smoking, obesity, and advanced age.

The purpose of our study was to determine whether or not prophylactic use of antibiotics lowers SSI after surgery in individuals with open mesh inguinal hernias.

METHODOLOGY

The quasi-experimental study was carried out at the inpatient surgical department of the Combined Military Hospital in Gujranwala, Pakistan from January 2022 to October 2024, after approval from the Institutional Ethical Review Committee (letter no. ERB 01-2025 Dated 06-01-2025).

Inclusion Criteria: Male patients receiving mesh technique elective inguinal hernia (Lichtenstein tension-free mesh repair) surgery.

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Exclusion Criteria: Patients with diabetes mellitus, abdominal cancer, or those on steroids, those with bilateral inguinal hernias, recurrent inguinal hernias, or those requiring emergency surgery were excluded.

Sample size was calculated using WHO calculator taking prevalence of recurrence in penalization group as 21.21%, and in simple matrixectomy group as 42.10%.[11] The estimated sample size came out to be 162 patients.

Written informed consent was acquired from each person. Non probability consecutive sampling was used to collect data. A proforma was used to record baseline demographic information, comorbidities, and surgical findings.

In Group-A, patients were administered 80 mg Gentamicin topically over the prolene mesh per operatively, it was labeled as experimental group. In Group B patients, surgery was conducted and gentamicin was not used, it was labeled as control group (Figure-1). Patients were randomly selected by lottery method. Prolene mesh was sutured with prolene 2/0.

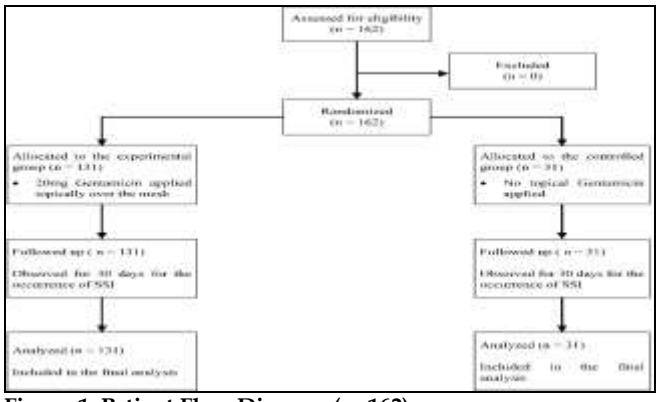


Figure-1: Patient Flow Diagram (n=162)

Vicryl 2/0 interrupted sutures were used to approximate the patient's subcutaneous fat, and prolene 2/0 interrupted sutures were used to seal the skin. Up to 24 hours after surgery, intravenous antibiotics were given, and then oral antibiotics for three days. All patients' dressing procedures and methods stayed the same (me pore dressing was opened 48 hours after surgery and then changed every 24 hours after that). In order to avoid variation in wound-handling methods, neither group employed drains.

All of the procedures were carried out by the same surgical team, and patients were monitored for the emergence of SSI for thirty days following surgery. The Southampton wound grading system (Table-I) was used to assess the wounds, and wounds meeting Class II and above were deemed positive for SSIs. Patients' contact information was obtained, and all information was recorded on a specially designed data collection proforma. During outpatient follow ups, physical examinations were carried out, but in any case, where physical follow-up was not feasible, telephone confirmation was done.

Table-I: Southampton Wound Grading System

Grade	Definition
0	Normal healing
I	Normal healing with mild bruising or haematoma
II	Erythema plus other signs of inflammation (e.g., warmth, tenderness, induration)
III	Clear or haemoserous discharge
IV	Pus discharge ± wound breakdown
V	Deep or severe wound infection with or without tissue necrosis; hematoma requiring evacuation

The Southampton scale was selected because of its usefulness for evaluating mesh-related groin wound infections, repeatability, and ease of clinical application.

Statistical Package for Social Sciences (SPSS) version 20 was used to analyze the data. Quantitative factors were expressed using Mean±SD, whereas qualitative variables were expressed using frequency and percentages.Chi-square test was employed to examine associations. A *p*-value ≤0.05 was considered statistically significant.

RESULTS

A total of 162 patients underwent elective surgery (Lichenstein tension-free mesh repair) for inguinal hernias. Group-A patients (mean age 47.96±17.84 years) received gentamicin over prolene mesh, while Group-B (mean age 49.1±18.3) patients underwent same procedure without gentamicin.

Age-based comparability was confirmed by the lack of a statistically significant variation in mean age between the two groups (p=0.620).

In this study, four age categories were created. Table-II shows, majority of patients were of age group 1 (17-33 years), (n=47, 29.1%). Age group 2(34–50 years) included 40 patients (24.8%), while age group 3 (51–67 years) included 43 patients (26.7%). Age group 4(68–85 years) constituted the smallest group with 32 patients (19.2%). In line with the general demographic pattern for inguinal hernias, this distribution shows that the majority of participants were young to

middle-aged people. The distribution shows that younger and middle-aged adults are more likely to present with inguinal hernias, which is consistent with the typical age profile of these patients.

Table–II: Distribution of Study Population by Age Group (n=162)

Age Group	n (%)
17–33 years	47 (29.1%)
34–50 years	40 (24.8%)
51–67 years	43 (26.7%)
68–85 years	32 (19.2%)

A statistically significant difference was observed in the frequency of SSI across groups (p=0.002), as shown in Table-III. In Group-A, only 3 patients (2.29%) developed surgical site infection (SSI), whereas in Group-B, 6 patients (19.35%) developed SSI. This indicates that the gentamicin group's relative risk of getting SSI was decreased by about 88%.

Table-III: Comparison of Surgical Site Infection (SSI) across Groups (n = 162)

Surgical Site Infection	Group-A n=131 n (%)	Group-B n=31 n (%)	p-value
Yes	3 (2.2%)	6 (19.3%)	0.002
No	128 (97.1%)	25 (80.6%)	

Applying topical gentamicin to the mesh surface during hernia repair surgery may be beneficial, as evidenced by Group-A's noticeably lower infection rate.

DISCUSSION

Inguinal hernias are among the most frequently seen surgical conditions in surgical outpatient clinics, and they commonly require operative management. An inguinal hernia is a common issue, traditionally treated with surgical repair.[9] However, patients who are asymptomatic or minimally symptomatic may benefit with careful observation.[10] Surgical site infections (SSI) are one of the most common post-operative complications, with increased morbidity, prolonged hospital stay and higher healthcare costs. Early and effective management strategies are therefore crucial.[11]

Approximately 20% of all complications related to healthcare are surgical site infections (SSIs), making them a major concern in postoperative treatment.[12,13] Extended hospital stays, higher treatment expenses, and, in extreme situations, the need for additional surgical procedures are all possible outcomes of these infections. Between 5% and 11% of surgical patients worldwide get SSIs, which can appear as anything from minor wound leakage to potentially fatal complications within 30 days of surgery.[14] With a reported total prevalence of 29.8%, SSIs are significantly more common in Pakistan, highlighting the urgent need for efficient preventive measures. In order to lower avoidable surgical complications, local perioperative protocols, sterility measures, and antibiotic stewardship need to be continuously strengthened, as indicated by the higher incidence of SSIs in low- and middle-income settings.

Post-operative wound infection is a problem for surgeons and requires special attention. Globally, surgical site infections (SSI) represent a significant obstacle for surgeons and have the potential to alter the course of treatment.[15] Trials are underway to prevent these problems with important steps. Abdominal facial closure using antibiotic-impregnated sutures avoids dehiscence, hernias, and/or post-operative surgical site infections. Role of intravenous cefuroxime antibiotics significantly reduced the incidence of wound infection. Intravenous (IV) antibiotics have historically been used as a preventative measure in inguinal hernia surgeries.16 As an additional strategy, topical antibiotic administration has recently gained popularity with the goal of preventing microbial colonization of the surgical mesh and adjacent tissues, which could lower infection rates. This movement in surgery toward tailored prophylaxis that maximizes local protection while minimizing systemic exposure is reflected in the trend toward localized antibacterial treatments.

An elective inguinal hernia (Lichtenstein tension free-mesh) repair is regarded as a clean surgical procedure, and the rate of secondary surgical site infections (SSIs) following the procedure should be low.[6,17] Preventive antibiotic in other surgical procedures, (such as vascular and trauma), SSI is decreased, whereas conversely, inguinal procedures for hernias, SSI is yet unknown.[18] Prophylaxis with antibiotics is used for prevention. Antibiotics lower the incidence of SSI, benefit the surgeon and patients from a variety of potential issues.[19] Surgical site infections are frequently reported as problems in surgical practice, often resulting in significant morbidity.[20] Finding the best preventative strategy for mesh-based hernia repair is therefore still crucial, especially in areas with high initial infection rates.

Wound healing optimization is an essential aspect of surgical care. Although the overall risk of SSI in inguinal hernia repair is low, even minor infections can impair healing and compromise mesh integration.[21] One study found no significant reduction in postoperative infections with systemic prophylactic antibiotics, while according to another study, antibiotics significantly reduce SSI rates in open mesh hernia repair.[22,23] Our work supported the potential benefit of targeted antibiotic distribution by showing that topical gentamicin instillation over the mesh dramatically lowers postoperative infection rates, contrary to certain findings. This result supports the idea that early bacterial adherence is frequently the cause of mesh-related infections; as a result, obtaining a high immediate local antibiotic concentration may offer better protection than systemic therapy alone.

Gentamicin, an aminoglycoside antibiotic, is used to treat gram-negative aerobic bacterial infections.[24] Gentamicin is given parenterally by systemic, topical, or ocular methods because of its low gastrointestinal absorption. It exhibits bactericidal activity against a wide range of pathogens, such as Pseudomonas aeruginosa, members of the Enterobacteriaceae family, and certain strains of Moraxella, Haemophilus, and Neisseria.[25] Gentamicin's clinical use should be directed by culture and susceptibility data, but local epidemiological patterns may also support its use, especially in cases of meningitis, bacterial septicemia, urinary tract infections, gastrointestinal infections, and soft tissue infections. Additionally, the topical approach reduces systemic toxicity, including ototoxicity and nephrotoxicity, which are issues with systemic gentamicin use.

LIMITATIONS OF STUDY

The patients were monitored for the emergence of SSI for only thirty days following surgery, ruling out longer-term complications. A relatively small sample size and single-centre setting also limit generalizability.

CONCLUSION

Participants in the trial tended to have lower risks of wound infections after receiving gentamicin topical Instillation over prolene Mesh per operative as compared to no gentamicin usage. Thus, gentamicin topically instilled over prolene mesh per operatively, significantly reduces the chances of the development of SSI.

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Authors Contribution

Following authors have made substantial contributions to the manuscript as under:

TJ & SBR: Conception, study design, drafting the manuscript, approval of the final version to be published.

SR & YA: Data acquisition, data analysis, data interpretation, critical review, approval of the final version to be published.

SSH & SI: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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