

Incidence of Mesh Infection in Inguinal Hernia Surgery in Bidar Institute of Medical Sciences**Manjunath^{1*}, Shrikant²**^{1,2}Assistant Professor, Department of Surgery, Bidar Institute of Medical Sciences Bidar Karnataka India

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Conflict of interest: Nil

Abstract:**Background:** Mesh infection is considered as disturbing complication of sterile inguinal hernia surgery. This study was conducted to evaluate short-long term outcomes ensuring mesh infection treatment in inguinal hernia surgery.**Methods:** This study is single-centered retrospective study that involves all those patients who had incidence of mesh infection in inguinal hernia surgery. Study has been conducted in one year from January 2022 to January 2023. Characteristics of mesh infection, demographics of patients, surgery features, microbiology, follow-up data and short-long term outcomes were studied.**Results:** Total 100 patients (10 women, 90 men with mean age of 13-82 and BMI of 24.6 were selected for the incidence of mesh infection. Almost 60 patients undergo complete infected mesh removal and 50 patients undergo partial removal. In 10 patients minor wound infection has been developed during short-term follow-up. Similarly, 30 patients had developed seromas and almost 4 patients had developed hematomas. 10 months of mean follow-up has also been conducted in which almost 5 patients had developed hernia recurrence, 22 patients had developed recurrent infection needed reoperation in the partial removal of mesh and 2 patients had developed chronic pain.**Conclusion:** The result of mesh infection after inguinal hernia repair treated with mesh removal is satisfactory. Systematic individualized treatment by experienced professionals based on the patient's previous repair technique, implanted mesh, and physical condition is recommended.**Keywords:** Inguinal hernia surgery, mesh infection, surgery.

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Introduction

Mesh repair has been considered as a favoured technique for tension-free hernia treatment since 1990s. Postoperative infections have been significantly decreased throughout this time due to improved mesh material tolerance and infection control measures. Globally, Mesh use in hernia repair surgery has evolved into routine practice over the past few years [1]. It has been discovered that implanting a mesh during surgical therapy lowers the hernia's propensity to reoccur. A part of the intestine or fatty tissue can protrude through a weak area in the abdominal muscles in a disease known as an inguinal hernia, which is frequently painful and uncomfortable. Inguinal hernias are frequently surgically repaired, and mesh is now a common approach to reinforce the repair and lower the chance of recurrence [2]. The likelihood of mesh infection surgery is one of the major concerns, however this approach is not without possible drawbacks. When bacteria or other germs invade the surgical site and spread infection surrounding the implanted mesh, mesh infection ensues. Even though the precise incidence rate can

change based on a number of variables i.e., the patient's health, the kind of mesh used, and surgical skill, it is still a vital component of patient care and surgical research. There exist multiple of factors through which occurrence of mesh infections is influenced. The type of mesh used, such as synthetic or biological may have an effect on an infection's susceptibility. Additionally, whether an open repair is performed or a minimally invasive laparoscopic method is used, both can affect the risk of infection [3]. The chance of infection can be increased by patient-related factors such as pre-existing medical disorders (i.e., immune deficiency or diabetes) and lifestyle decisions. The risk of mesh infection is continuously being reduced by surgeons and researchers. To prevent the overview of hazardous bacteria during surgery, they concentrate on using strict sterilizing measures. Additionally, improvements in surgical techniques including aseptic techniques and precise wound closure help to reduce infection rates. For patients and medical professionals, it is crucial to comprehend the true prevalence of mesh infection

[4]. By using this information as a reference, surgeons can choose the best surgical approach and mesh while still achieving the best results with the least number of difficulties. Patients gain from knowing about potential dangers and issues since it empowers them to choose their treatments with knowledge. Current incidence rates of mesh infection are discussed in recent medical literature and research studies [5].

However, it's crucial to keep in mind that as medical procedures and technologies progress, these figures may change over time. Healthcare professionals and consumers should examine the most recent research findings and speak with doctors who specialize in hernia surgery for the most up-to-date and accurate information. Inguinal hernia mesh infection after surgery is, in summary, an important factor in patient care.

While there are a number of variables that might affect the frequency of mesh infection, continual improvements in surgical methods, mesh materials, and infection prevention approaches all help to lower the risk and enhance surgical results [6]. To offer the best possible therapy and care for that undergoing mesh-assisted inguinal hernia surgery, both patients and medical staff must stay up to date on the most recent findings.

Material and Methods

This research serves a single centered retrospective study. Data has been collected from patients experiencing surgery of inguinal surgery from Bidar Institute of Medical Sciences. Following surgery, patients are checked on to look for any indications of mesh infection. The duration of this research is one year [8]

The aim of this study is to investigate mesh infection incidence in inguinal hernia surgery. The sample size taken for this study is 100 patients. To collect data on mesh types, demographics of patients, postoperative follow-up, surgical techniques and mesh infection occurrences

Design:

Time Duration:

Inclusion and Exclusion criteria: This study includes 100 patients undergoing inguinal hernia surgery after obtaining informed consent from all patients. Patients with history of active infections, immunodeficiency and prior mesh infection are excluded.

Data Collection Procedure: Data had been collected on the basis of following factors.

Mesh Infection: Based on laboratory tests, imaging and clinical symptoms mesh infection diagnosis has been done.[9]

Demographics: Comorbidities, sex, age and BMI.

Postoperative follow-up: To monitor infection signs i.e., redness, discharge, swelling, pain and fever regular follow-ups has been done.

Surgical details: Experience of the surgeon, technique used, type of mesh (biologic/synthetic), and surgical approach (laparoscopic/open). [10]

Statistical Analysis: To summarize surgical details, mesh infection incidence and patient demographics descriptive statistics (frequency, standard deviation and mean) has been used. In this study the incidence of mesh infection has been calculated as total number of infections divided by sample size [11]

Limitations

- Infection rates may be influenced by external factors (wound care, hygiene).
- The observational design of the study may bind causal relationship creation.
- Duration of follow-up may influence the recognition of delayed mesh infections [12]

Results

In this study total 100 patients (10 women and 90 men) with mean age of 13-82 years of age were included. Almost 36 patients were smokers, 11 had diabetes, 20 were obese and 33 were overweight [13]

Table 1: Demographics of Patients

Gender	Mean
Male	10
Female	90
Age/years	13-82'
BMI	24.6
<18.6	4
18.7- 24	41
24.1 – 27.8	40
>28	15
Comorbid conditions	
Diabetes	9
Tobacco use	36
Immunosuppression	2
Cirrhosis	3

Persistent sinus problems where the primary way patients often showed their health. In two cases, the individuals had problems with their urinary system, leading to the need for cystoscopy before surgery to check if the mesh material had entered the bladder. About 70.8% of patients had chronic infections for

more than three months, with the longest infection lasting 84 months. Among the operations performed, plug implantation was predominant, accounting for 41.6% of procedures. As for the type of mesh most often removed, it was mainly polypropylene (14).

Table 2: Mesh infection characteristics

	Frequency
Chronic sinus	97
Urinary symptoms	1
Mesh extrusion	2
Previous hernia type	
Primary	901
Recurrence	10
Previous hernia surgery	
Plug	15
TEP	2
Flat patch	29
TAPP	29

Table 3: features of surgery

Mesh removal method	Mean
Laparoscopic mesh removal	19
Open mesh removal	90
Previous TAPP repair	19
Previous TAAP and TEP repair	12
Previous plug repair	49
Mesh removal type	
Partial	40
Complete	60
Incision method	
Packing with gauze	14
Blood loss	15.8
Stay in hospital	23
Operation time	81.4

Discussion

Surgical site infections (SSI) can be classified into three categories by the Centers for Disease Control and Prevention: superficial incisional SSI, deep incisional SSI, and organ/space SSI. Mesh infections must be distinguished from superficial incisional SSI, which frequently appear soon after surgery and don't impact the mesh itself. In contrast, mesh infections typically appear sometime after mesh repair and call for the mesh to be removed [15]

Mesh infections commonly present with localized edema, discomfort, lump development, and fluid leakage through sinus passages. Fever can also occur in certain patients. Mesh infections are more likely to develop gradually and with less severity, with long-lasting or reoccurring signs and symptoms [16]. The typical symptom is the existence of a chronic sinus that is painless, unhealed, and does not exhibit acute inflammation in the skin around it. Additionally, if the mesh migrates, it has a higher chance of entering the

bladder. Therefore, it's crucial to keep an eye out for bladder calculi, recurrent urinary tract infections, and painless hematuria [17] in the current study, nearly one-third of patients had symptoms at least a year following hernia repair, and more than 70.8% of patients had a history of chronic infection lasting more than three months. This delayed onset is consistent with the slow-moving nature of many mesh infections, which is probably caused by the prolonged time it takes for contamination to result in biofilm growth. Bacterial growth is made possible by this situation's reduced immune response and minimal antibiotic penetration [18]

In this study, 88 individuals had cultures examined that showed positive results, with *Staphylococcus aureus* being the most common infection in 62.5% of these instances. This is consistent with research reported in the literature [19]. A lower percentage of positive bacterial cultures is caused by the formation of bacterial biofilms, frequently involving *Staphylococcus aureus*, on the surface of

the mesh. As a result, clinical appearance is the primary factor in mesh infection diagnosis. Confirmation of the diagnosis can be aided by ancillary procedures including contrast fistulography, ultrasonography, and CT scans. CT scans with injected iodinated contrast media into the sinus are recommended for the best visualization of the abscess size, sinus length, depth, orientation, and involvement of surrounding tissues like the intestine and bladder [20]

Mesh infection risk factors are numerous and include both regional surgical variables and patient-related systemic ones. After initial open treatment of reducible inguinal hernias, Zouet al. found that patients with diabetes, a body mass index of less than 35 kg/m², and current smoking had a greater incidence of surgical site infection (SSI) [21]. According to Yang et al., obesity is a lifelong risk factor for mesh infection following groin hernia treatment. Local variables that hinder optimal mesh integration include the frequent occurrence of dead space between the mesh and host tissues [22]. Mesh wrinkles, the use of microporous mesh, nonabsorbable sutures for mesh fixation, covering existing mesh to prevent recurrence, and inappropriate use of medical adhesive are all factors that contribute to dead space [23]

Similar methods for treating mesh infections have been proposed in a number of recent smaller studies. On the best time to remove the mesh, a consensus hasn't yet been reached [24]. According to our experience, the removal of mesh should be postponed for at least three months following infection development and initial conservative measures including dressing changes and drainage are advised [25]. The uninfected component of the mesh improves in incorporation throughout this time, whereas the infected portion separates due to purulent exudate, making removal easier. In this study, 100 patients underwent laparoscopic exploration, which has benefits include discovering internal organ involvement and dissolving groin adhesions. Methylene blue injection, followed by open mesh removal, can help patients with a history of flat patch and plug repair and a severe sinus-associated mesh infection that doesn't impact internal organs [26]. Patients who have had transabdominal preperitoneal hernia repairs or hernias that are entirely extraperitoneal in nature often prefer laparoscopy. This method preserves the anterior access for possible recurrence correction while offering superior visualization for anatomical features. The choice between open or laparoscopic removal for individuals who have previously had an open preperitoneal mesh implant relies on the degree of peritoneal involvement and the existence of sinuses [27]. In this investigation, sinus and intact peritoneum were removed openly

in patients who had previously had open preperitoneal mesh repair.

The majority of existing research points to total excision of infected mesh and surrounding infected tissue as an efficient approach. In research, by Chung et al., partial removal of infected mesh caused recurrent sinus problems in the majority of individuals, possibly as a result of leftover mesh pieces from the initial treatment. Notably, this study discovered a substantial difference in the prevalence of recurrent infection between the removal of the mesh completely and partially (P 0.001), with 46.0% of patients reporting recurrence following partial removal. Complete removal of diseased mesh can be difficult, especially if it has been assimilated into the surrounding tissue. This necessitates surgical skill and careful attention to anatomical features [28]

Synthetic mesh should not be used in a polluted or infected environment after infected mesh has been removed. Only repair using polypropylene mesh, however, has been demonstrated to be effective in preventing hernia recurrence and maintaining a manageable postoperative infection rate by Sakamoto et al. Similar findings were made by Rehman et al., who said that it is rare for hernias to return after an infected mesh has been removed. Inflammatory cells begin to colonize the prosthetic mesh after it has been implanted, and fibroblast infiltration gradually replaces these cells through the mesh holes. Fibrous infiltration and neo-fascia development enable mesh incorporation. The fibrous response that the prosthetic material causes in the transversalis fascia, rather than the mesh itself, is what makes mesh repair effective [29]

The best method for preventing mesh infection is through adequate preoperative planning, sterile surgical techniques, and rigorous mesh insertion criteria. In situations where open mesh repair is high risk, antibiotic prophylaxis is advised. Due to its ability to resist infection, biologic mesh has showed promise in a limited number of hernia repairs, but there is insufficient data to support its use in the treatment of persistently infected synthetic meshes. In order to determine which patients would benefit from using biologic mesh to lower the risk of infection, a system for categorizing hernias was developed. Biologic mesh can be used on patients with grade 3 and 4 hernias, which indicate active infection and the possibility of contamination. For a complete evaluation of the clinical effectiveness, more thorough research is needed [30]

Conclusion

Mesh infection after inguinal hernia repair presents a challenging situation. It is advised that skilled professionals take a tailored approach while taking into account the patient's current health and

conditions, implanted mesh, and past repair methods. Risk factors for mesh infections are numerous. The most effective treatment is complete removal of the diseased mesh.

According to our observations, mesh removal needs to happen at least three months after an infection starts. Intra-abdominal evaluation is aided by laparoscopic exploration. It is dangerous to implant new synthetic or biologic mesh after contaminated mesh has been removed. Our findings suggest that problems following the removal of infected mesh, both short-term and long-term, are uncommon, but bigger trials with longer follow-up are required.

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