



Original Research Article

OUTCOMES OF DUAL MESH REPAIR ON GIANT INCISIONAL HERNIA

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Abstract: **Introduction:** The term giant incisional hernias usually refers to abdominal wall defects that >15 cm. These types of incisional hernias are often associated with high recurrence rates and other complications, thus making surgical management difficult. Abdominal wall reinforcement with dual mesh negative pressure wound therapy is proposed to minimize complications and facilitate repair of the abdominal wall. The purpose of this study is to assess the outcomes in patients with giant incisional hernias undergoing dual mesh repair with specific attention to post-operative DVT, hematoma, surgical site infections, pain, and seroma. **Methodology:** For a period of six months and within the surgical department of Lahore General Hospital, a descriptive study was conducted. Out of the one hundred thirty four patients who were 18-60 years old and had dual mesh hernioplasty with giant incisional hernias, all were included. Those patients having certain types of hernias were not included. Post-operative outcomes were assessed for conditions like DVT, hematoma, SSI, post-operative pain using VAS, and seroma. Data were analyzed in SPSS 25.0, using chi-square tests for statistical significance ($p \leq 0.05$). **Results:** From a total of 134 patients, 56% were male while 44% were female, with a mean age of 38.63 ± 12.45 years and a mean BMI of 26.84 ± 4.92 kg/m². The mean duration of the hernia was 5.73 ± 2.26 years with 48.5% of the cases lasting ≤ 5 years and 51.5% > 5 years. DVT was present in 2.2% of cases, hematoma occurred in 6.7%, and pain with VAS ≥ 4 in 16.4%, with average VAS score of 2.51 ± 2.56 . SSI was recorded in 5.2% of cases, and seroma formation in 7.5%. **Conclusion:** The use of dual mesh repair for giant incisional hernia is associated with encouraging postoperative results and minimal severe complications such as DVT, hematoma and SSI, which suggests its practicality and efficiency in dealing with recurrence chances. Larger follow-up studies are necessary to confirm these findings and improve surgical methods.

Keywords: Giant Incisional Hernia, Dual Mesh Repair, Deep Vein Thrombosis, Hematoma, Surgical Site Infection, Post-Operative Pain, Seroma Formation.

INTRODUCTION

The development of incisional hernias, which is a prevalent form of complication after an abdominal surgery, has an initial rate of occurrence between 9% and 12.5% in the first year after the surgery, and this rate can rise as high as 30% over time.^{1,2} Multiple factors regarding the patient as well as the surgery itself cause incisional hernia.^{2,3} This condition results from the combination of considerable stress at the incision site, insufficient healing of the wound, and, most importantly, obesity and postoperative infections. Patients with wound infections have faced a much higher risk since 20-25% of them suffer from incisional hernias.^{1,4}

Obesity is a major contributor and greatly increases the likelihood of developing an incisional hernia by 30%. The healing of wounds or their closure influence the chance of developing an incisional hernia, provided a certain incision is made within specific criteria.¹ The age factor, some diseases, drug therapies, cancer treatment, surgical aftercare, surgical method, and reopening of old surgical wounds for new surgeries greatly aid in the development of an incisional hernia. Patients at higher risk of abdominal compartment syndrome, like those with infections or intestinal swelling, may develop hernias if the fascia is left open.^{1,4-5}

The use of mesh has become standard for hernias

larger than 2 cm because of high recurrence rates.⁶⁻⁷ Various meshes, categorized as biological or synthetic, are available for clinical use. Biological meshes are derived from collagen-rich tissues, while synthetic meshes like polypropylene, polyester, and ePTFE are common. Ongoing development focuses on creating new meshes with diverse weave properties and materials.⁸⁻⁹ Dual meshes, mainly synthetic and designed for medical use, feature a unique characteristic on their intraperitoneal surface that prevents intestinal adhesion, crucial in laparoscopic repairs and for repairing large hernias through open surgeries.^{4,10}

Complications following incisional hernia surgery manifest in the early and late stages, ranging from perioperative bowel injury, seroma, bleeding, infections, to mesh-related issues such as detachment and skin necrosis. Late complications may include hernia recurrence and mesh reaction.¹¹⁻¹² Due to the absence of a unanimous agreement on the established course of action for treating large incisional hernias, as well as the scarcity of information regarding the techniques and results of addressing such hernias, particularly in developing nations, we have undertaken this investigation to ascertain the outcomes of repairing giant incisional hernias at a tertiary care hospital within a local context.

METHODOLOGY

The study was conducted in the Surgical Department of Lahore General Hospital, Lahore, over a period of six months following the approval of the synopsis. A descriptive study design was employed, utilizing a non-probability consecutive sampling technique. The sample size was calculated as 134 patients based on a 95% confidence level and a 7% margin of error, with an expected percentage of surgical site infections (SSIs) at 21.67%.¹⁵ Patients of both genders, aged between 18 to 60 years, diagnosed with giant incisional hernia as per the operational definition, and undergoing mesh hernioplasty were included. Patients with recurrent or bilateral hernias, complicated hernias (irreducible, obstructed, or strangulated), and those unwilling to provide consent

were excluded.

After obtaining consent and approval, eligible patients from the surgical unit were enrolled. Demographic data, such as name, age, and sex, were collected. A detailed history and clinical exam were done to form a preliminary diagnosis. The surgery began by making an 8-15 cm incision on the skin over the hernia, removing adhesions, and measuring the hernia defect. A dual mesh was prepared, ensuring it extended 3-5 cm beyond the defect. Prolene sutures were tied to the mesh at intervals and pulled out through 2 mm incisions on the abdominal wall using a trocar.

A central 0.5 cm incision was made in the middle of the mesh, which was stapled with a 5 mm laparoscopic absorbable tackler. Mesh margins were secured to the abdominal wall with tackers at prolene suture sites, and additional fixation was done at 2 cm intervals to prevent herniation. Hernia incision and prolene suture sites were then sutured. Postoperative outcomes, such as surgical site infections (with purulent discharge causing wound dehiscence within four weeks), postoperative pain (evaluated using a visual analogue scale at 24 hours, scoring pain greater than 3), seroma formation (diagnosed via ultrasonography and needle aspiration within 30 days), DVT (assessed with duplex scanning on days 1 and 5 postoperatively), and hematoma (defined as blood collection outside vessels) were all evaluated according to predefined criteria.

Collected data were entered and analyzed using SPSS version 25.0. Continuous variables such as age, duration of hernia, and mean pain score were expressed as mean $\pm$ standard deviation. Categorical variables, including gender, deep vein thrombosis, hematoma, surgical site infection, pain, and seroma formation, were reported as frequencies and percentages. Stratification was performed for age, gender, and duration of hernia to control confounding variables. A post-stratification chi-square test was applied, with statistical significance set at $p \leq 0.05$.

RESULTS

The sample consisted of 134 patients, with a male predominance of 56.0% and a female proportion of 44.0%. The majority of patients belonged to the 31-50 years age group, accounting for 47.0% of the sample, followed by 29.1% in the 18-30 years group and 23.9% in the 51-60 years group. The mean age of the patients was 38.63 ± 12.45 years. The mean BMI was recorded at 26.84 ± 4.92 kg/m². The duration of hernia was nearly equally distributed, with 48.5% of patients having the condition for five years or less, while 51.5% had it for more than five years. The mean duration of hernia was observed to be 5.73 ± 2.26 years.

Table 2 shows post-operative outcomes after dual mesh repair. DVT occurred in 2.2% of patients, while 97.8% did not have it. Hematoma was seen in 6.7% of cases, and 93.3% did not have it. Post-op pain (VAS ≥ 4) affected 16.4% with a mean VAS score of 2.51 ± 2.56 . SSI was noted in 5.2% of patients, while 94.8% were infection-free. Seroma was present in 7.5% of patients, while 92.5% avoided this complication.

Table 3 shows outcomes by gender. DVT occurred slightly more in males (2.7%) than females (1.7%) but was not significant ($p=0.706$). Hematoma rates were 9.3% in males and 3.4% in females ($p=0.172$). Post-op pain was significantly higher in males (22.7%) than females (8.5%, $p=0.028$). SSIs were seen in 8.0% of males and 1.7% of females ($p=0.103$). Seroma rates were 10.7% in males and 3.4% in females ($p=0.112$).

Table 4 stratified outcomes by age groups. DVT occurred in 3.2% of patients aged 31-50 years and 3.1% aged 51-60 years, zero cases in the 18-30 years group ($p=0.533$). Hematoma rates were 2.6% in the youngest age group, 7.9% in the 31-50 years group, and 9.4% in the oldest group ($p=0.453$). Post-operative pain prevalence was similar: 15.4% in the youngest, 15.9% in the middle age group, and 18.8% in the oldest ($p=0.918$). SSI was absent in the youngest group but in 9.5% of 31-50 years and 3.1% of 51-60 years ($p=0.091$). Seroma occurred in 7.7% of the youngest, 6.3% of middle age, and 9.4% of the oldest ($p=0.867$).

Table 5 shows outcomes based on hernia duration. DVT was slightly more common in patients with ≤ 5 years (3.1%) versus longer duration (1.4%, $p=0.524$). Hematoma was seen in 7.7% with shorter duration and 5.8% with longer ($p=0.661$). Pain rates were 16.9% and 15.9%, respectively ($p=0.878$). SSI incidence was 7.7% and 2.9% ($p=0.213$). Seromas were more frequent in ≤ 5 years (10.8%) versus longer duration (4.3%, $p=0.157$).

Table-1: Frequency distribution of different variables (n=134)

Variables		Frequency	Percent
Gender	Male	75	56.0%
	Female	59	44.0%
Age groups	18-30 years	39	29.1%
	31-50 years	63	47.0%
	51-60 years	32	23.9%
	Mean age (years)	38.63 $\pm$ 12.45	
BMI	Mean BMI (kg/m ²)	26.84 $\pm$ 4.92	
Duration of hernia	≤ 5 years	65	48.5%
	> 5 years	69	51.5%
	Mean duration of hernia (years)	5.73 $\pm$ 2.26	

Table-2: Frequency distribution of outcomes of dual mesh repair on giant incisional hernia (n=134)

Outcomes of dual mesh repair on giant incisional hernia		Frequency	Percent
Deep vein thrombosis (DVT)	Yes	3	2.2%
	No	131	97.8%
Hematoma	Yes	9	6.7%
	No	125	93.3%
Pain (VAS ≥ 4)	Yes	22	16.4%
	No	112	83.6%
	Mean VAS	2.51 $\pm$ 2.56	
Surgical site infection (SSI)	Yes	7	5.2%
	No	127	94.8%
Seroma formation	Yes	10	7.5%
	No	124	92.5%

Table-3: Stratification of outcomes of dual mesh repair on giant incisional hernia with respect to gender

Outcomes of dual mesh repair on giant incisional hernia		Gender		p-value
		Male	Female	
Deep vein thrombosis (DVT)	Yes	2(2.7%)	1(1.7%)	0.706
	No	73(97.3%)	58(98.3%)	
Hematoma	Yes	7(9.3%)	2(3.4%)	0.172
	No	68(90.7%)	57(96.6%)	
Pain (VAS ≥ 4)	Yes	17(22.7%)	5(8.5%)	0.028
	No	58(77.3%)	54(91.5%)	
Surgical site infection (SSI)	Yes	6(8.0%)	1(1.7%)	0.103
	No	69(92.0%)	58(98.3%)	
Seroma formation	Yes	8(10.7%)	2(3.4%)	0.112

	No	67(89.3%)	57(96.6%)	
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Table-4: Stratification of outcomes of dual mesh repair on giant incisional hernia with respect to age

Outcomes of dual mesh repair on giant incisional hernia		Age groups			p-value
		18-30 years	31-50 years	51-60 years	
Deep vein thrombosis (DVT)	Yes	0(0.0%)	2(3.2%)	1(3.1%)	0.533
	No	39(100.0%)	61(96.8%)	31(96.9%)	
Hematoma	Yes	1(2.6%)	5(7.9%)	3(9.4%)	0.453
	No	38(97.4%)	58(92.1%)	29(90.6%)	
Pain (VAS ≥ 4)	Yes	6(15.4%)	10(15.9%)	6(18.8%)	0.918
	No	33(84.6%)	53(84.1%)	26(81.3%)	
Surgical site infection (SSI)	Yes	0(0.0%)	6(9.5%)	1(3.1%)	0.091
	No	39(100.0%)	57(90.5%)	31(96.9%)	
Seroma formation	Yes	3(7.7%)	4(6.3%)	3(9.4%)	0.867
	No	36(92.3%)	59(93.7%)	29(90.6%)	

Table-5: Stratification of outcomes of dual mesh repair on giant incisional hernia with respect to duration of hernia

Outcomes of dual mesh repair on giant incisional hernia		Duration of hernia		p-value
		≤ 5 years	> 5 years	
Deep vein thrombosis (DVT)	Yes	2(3.1%)	1(1.4%)	0.524
	No	63(96.9%)	68(98.6%)	
Hematoma	Yes	5(7.7%)	4(5.8%)	0.661
	No	60(92.3%)	65(94.2%)	
Pain (VAS ≥ 4)	Yes	11(16.9%)	11(15.9%)	0.878
	No	54(83.1%)	58(84.1%)	
Surgical site infection (SSI)	Yes	5(7.7%)	2(2.9%)	0.213
	No	60(92.3%)	67(97.1%)	
Seroma formation	Yes	7(10.8%)	3(4.3%)	0.157
	No	58(89.2%)	66(95.7%)	

DISCUSSION

The clinical experience articulated through the implementation of dual mesh repair techniques for the management of significantly sized incisional hernias within the confines of this particular study reveals that it serves as a notably advantageous surgical intervention, especially for those patients who are afflicted with hernias of a larger scale. The discourse surrounding the classification of large incisional hernias has been a subject of considerable debate and contention within the academic literature, until such time as the European Hernia Society established a formal classification system that delineates these hernias as those exhibiting a defect width of a minimum of 10 centimeters or a surface area that measures at least 100 square centimeters when assessed in two dimensions.¹⁸⁻¹⁹

The foremost obstacle encountered in the therapeutic management of extensive incisional hernias or defects within the abdominal wall is fundamentally rooted in the significant deficit or inherent weakness of the abdominal wall structure, a condition that arises as a direct consequence of the detachment of

the muscular layers that constitute this critical anatomical region. In addition to this, the phenomenon of muscle traction serves to further amplify the dimensions of the defect, thereby creating an imperative for a surgical approach that facilitates a tension-free repair, which is essential not only for the reduction of the abdominal diameter but also for the mitigation of the risks associated with muscular ischemia that could arise from inadequate blood supply to the affected areas. Thus, the complexities associated with effectively addressing these conditions underscore the necessity for a comprehensive understanding of the underlying pathophysiology, as well as the implementation of advanced surgical techniques that can accommodate the multifaceted nature of such hernial presentations.²⁰⁻²¹

This comprehensive investigation has delineated a significant incidence of complications arising at the wound site, which notably encompasses the formation of seromas occurring in approximately 7.5% of the patients analyzed, alongside hematomas manifesting in about 6.7% of individuals, and a

prevalence of surgical site infections (commonly referred to as SSI) that is observed in 5.2% of the patient cohort. While it is pertinent to note that these observed complication rates are marginally lower when juxtaposed with findings from earlier research, they nonetheless remain firmly situated within the anticipated parameters of complication frequencies that are typically encountered in clinical practice. In a contrasting examination conducted by Koraney et al., the authors reported an overall complication rate that was significantly higher, calculated at 24%, which included specific incidences of wound infections affecting 6% of their study population, hematomas occurring in 2%, and seromas noted in 8% of the patients under review.²²

In a similar vein, the study conducted by Hosseini et al. elucidated that the incidence of hematoma occurred in approximately 19.6% of the patient population, while the formation of seroma was observed in about 13% of the individuals, and the rate of wound infection was noted to be around 4.3%. Despite the fact that the overall rate of complications identified in this particular investigation was found to be comparable to findings reported in prior studies, it is noteworthy that only a minimal percentage of patients, specifically 8.57%, necessitated minor surgical interventions, all of which were executed in a day-care context and importantly did not result in any fatalities associated with these procedures.²³

In a comprehensive analysis conducted within the study framework, it was determined that an incidence rate of 2.04% of participants exhibited the clinical manifestation of deep vein thrombosis (DVT), while an identical percentage of 2.04% was also observed in the formation of haematomas, in addition to which a noteworthy occurrence of surgical site infections (SSI) was documented at a significant rate of 10.2%, furthermore, it was recorded that pain was reported by 16.32% of the subjects involved in the study, and interestingly, seroma formation was noted to be absent in all observed cases, with a striking incidence of 0%.¹³

The other clinical outcomes were carefully followed in a separate study, where it was found that seroma formation occurred at an alarming rate of 13.04%, hematoma took place at a rate of 6.52%, deep vein thrombosis (DVT) at a lower rate of 2.17%, pain experienced was reported at 4.34%, and so too was the occurrence of surgical site infections (SSI) at a level of 4.34%.¹⁴

A dedicated and independent research study demonstrated that, for the population of people observed, surgical site infections (SSI) occurred in 21.67% of the cases studied which stood out as one of the many important postoperative complications

that needs further investigation and comprehension in the field of clinical effects and patient welfare.¹⁵

In a different study conducted recently, there was a startling finding pertaining to the frequency of surgical site infections (SSI): an unfathomable rate of 0% was reported for this phenomenon. Additionally, the occurrence of seroma formation, a frequent complication that arises after surgery, was reported at 2%. These figures reveal how infrequent these negative outcomes are, considering the scope of the study's population and parameters.¹⁶

During a different research project, there were several important clinical outcomes that appeared to be meticulously recorded and analyzed, demonstrating that there was notable seroma formation in around 20 percent of the patients, an incidence of hematoma formation was noted in 8.57 percent of the subjects, and surgical site infection (SSI) was recorded at a much lower rate of 2.86 percent.¹⁷

One of the most significant benefits associated with the implementation of this particular surgical technique was the remarkable observation of a complete absence of hernia recurrence, which is a crucial factor in evaluating the long-term efficacy of such interventions. Furthermore, a comprehensive review of the existing literature reveals that the rates of recurrence for hernias can fluctuate significantly, with reported figures ranging from an astonishingly low 0% to as high as 13.3%, although it is important to note that the majority of studies tend to consistently indicate a recurrence rate of 0%, thereby underscoring the effectiveness of the technique in question. In light of these findings, it becomes evident that the surgical method under consideration not only minimizes the risk of recurrence but also contributes to enhanced patient outcomes and overall satisfaction.²⁴

The results of this study are, by and large, aligned with the existing information, furthermore reinforcing the credibility and longevity of the dual mesh repair strategies for reducing the chances of hernia reoccurrence.

However, it is essential to recognize that this study had its limitations. Primarily, the research was limited to a single institution which resulted in a small and biased sample of patients. Additionally, it is important to acknowledge that a longer duration of follow up would be vital to adequately evaluate any delayed complications and the likelihood of reoccurrence over time. To validate the conclusions of this study, they need to be tested in larger, multicenter studies, as this would provide stronger support for tailoring guidelines for dual mesh repair of giant incisional hernias.

CONCLUSION

Dual mesh repair for giant incisional hernia showed good post-operative results with low rates of serious complications. This technique appears feasible, effective, and low-risk for recurrence. Additional larger-scale studies are necessary to validate these findings and enhance surgical procedures.

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