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Original Article

Incidence of Seroma Formation in Mesh Abdominal Hernioplasties: Irrigated Versus Non-Irrigated Wounds

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ABSTRACT

Objective: To determine the frequency of seroma formation after abdominoplasty using mesh repair with wound irrigation versus without wound irrigation.

Study Design: Quasi-experimental study.

Place and Duration of Study: Department of Surgery, Combined Military Hospital, Rawalpindi Pakistan, from Aug 2023 to Jan 2024.

Methodology: This study enrolled 52 patients who underwent mesh repair of ventral hernia of abdomen. After randomization, patients were allocated to one of two groups labelled Irrigation of Wound (WI) Group versus No Irrigation of Wound (NIW) Group. The frequency of formation of seroma was chosen as the primary outcome. Statistical tests were applied for data analysis where a *p*-value ≤0.05 was considered as significant.

Results: On analysis, it was noted that 2(7.7%) patients in WI Group showed signs of seroma formation, and experienced seroma development 7 days after mesh repair of hernia. During the first few days following surgery, none of the patients experienced seroma. In WI Group, 22(92.3%) patients did not experience seroma development. After mesh repair, a total of 9(34.6%) patients in NWI Group developed seroma, of these, 3(11.5%) developed seroma within a week of mesh repair and 6(23.1%) developed seroma after 7 days of surgery.

Conclusion: Saline wound irrigation was noted to have lowered the incidence of seroma formation following mesh repair of abdominal hernia.

Keywords: Hernia, Mesh Repair, Saline Irrigation, Seroma, Sublay Technique.

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INTRODUCTION

Post-operative seroma formation occurs in procedures involving extensive and vigorous tissue dissection, with frequency, associated with mesh repair for ventral hernias, ranging from 5-50%[1] with preventive strategies entailing changing suturing methods, using sclerosing agents, and promoting the use of immobilization and compression.[2] Globally, 20% of post-surgical seromas are caused by mesh repair of ventral hernias,[3] which is concerning as 16% of people in Pakistan have abdominal wall hernias, approximately twice the level of incidence of hernia worldwide.[4] Wound irrigation is the term used to describe cleaning a surgical wound before closure and the irrigation methods used are regular saline, antibacterial solutions, and antiseptic agents[4,5] which post-operatively reduced length of stay in the hospital, decrease likelihood of morbidity, and decreased prevalence of superficial surgical site infections.[6] In one pilot trial, irrigation with hypertonic saline was shown to decrease the incidence of seroma development during abdominoplasty[7] with some literature advocating wound irrigation for prevention of seroma formation after breast reconstruction[8] and cesarean section.[9] As mesh repair is a very frequent surgery for hernia repair, seroma formation is commonly seen among local patients, therefore, the rationale of our research is to determine the consequence of irrigation on seroma formation in local population and determine a cost-effective strategy to prevent this complication from occurring.

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METHODOLOGY

After obtaining the approval of Ethics Committee via letter IERB# 553, we performed this quasi-experimental study at Combined Military Hospital (CMH), Rawalpindi Pakistan, from August 2023 to January 2024. A total of 52 patients were enrolled for the study via non-probability consecutive sampling and sample size was calculated with the help of World Health Organization (WHO) sample size calculator, where level of significance used was 5%, power of test

was 80%, and probability of seroma formation with wound irrigation was 4.8%[10] and seroma formation without wound irrigation was 11.6%,[10] after which the required sample size was 24, therefore, 52 participants were enrolled, (26 in each group) in our study, after taking written, informed consent.

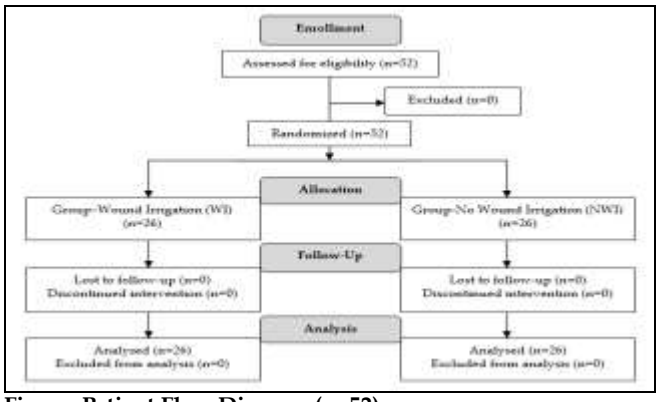

Figure: Patient Flow Diagram (n=52)

Inclusion Criteria: Patients belonging to wither gender, with age ranging from 25-65 years, having ventral wall abdominal hernia including epigastric, incisional, umbilical and para-umbilical hernias, undergoing elective mesh repair were included.

Exclusion Criteria: Patients with previous hernioplasty or abdominoplasty, steroid dependent, morbidly obese (Body Mass Index >40Kg/m2), past history of emergency surgery, insulin dependent, complicated hernia, congestive cardiac failure, malignancy or having deranged renal or liver function tests were excluded.

Patients were randomly assigned to either WI or NWI groups using sealed envelope method. Before surgery, the patient underwent a thorough pre-anesthetic evaluation and standard general anesthesia with endotracheal intubation was used. All patients underwent mesh fixation using the Sublay[11] technique. To avoid bias, the surgical approach was the same for both study groups. Saline lavage was performed in Group WI, but not in Group NWI. Group WI was given an extensive wound irrigation using 1000 milliliters of warm normal saline. Following surgery, the patients were moved to a post-operative ward where their drain output was noted. After 5 days, the patients were discharged home with sufficient antibiotic coverage. The drain output was recorded and it was removed on 4th post-operative day. Throughout their hospital stay, all patients received compressive bandages and were instructed to spend at least 3 days sleeping with their heads slightly elevated in supine position. All the patients were re-examined and 7th day after surgery and ultrasound abdomen was performed on all patients to identify any seroma formation. All demographic details, such as age, weight, gender, BMI, and kind of hernia were noted and entered for analysis on Statistical Package for Social Sciences (SPSS) 23.0, including both quantitative and qualitative variables, for comparison against primary outcome of frequency of seroma formation. For qualitative data, frequency and percentage were computed, and for quantitative variables, mean and standard deviation were calculated. To compare frequencies, chi-square analysis was performed, and the independent-sample t-test was performed to compare means in order to calculate p-value and establish statistical significance, where a *p*-value ≤0.05 indicated statistical significance. The normality of data was assessed through Kolmogorov-Smirnov test.

RESULTS

On 8th post-operative day, all enrolled patients were analyzed for primary outcome. Both groups' demographic data was comparable, as listed in Table-I. The mean age of patients in Group Wound Irrigation (WI) was 49.81±10.48 years, comparable to those in Group No Irrigation of Wound (NWI) of 49.69±10.96 years, weight of 75.88±16.55kg and height of 162.35±7.310 cm with body mass index (BMI) of 30.32±3.62 kg/m² was noted in Group WI, while Group NWI had mean height of 161.62±6.46 centimeters, mean weight of 72.73±8.81 kilograms, and mean BMI of 34.06±3.19 Kg/m² with all variables normally distributed across both groups.

Table-I: Demographic Profile of Both Groups (n=52)

Variables		Group WI (n=26) Mean±SD	Group NWI (n=26) Mean±SD	*p*-value
Age (Years)		49.38±9.82	43.58±9.27	0.610
Weight (Kilograms)		75.88±16.55	72.73±8.81	0.124
Height (Centimeters)		162.35±7.310	161.62±6.46	0.171
BMI (kg/m2)		28.83±6.55	27.85±4.28	0.473
Operative time (Minutes)		140.77±7.42	144.23±7.33	0.479
Drain output (Milliliters)		37.15±5.59	35.08±7.74	0.281
Variables		**n(%)**	**n(%)**	***p*-value**
Gender	Male	17(65.4)	12(46.2)	0.132
	Female	9(34.6)	14(53.8)	
Type of hernia	Epigastric hernia	6(23.1)	11(42.3)	0.269
	Incisional hernia	6(23.1)	2(7.7)	
	Umbilical hernia	9(34.6)	7(26.9)	
	Para umbilical hernia	5(19.2)	6(23.1)	

In Group WI, 4(15.4%) patients showed signs of seroma formation, and experienced seroma

development 7 days following mesh repair of hernia, however, during the first few days following surgery, none of these patients experienced seroma. In Group NWI, 22(84.6%) patients did not experience seroma development. After mesh repair, 9(34.6%) patients in Group NWI developed seroma, of which 3(11.5%) developed seroma within a week of mesh repair and 6(23.1%) developed seroma after 7 days as shown in Table-II.

Table-II: Frequency of Seroma in Both Groups (n=52)

		Group WI (n=26) n(%)	Group NWI (n=26) n(%)	*p*-value
Seroma Formation	>7 days	2(7.7)	3(11.5)	0.024
	≤7 days	0(0.0)	6(23.1)	
	No seroma	24(92.3)	17(65.4)	

In both groups, co-morbidities were present at similar rates, with 5(19.2%) patients in Group NWI and 9(34.6%) patients in Group WI having diabetes, hypertension being present in 5(19.2%) Group WI patients and 4(15.4%) Group NWI patients while 13(50%) Group WI patients and 12(46.2%) Group NWI patients had a history of smoking, as listed in Table-III.

Table-III: Frequency of Co-morbidities Between Groups (n=52)

Co-morbid		Group WI (n=26) n(%)	Group NWI (n=26) n(%)	*p*-value
Diabetes	Yes	9(34.6)	5(19.2)	0.174
	No	17(65.4)	2(80.8)	
Hypertension	Yes	5(19.2)	4(15.4)	0.500
	No	21(80.8)	22(84.6)	
Smoking	Yes	13(50.0)	12(46.2)	0.500
	No	13(50.0)	14(53.8)	

DISCUSSION

Saline lavage of surgical wound is an easy and efficient way to lower the incidence of seroma formation but few studies have been done to determine the correlation between saline irrigation of the wound after abdominal surgeries and complications like surgical site infection and seroma formation.[12] One researcher reported that patients whose wounds were irrigated with normal saline showed a significant reduction in seroma formation, with an incidence of approximately 8% with irrigation and 18% without irrigation, along with marked reduction in surgical site infection,[13] however, another study reported 14% incidence of seroma formation in saline irrigation group versus control group.[14] Within this conflicting picture, our study provides a unique insight as, in addition to using sublay method, application of quilting sutures, and utilization of drain placement in all the patients was also done as the drain removes the accumulated fluid and its placement lowers the chance of seroma formation[15] while the usage of quilting technique for wound closure in patients having BMI >25, also decreased the formation of seroma as reported by another study.[16] One meta-analysis found that seroma following hernioplasty is highly common worldwide, increasing hospital stays', expenses and contributing to patient dissatisfaction.[18] Another study found that using hypertonic saline for wound irrigation reduced the incidence of seroma development even when a closed drain system to irrigate with 20 milliliters of hypertonic saline was used.[19] Another study[20] showed that seroma production was similarly reduced when gentamycin, an antibiotic, was irrigated into the wound from an appendectomy. As no local research has been done to support the use of regular saline irrigation for seroma development in mesh repair wounds, this study is notable as it links and contrasts the outcomes to help in lowering the prevalence of this difficult but treatable condition.

LIMITATIONS OF STUDY

The quasi-experimental design with a small sample size limits statistical power and increases the risk of type II errors, particularly given the low event rate in the irrigation group. The single-center setting restricts generalizability to other populations or surgical contexts with varying patient characteristics and surgical techniques. Follow-up details beyond the initial postoperative period were not recorded, potentially missing late-onset seromas. Additionally, the study did not account for potential confounders such as patient BMI, smoking status, surgical duration, or drain usage, which could influence seroma formation.

CONCLUSION

Saline wound irrigation lowered the incidence of seroma formation following mesh repair of abdominal hernias.

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Authors' Contribution

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

MSH & SI: Data acquisition, data analysis, critical review, approval of the final version to be published.

IA & MAL: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

ABJ & FN: 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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