Original Article

Seroma Formation in Ventral Hernia Repair

Association of Seroma Formation in Ventral Hernia Repair: An Analysis of Gender, Body Mass Index and Hernia Defect Size

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ABSTRACT

Objective: To investigate the relationship between patient characteristics and the development of postoperative seroma following ventral hernia repair.

Study Design: Observational / descriptive study

Place and Duration of Study: This study was conducted at the Al-Basrah Teaching Hospital between 1st March 2024 and 31st August 2024.

Methods: One hundred and twenty four patients diagnosed with ventral hernias undergoing treatment and age between 28-78 years was enrolled. The patients' demographic criteria, body mass index, waist circumference, comorbidities, postoperative seroma formation, and hernia type were evaluated. All patients were followed up for six weeks after surgery.

Results: There were predominance of females 71% and males 29%. A significant proportion of the participants over 40 years of age constituted the majority of the cohort. Nearly half of the patients were obese, and almost half of the patients presented with umbilical hernia; nearly half of the patients developed post-operative seroma. Patients with larger hernia defect sizes developed postoperative seroma significantly more often than the others.

Conclusion: Seroma formation after ventral hernia repair is frequent but often self-limiting. The incidence varies due to many factors, such as technique, preventive strategies, and the size of the hernia defect, which is critical to mitigating morbidity.

Key Words: Seroma, Complications, Ventral hernia repair, Postoperative seroma formation

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INTRODUCTION

Seroma can be defined as a collection of serosanguinous fluid that is localized within the tissue, and is responsible for the most frequently observed complications after ventral hernia repair.[1,2] However, the occurrence of seroma/hematoma remains unclear.[3,4] The repair of these types of hernia is considered a frequent and common surgery worldwide.[5]

Many patients with ventral hernia have a high body mass index (BMI). Obesity is still not a well-known independent risk factor for complications after ventral hernia surgery.[6]

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Body mass index ≥35 kg/m^2 is a known independent risk factor for complications following open ventral hernia repair (VHR).[7] The precise cause of seroma formation remains uncertain; however, it is hypothesized to arise from the build-up of fluid caused by impaired lymphatic and vascular drainage pathways following surgical procedures involving substantial tissue manipulation. Additionally, inflammatory processes leading to fluid secretion may contribute to postoperative collection within a cavity devoid of natural drainage.[8,9] Recent studies emphasize the need for a standardized classification to distinguish between transient seroma (incidents) and clinically significant complications.

Morales-Conde et al[10] proposed a seroma classification system (types 0-IV) based on duration, symptomatology, and intervention requirements, aiding in risk stratification and management protocols. Furthermore, preventive strategies, such as primary fascial closure (PFC), have shown promise in reducing the incidence by minimizing dead space.[11,12] Despite these advances, debates persist regarding optimal mesh placement techniques, with sublay approaches demonstrating lower seroma risks than onlay methods.[12] This study aimed to review the evidence of seroma formation following ventral hernia repair

concerning sex differences, BMI, and size of hernia defects.

METHODS

This Descriptive (observational) study was conducted at the Al-Basrah Teaching Hospital in southern Iraq 1st March 2024 and 31st August 2024. involving 124 patients who underwent ventral hernia repair. Participants were stratified into five age-based categories and underwent elective open mesh repair for ventral hernias within the General Surgery Department. The males and females with ventral, aged 16 years and older, who agree to participate in this study were included. All patients under the age of 16 years and all patients who were offered laparoscopic procedures were excluded. All patients were monitored from admission to six weeks postoperatively. Written informed consent was obtained from all participants before enrolment and ethical approval was granted by the Institutional Ethics Review Board (IRB). An agreement between the Basrah Health Director and the scientific research committee was obtained before data collection, and accordingly, modulations and adjustments were performed to optimize the data collected.

Demographic characteristics, anthropometric measures (body mass index, waist circumference), hernia classification, smoking status, pre-existing medical conditions, and postoperative complications, including seroma formation, were systematically recorded using standardized, pretested data collection tools. The data was entered and analyzed through SPSS-23.

RESULTS

The mean was 58.45±10.90 years. Majority of the females 88 ((71%), whereas males accounted for 36 (29%), resulting male to female ratio was 0.40. All patients underwent elective hernia repair using an open mesh method. Nearly one-third of patients were of class I obesity, 38 (30.6%), whereas other patients were of different body mass indices. Almost half of patient 66 (53.2%) presented with umbilical hernia, and the others had other types of abdominal wall hernia, and they were classified according to the European Hernia Society (EHS) classification of abdominal wall hernia into four groups (Table 1).

The patients were divided into three groups according to the size of the defect according to the European Hernia Society (EHS). The size of the hernia defect varied, ranging from small defects to larger defects (2-9) cm, and the defect was measured intraoperatively; almost half of the patients had medium-sized defects (Table 2).

Sixty (50%) patients developed post-operative seroma, most of them from the large size hernia group, 22(78%), and the other groups developed seroma at a lower frequency (Table 3). Almost half of the patients with different classes of obesity developed postoperative seromas (Table 4). Post-operative seroma was not significantly (P>0.05) associated with patient sex (Table 5).

Table No.1: Patient's characteristics (N= 124)

Variable	No.	%
Age (years)		
2-29	2	1.6
30-39	18	14.51
40-49	54	43.54
50-59	26	20.96
60^{+}	24	19.35
Gender		
Male	36	29.0
Female	88	71.0
Smoking		
Yes	12	9.7
No	112	93
Systemic Disease		
Present	68	54.8
Absent	56	45.2
Body mass index		
Normal weight(18.5-24.9)	12	9.7
Overweight (25.0-29.9)	32	25.8
Class 1 obesity (30-34.9)	38	30.6
Class 2 obesity(35-39.9)	22	17.7
Class 3 obesity(>40)	20	16.1
EHS Class		
Epigastric	12	9.7
Umbilical	66	53.2
Spigelian	4	3.2
Incisional	42	33.9

Table No. 2: Classification of hernia according to the defect size

Size	No.	%
Small <2 cm	32	25.80
Medium 2-4 cm	64	51.61
Large >4 cm	28	22.58

Table No. 3: Seroma formation according to the size of the defect

Size of defect	Number	No. patients with seroma	%	P. value
Small <2 cm	32	16	50.0	0.000
Medium 2-4 cm	64	22	34.4	
Large >4 cm	28	22	78.6	

Table No. 4: Frequency of seroma by body mass index body mass index

Body mass index	Number	No. patients with seroma	%	P. value
Normal weight	3	10	12.0	0.083
Overweight	22	24	46.0	
Obese	35	30	65.0	

Table No.5: Frequency of seroma concerning the gender of patients (N=124)

Gender	Occurrence of seroma		Exact Sig.(2-sided)	Exact Sig.(1-sided)
	Present	Absent		
Male	16 (12.9%)	20 (16.1%)	.0693	.358
Female	44 (35.4%)	44 (35.4%)		

DISCUSSION

In this study, we found that most of the patients found to be middle-aged females, and they underwent an elective ventral hernia repair, particularly umbilical hernia (53.2%). Nearly two-thirds of the patients had different classes of obesity. Patients with larger hernia defects tend to develop post-operative seromas more frequently than other patients do. Consistent with existing studies, our findings demonstrated a predominance of female over male patients as observed by Howard et al[10], Polcz et al[11], and Bittner et al.[12] In our study we observed that there was no significant association between sex differences and post-operative seroma formation p value more than (0.05), as nearly 50% of female patients had seroma and 48 % of male patients who developed seroma, other researchers claim that females tend to have more seroma formations as a result of differences in the abdominal wall elasticity as well as the larger hernia defect.[10-16]

Post-operative seroma formation is a common complication following ventral hernia repair, but the exact incidence is variable as asymptomatic patients are often missed, unlike those patients with large seroma or when seroma accumulates under tension that mandates both clinical and imaging workup for accurate diagnosis, which subsequently ensures adequate treatment.[13,14] In the present study, almost half of the patients developed post-operative seromas.

In our study, we observed that 64.5% of patients were obese, and nearly half of them, 52.5%, developed post-operative seroma, which was statistically not significant p p-value more than 0.05). Similar findings were also documented by other similar studies.[16] Other similar studies mentioned that obesity classes I, II, and III do not significantly affect the rate of seroma after ventral hernia repair, but other factors such as larger hernia defect size and prior repair had a significant impact on post-operative seroma formation.[15,17-19]

In this study, we observed that patients with large hernia defects developed postoperative seroma, which was statistically significant. P-value less than (0.05), similar findings were also reported by Holihan et al[20] who found that hernias 10 cm wide had a 2.5-fold higher risk of seroma compared to smaller defects. A similar results were found by other researchers[21-23], and they mention that the association between large hernia defect size and post-operative seroma formation post ventral hernia repair results mostly due to multiple mechanisms and was well documented in surgical literature, larger defects require extensive dissection to mobilize tissue for closure, this will result in creation of dead space where fluid (seroma) can accumulate and as a result of lymphatic channels and vascular network disruption during dissection impairs fluid reabsorption, closure under tension reduces tissue perfusion, exacerbating inflammation and fluid leakage, in addition to that larger hernias often necessitate longer operative times and more aggressive tissue handling, leading to inflammation and exudate production.[21-23]

In our study, we observed that all patients with seroma formation were improved by short-term antibiotics and aspiration under ultrasound guidance with follow-up, and only they developed short-term morbidity; other researchers have nearly similar results.[14,24-26]

In summary, this study highlights a significant association between seroma development and the size of ventral hernia defects, with additional factors such as obesity and sex-related variations that potentially exert indirect influences. Conservative approaches appear to be optimal for the management of asymptomatic cases. To validate these findings, future research should prioritize randomized controlled trials and prospective studies involving larger cohorts and control groups. We recommend that future research should focus on the closure of hernia defects, optimizing mesh materials, and fixation methods to further reduce seroma rates.

CONCLUSION

Seroma formation after ventral hernia repair is frequent but often self-limiting. Incidence is affected by many factors such as technique, preventive strategies (e.g., fascial closure, drains), and the size of hernia defects, which are critical to mitigating morbidity.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Ahmed Ziarra Khalaf, Mazin A. Abdulaa
Drafting or Revising Critically:	Hashim Jakob, Ahmed A.R. Issa
Final Approval of version:	All the above authors
Agreement to accountable for all aspects of work:	All the above authors

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