ORIGINAL ARTICLE ASIAN JOURNAL OF MEDICAL SCIENCES

Clinical study of mesh repair in ventral hernia with comorbidities (diabetes mellitus and/or obesity and/or hypothyroidism) in a tertiary care hospital

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Submission: 25-11-2023 Revision: 30-01-2024 Publication: 01-03-2024

ABSTRACT

Background: Ventral hernias comprise the second-most common hernia presentation, or 21–35% of all hernia types in the surgical world. Ventral hernias include incisional, umbilical, epigastric, and spigelian hernias, among others. This study was undertaken to know the different clinical types, age incidence, and predisposing factors for ventral hernia and to study the complications. **Aims and Objectives:** This study was undertaken to know the different clinical types, age incidence, and predisposing factors for ventral hernia and to study the complications. **Materials and Methods:** Forty-five cases of ventral hernias treated were studied prospectively from January 2021 to June 2022, in which each patient was evaluated thoroughly and surgery was planned to obtain a satisfactory outcome. The distribution of ventral hernias with respect to age, sex, comorbidities, and risk was recorded. Common presenting symptoms of ventral hernias, diagnosis, and complications were studied. The data collected was entered in a proforma, tabulated, and statistically analyzed. **Results:** Females were affected much more than males. Out of the three types of hernia that were studied, umbilical hernia showed more incidence (n = 23/51%), followed by incisional hernia (n = 15/33%), and epigastric hernia (n = 7/16%). The most common age presentation was in the fourth and fifth decades. The most common type of mesh repair was pre-peritoneal repair in 28 (62%). The pain was relatively more common post-surgery complications, as noted in 11 (24%). In 100% of the cases, swelling was the complaint, followed by pain (18.8%). Obesity was the most common etiological factor in the development of ventral hernias (60%), followed by diabetes (35%). **Conclusion:** The most common ventral hernia was an umbilical hernia. Ventral hernias are more common in females. Obesity and diabetes are observed to be the major predisposing risk factors. Good pre-operative evaluation and preparation, sound anatomical knowledge, and meticulous attention to surgical detail are the most important factors for the prevention of postoperative complications. In view of the limited period of follow-up, we were not in a position to comment on recurrence rates, but when proper surgical procedures are adopted along with pre-operative correction of comorbid factors, results will always be excellent.

Key words: Clinical study; Ventral hernia; Tertiary care hospital; Comorbidities

Access this article online

Website: http://nepjol.info/index.php/AJMS

DOI: 10.3126/ajms.v15i3.60171

E-ISSN: 2091-0576

P-ISSN: 2467-9100

INTRODUCTION

A ventral hernia is coming out through the anterior abdominal wall and is a common surgical problem with an increase in the repair rate.[1] Ventral hernias are frequently occurring surgical entities that may or may not be symptomatic. However, they can be aesthetically disturbing and are diagnosed primarily by clinical

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examination.[2] In patients presenting to general surgery OPD having ventral hernias, the most common complaint for presentation is swelling, while the 2nd most common is pain over the swelling. These two complaints often bring the patient to a surgeon seeking surgical treatment. Investigations like ultrasound and computed tomography can be used to diagnose any predisposing factors. While tension-free repair is the core concept, the use of mesh has caused a decrease in recurrence rates and is recommended.[3]

An understanding of the abdominal wall anatomy and physiology is key to the restoration of abdominal wall function. Prevention of incisional hernia still requires evaluation (Figure 1), but proper closure of laparotomies and abdominal incisions, in general, using the correct technique and suture material may reduce the incidence. Preventing wound infection is vital to preventing incisional hernias in the future. The operative management of ventral hernias constitutes a wide range of surgeries, from classical anatomical repair of the defect to prosthetic repair and advanced reconstruction methods. In addition, the use of minimally invasive procedures allows for less surgical site infections, shorter hospital stays, and an early return to work. In this study, we have made an attempt to study 45 cases of ventral hernia prospectively from January 2021 to June 2022 regarding their presentations, age incidence, predisposing risk factors, and complications.

Aims and objectives

To understand the different clinical types, age incidence, and predisposing factors for ventral hernia and to study the complications (Figure 2).

MATERIALS AND METHODS

The approval of the institutional ethical board was obtained from Mysore Medical College and Research Institute under the letter number (EC REG: ECR/134/Inst/KA/2013/RR-19). 45 cases of ventral hernias were treated in the department of general surgery at a tertiary care hospital, Mysore Medical College and Research Centre, Mysore, from January 2021 to June 2022 (prospective). Approval was taken from the Ethical Committee. A simple random sampling was done to select the patients. The patients were taken up for surgery after written and informed consent. All the patients diagnosed with ventral hernias (epigastric, para-umbilical, incisional, parastomal, and Spigelian) treated during the study above the age of 30 were included. Patients diagnosed with inguinal hernias and femoral hernias were excluded from the study (Figure 3). Informed consent was taken from both patients and informants. The distribution of various types of ventral hernias with respect to age, sex, and common presenting symptoms of ventral hernias, diagnosis, and complications were studied. The findings were then recorded, and the patients were monitored postoperatively. The data collected

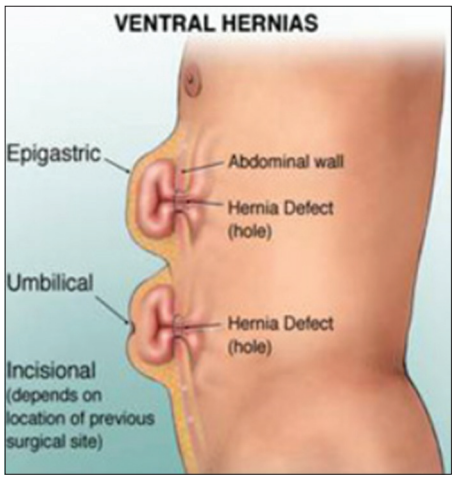

Figure 1: Diagrammatic representation of ventral hernia

Figure 2: Ventral hernia

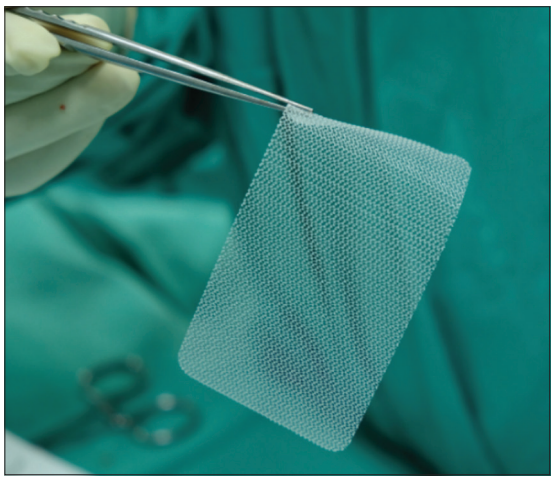

Figure 3: Mesh

were analyzed. Percentages were used for the analysis and presentation of the collected data.

Inclusion criteria

1. All cases of ventral hernia between 14 and 60 years of both sexes with co-morbidities (obesity, diabetes mellitus)
2. Patients for whom mesh repair was indicated
3. Patients willing for surgery and follow up.

Exclusion criteria

1. Patients with recurrent ventral hernias
2. Patients with collagen-vascular diseases
3. Patients associated with major co-morbidities
4. Retroviral diseases-positive patients.

RESULTS

The mean age of patients presenting with ventral hernia with co-morbidities in this cohort was 50.8±5 years. The occurrence of ventral hernia was more common in females (26/58%) compared to males (19/42%). The highest incidence of ventral hernia was noted in the 4th decade, which was 40–49 year old and amounted to 15 (33.3%) patients. The most common complaint was swelling in 44 (98%) patients, followed by pain in 21 (47%) patients. Irreducibility was seen in 5 (11%), obstruction in 3 (6%), and strangulation in 0 (0%) patients. On evaluation, the most common predisposing factor for ventral hernia was obesity in 27 (60%) patients, followed by diabetes observed in 16 (35%) of patients, hypertension was present in 14 (31%) of patients, and hypothyroidism in 13 (29%) of patients (Table 1).

Diabetes was present in 16 (35%), hypertension in 14 (31%), hypothyroidism in 13 (29%), obesity in 27 (60%), COPD in 0 (0%), past surgery in 20 (44%), and multiparity in 21 (47%). After the patients were investigated, a diagnosis of umbilical hernia was made in 23 (51%) of the patients. Epigastric hernia was noted in 7 (16%) of patients, and incisional hernia was diagnosed in 15 (33%) of patients (Table 2).

The most common type of mesh repair was pre-peritoneal repair in 28 (62%) patients, followed by on-lay repair in 17 (38%) patients (Table 3).

The most common post-surgery complication observed was pain in 11 (24%) patients, followed by surgical site infection (SSI) in 10 (22%), seroma in 8 (18%), long duration of hospital stays in 7 (16%), long duration of drain removal in 2 (4%), and pneumonia was not seen in any patients (Table 4).

The patients were evaluated for hospitalization days and the drain duration post-surgery in diabetes, hypertensive, hypothyroidism, and obese patients. Diabetes patients had a mean of 6 days of hospitalization and 2.8 days of drain duration compared to non-diabetes patients, who had 5.6 days of hospitalization and 2.6 days of drain duration. The hypertension patients had slightly more than 5.78 days of hospitalization compared to 5.77 days in non-hypertensive patients. The drain duration was longer

Table 1: Distribution of patients based on age, gender, presenting complaints, and comorbidities

Distribution of patients based on age					
Age distribution	**Number of cases**	**Percentage**			
30–39	9	20.0			
40–49	15	33.3			
50–59	11	24.4			
60–69	4	8.9			
70–79	6	13.3			
Total patients	45	100.0			
Distribution of patients based on gender					
Gender					
Male	19	42			
Female	26	58			
Total	45	100			
Distribution of patients based on presenting complaints					
	Swelling	**Pain**	**Irreducibility**	**Obstruction**	**Strangulation**
Number of patients	44	21	5	3	0
Percentage	98	47	11	6	0
Distribution of patients based on comorbidities					
	Diabetes	**Hypertension**	**Hypothyroidism**	**Obesity**	
Number of patients	16	14	13	27	
Percentage	35	31	29	60	

Table 2: Distribution of patients based on risk factors and spectrum of diagnosis

Distribution of patients based on risk factors							
	Diabetes	Hypertension	Hypothyroidism	Obesity	COPD	Past surgery	Multi parity
Number of patients	16	14	13	27	0	20	21
Percentage	35	31	29	60	0	44	47
Distribution of patients based on the spectrum of diagnosis							
Diagnosis				**Patients**		**Percentage**	
Umbilical hernia				23		51	
Epigastric hernia				7		16	
Incisional hernia				15		33	

Table 3: Distribution of patients based on the spectrum of mesh repair, days of hospitalization, and duration of the drain

Distribution of patients based on the spectrum of mesh repair					
Types of mesh repair	**On lay repair**			**Pre peritoneal repair**	
No. of patients	17			28	
Percentage	38			62	
Distribution of patients based on days of hospitalization					
Hospitalization days	**1–3 days**		**4–6 days**		**7–10 days**
No. of patients	11		27		7
Percentage	24		60		16
Distribution of patients based on the duration of drain post-surgery					
Drain duration	**1 day**	**2 days**	**3 days**	**4 days**	**5 days**
No. of patients	2	19	17	5	2
Percentage	4	42	38	12	4

Table 4: Complications observed among patients

Distribution of patients based on the spectrum of mesh repair					
Types of mesh repair	**On lay repair**			**Pre peritoneal repair**	
No. of patients	17			28	
Percentage	38			62	
Distribution of patients based on days of hospitalization					
Hospitalization days	**1–3 days**		**4–6 days**		**7–10 days**
Number of patients	11		27		7
Percentage	24		60		16
Distribution of patients based on the duration of drain post-surgery					
Drain duration	**1 day**	**2 days**	**3 days**	**4 days**	**5 days**
No. of patients	2	19	17	5	2
Percentage	4	42	38	12	4

in hypertensive patients (2.9 days) as compared to non-hypertensive patients (2.5 days). The hypothyroid patients had lesser hospitalization days (5.3 days) and a drain duration of 2.6 days compared to the non-hypothyroid patients, who had 5.9 days of hospitalization and 2.7 days of drain duration. The obese patients had more hospitalization days (5.85 days) and a drain duration of 2.8 days compared to non-obese patients, who had 5.6 days of hospitalization and 2.4 days of drain duration (Table 5).

DISCUSSION

A ventral hernia is a common surgical problem, with an increase in the repair rate annually. Ventral hernias incorporate a group of hernias that occur in the anterior abdominal wall, including incisional, umbilical, epigastric, and para-umbilical hernias.[4] Hernias are commonly managed by laparoscopic or open surgery, either by tissue repair or mesh repair.[5] Patients who underwent "onlay" repair (placement of mesh anterior to the anterior rectus sheath/external oblique) were compared with those

Table 5: Group statistics between days of hospitalization and duration of drain in diabetes with comorbidities among patients

Statistics of comorbidities				
	Diabetes	Hypertension	Hypothyroidism	Obesity
Chi-Square	3.756	6.422	8.022	1.800
df	1	1	1	1
Asymptotic significance	0.053	0.011	0.005	0.180

Statistics between days of hospitalization and duration of drain in diabetic patients					
	Diabetes	n	Mean	SD	Mean SE
Hospitalization days	Yes	16	6.0625	1.84278	0.46069
	No	29	5.6207	1.93490	0.35930
Drain duration	Yes	16	2.8125	0.91059	0.22765
	No	29	2.6207	0.90292	0.16767

Statistics between days of hospitalization and duration of drain in hypertensive patients					
	Hypertension	n	Mean	SD	Mean SE
Hospitalization days	Yes	14	5.7857	2.19014	0.58534
	No	31	5.7742	1.78344	0.32031
Drain duration	Yes	14	2.9286	0.99725	0.26653
	No	31	2.5806	0.84751	0.15222

Statistics between days of hospitalization and duration of drain in hypothyroidism among patients					
	Hypothyroidism	n	Mean	SD	Mean SE
Hospitalization days	Yes	13	5.3846	1.80455	0.50049
	No	32	5.9375	1.93337	0.34177
Drain duration	Yes	13	2.6154	1.04391	0.28953
	No	32	2.7188	0.85135	0.15050

Statistics between days of hospitalization and duration of drain in obese patients					
	Obesity	n	Mean	SD	Mean SE
Hospitalization days	Yes	27	5.8519	1.87501	0.36085
	No	18	5.6667	1.97037	0.46442
Drain duration	Yes	27	2.8519	1.02671	0.19759
	No	18	2.4444	0.61570	0.14512

SD: Standard deviation

who underwent "preperitoneal" repair (mesh placement between the parietal peritoneum and the posterior rectus sheath). The definitions of these planes of mesh placement are in accordance with the consensus proposed.[6]

This present study has been compared to other series of similar natures. Forty-five cases of ventral hernia were taken up for this study, which was done between January 2021 and June 2022. This present study of 45 cases of ventral hernia had 23/45 (51%) umbilical hernia, 15/45 (33%) incisional hernia, and 7/45 (16%) epigastric hernia. There were no cases of spigelian hernia or divarication of the rectus abdominis. Kalyan et al., in their study, showed that the most common diagnosis was paraumbilical hernia (34%), followed by epigastric (22%) and umbilical hernia (22%).[7] In comparison with a study by Bose series, 44 of 175 cases, 110 were incisional hernias (62.86%), 12 were umbilical hernias (6.85%), 32 cases were para-umbilical hernias (18.28%), and 21 cases were epigastric hernias (12.0%).[8] Many patients had comorbidities that were seen either alone or in combination with others. The most common comorbidity was obesity in 27 (60%), followed by multiparity in 21 (47%), past surgery in 20 (44%), diabetes in 16 (35%), hypertension in 14(31%), and hypothyroidism in 13 (29%). Kalyan et al., observed in their study that the most common comorbidity was hypertension and type 2 diabetes mellitus.[7] Diabetes mellitus, obesity, and smoking have been associated with a high percentage of postoperative hernias.[9]

In the present series, female predominance is seen. This concurs well with the Akman Series and Siedel Series. Multiple factors, such as multiparity, decreased abdominal muscle tone, replacement of collagen tissues, history of gynecological surgeries through a lower midline incision, etc., predispose females to ventral hernias.[10,11] Among 45 cases of ventral hernia, 28 (62%) were treated with pre-peritoneal repair and 17 (38%) with onlay repair with mesh repair. In the Varghese et al., study, out of 121 patients, 51 had undergone onlay mesh placement and 52 had undergone preperitoneal mesh placement.[12] The dissection of subcutaneous tissue of the anterior rectus sheath and the external oblique aponeurosis

during onlay mesh repair is non-anatomical and transects capillaries as well as perforating vessels passing from inside the rectus sheath to the skin. Insertion of prosthetic material within this space further adds to the tendency for tissue fluid to collect due to foreign body reactions. Even though this space is usually drained with closed suction devices, seroma formation can be sustained until effective vascularity is established by the regeneration of capillaries within the healing tissue.[13] In comparison, the preperitoneal procedure involves the placement of mesh within an already existing anatomical plane between the rectus and the peritoneum, with the rich lymphatics of the peritoneum and rectus muscles on either side, which absorb the tissue fluid.

Post-operative complications play a major role in a surgical patient and add to the morbidity of the patient. Although hernia surgery is considered to be a clean surgery, it is not completely free of complications. Hematoma, seroma, surgical site infections (SSIs), and wound dehiscence are among the common complications following hernia surgery. Pain was the presenting complaint in 11 (24%) patients, followed by SSI in 11 (24%), surgical site infection (SSI) in 10 (22%), seroma in 8 (18%), long duration of hospital stays in 7 (16%), long duration of drain removal in 2 (4%), and pneumonia was not seen in any patients. Similar results have been noted in the studies conducted by Thota et al.,[14] and Badiger et al.,[15] In the Chavan et al., study, the pain was complained about by 18.96% of patients. Around 6.89% presented with features of irreducibility, and 0.57% presented with features of obstruction and strangulation. Read and yonder series 50 reported that 17% of incisional hernias were operated on for strangulation and obstruction.[16]

Twenty-eight out of forty-five patients underwent preperitoneal repair, possibly because of multiple sacs providing redundant peritoneum. Patients with comorbidities, especially obesity, have been reported to have higher chances of undergoing mesh repair. There was no significant difference in the comorbidities, days of hospitalization, and duration of the drain of the patients in predisposing the patient.

Limitations of the study

The data collection was confined to a particular limited tertiary care hospital, which may not be an accurate presentation of the general population. The sample size was very small; hence, it represents only a small proportion of the entire population. In view of a very limed period of follow-up and small sample size, it was not possible to comment on recurrence rates.

CONCLUSION

The commonest ventral hernia was an umbilical hernia. Ventral hernias are more common in females. Obesity and diabetes are observed to be the major predisposing risk factors. Good pre-operative evaluation and preparation; sound anatomical knowledge and meticulous attention to surgical detail are the most important factors for the prevention of postoperative complications. In view of limited period follow-up, we were not in a position to comment on recurrence rates, but when proper surgical procedures are adopted along with pre-operative correction of co-morbid factors, results will always be excellent.

ACKNOWLEDGMENT

The authors are acknowledged for presenting part of this paper in the form of a free paper presentation at the 5th Mid-Year Conference of the Karnataka State Chapter of the Associations of Surgeons of India (KSCASImidCON 2022).

REFERENCES

1. Smith J, Parmely JD. Ventral hernia. In: StatPearls. United States: StatPearls Publishing; 2021.
2. Hope WW and Tuma F. Incisional Hernia. InStatPearls; 2022. StatPearls Publishing.
3. Holihan JL, Hannon C, Goodenough C, Flores-Gonzalez JR, Itani KM, Olavarria O, et al. Ventral hernia repair: A meta-analysis of randomized controlled trials. Surg Infect (Larchmt). 2017;18(6):647-658.
   https://doi.org/10.1089/sur.2017.029
4. Luijendijk RW, Hop WC, Van Den Tol MP, De Lange DC, Braaksma MM, IJzermans JN, et al. A comparison of suture repair with mesh repair for incisional hernia. N Engl J Med. 2000;343(6):392-398.
   https://doi.org/10.1056/NEJM200008103430603
5. Tayar C, Karoui M, Cherqui D and Fagniez PL. Robot-assisted laparoscopic mesh repair of incisional hernias with exclusive intracorporeal suturing: A pilot study. Surg Endosc. 2007;21(10):1786-1789.
   https://doi.org/10.1007/s00464-007-9247-3
6. Parker SG, Wood CP, Sanders DL and Windsor AC. Nomenclature in abdominal wall hernias: Is it time for consensus? World J Surg. 2017;41(10):2488-2491.
   https://doi.org/10.1007/s00268-017-4037-0
7. Kalyan M, Rathore SS, Verma V, Sharma S, Choudhary M, Irshad I, et al. Laparoscopic versus open ventral hernia repair: Experience at a tertiary care center in Western Rajasthan. Cureus. 2022;14(7):e27279.
   https://doi.org/10.7759/cureus.27279
8. Bose SM, Lal R, Kalra M, Wig JD and Khanna SK. Ventral hernia: A review of 175 cases. Indian J Surg. 1999;61(3):180-184.
9. Howard R, Thompson M, Fan Z, Englesbe M, Dimick JB and Telem DA. Costs associated with modifiable risk factors

in ventral and incisional hernia repair. JAMA Netw Open. 2019;2(11):e1916330.
https://doi.org/10.1001/jamanetworkopen.2019.16330

10. Nho RL, Mege D, Ouaïssi M, Sielezneff I and Sastre B. Incidence and prevention of ventral incisional hernia. J Visc Surg. 2012;149(5):e3-e14.
https://doi.org/10.1016/j.jviscsurg.2012.05.004
11. Shah PP, Shaikh S and Panchabhai S. Prevalence of anterior abdominal wall hernia and its associated risk factors. Int J Anat Radiol Surg. 2016;5(3):7-10.
12. Varghese BK, Roy N, Yadav A and Jaiswal SS. Open mesh repair for ventral hernias-Onlay or preperitoneal: Analysis of a young surgeon's dilemma. Int J Sci Res. 2016;7:33-37.
https://doi.org/10.21275/ART2018483
13. Naegeli KM, Kural MH, Li Y, Wang J, Hugentobler EA and Niklason LE. Bioengineering human tissues and the future of vascular replacement. Circ Res. 2022;131(1):109-126.
https://doi.org/10.1161/CIRCRESAHA.121.319984
14. Thota A, Ravishankar KS, Rao KV, Ramesh BS and Ananda BB. Comparative study between open and laparoscopic ventral hernia repair: A prospective non-randomized single institutional study. J NTR Univ Health Sci. 2017;6(4):217.
https://doi.org/10.4103/JDRNTRUHS.JDRNTRUHS_115_16
15. Badiger S, Koppad SN, Kulkarni A and Kodliwadmath H. Comparative analysis of open versus laparoscopic ventral hernia repair. Int Surg J. 2016;3(3):1167-1172.
https://doi.org/10.18203/2349-2902.isj20161884
16. Chavan SS, Baruah TD and Babu GB. A clinical study on ventral hernias in a tertiary care hospital. Int Surg J. 2017;4(8):2600-2604.
https://doi.org/10.18203/2349-2902.isj20173106

Authors Contributions:
MBS- Coordination and manuscript revision; **M-** Definition of intellectual content, literature survey, prepared first draft of manuscript, implementation of study protocol, data collection, data analysis, manuscript preparation and submission of article; design of study, statistical analysis and interpretation; review manuscript; **D-** Concept, design, clinical protocol, manuscript preparation, editing, and manuscript revision; literature survey and preparation of figures; **SV-** Concept, design, clinical protocol, manuscript preparation, editing, and manuscript revision; literature survey and preparation of figures.

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Source of Support: Nil, **Conflicts of Interest:** None declared.