

A Study of Clinical Profile and Outcome of Open Mesh Repair vs Laparoscopic Mesh Repair of Umbilical Hernia in Public Sector Hospital

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ABSTRACT

Background: When a viscus or part of a viscus protrudes through the umbilicus, it is known as umbilical hernia. These hernias constitute as one of the common hernias of adults. Umbilical hernias are common in individuals with increased intra-abdominal pressure such as obesity, ascites, or chronic abdominal distension including malignancy. Mesh repair in umbilical hernia can be open mesh repair or laparoscopic mesh repair with each having their own advantages and disadvantages. This study attempts to evaluate various operative procedures and postoperative results of umbilical hernia in public sector hospital.

Methods: Study was an interventional study with a total sample size of 80. Study population were all the patients admitted with umbilical hernia to the surgical wards of hospitals associated with Bangalore Medical College and Research Institute. The study was conducted from November 2018 to May 2020. After admission, patients fulfilling the inclusion criteria were enrolled into the study and informed written consent was obtained. All the details and investigations of each patient were recorded in the case record form at the baseline visit. In 40 patients, open mesh repair of umbilical hernia was done, and in another 40 patients, laparoscopic mesh repair of umbilical hernia was done. The duration of surgery and various other postoperative complications were recorded.

Results: Eighty cases of umbilical hernia were operated, out of which, in 40 patients, open mesh repair was done and, in another 40 patients, laparoscopic mesh repair was done. Thirty-six of 40 patients were females, and 4 of 40 patients were males in the laparoscopic mesh group. Thirty-two of 40 patients were females, and 8 of 40 patients were males who underwent open mesh repair. Mean age was 45.0 years, and mean operating time was 64.75 minutes for open mesh repair group, whereas mean age was 42.37 years and mean operating time was 50.38 minutes for laparoscopic mesh repair group. Operating time showed statistical significance.

Conclusion: Laparoscopic mesh repair of umbilical hernia is becoming the procedure of choice in public sector hospitals in terms of decrease operating time, early recovery, less pain and less complications in postoperative period, and reduced duration of hospital stay as compared to open mesh repair of umbilical hernia.

Keywords: Laparoscopic mesh repair, Open mesh repair, Umbilical hernia.

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INTRODUCTION

In Latin, the word hernia means rupture. An abnormal protrusion of an organ or tissue through a defect in its surrounding walls defines hernia. When a viscus or part of a viscus protrudes through the umbilicus, it is known as umbilical hernia. It is a full thickness protrusion of the umbilicus with an underlying fascial defect and may contain peritoneal fluid, preperitoneal fat, intestine, or omentum as the content.¹

Umbilical hernia in infants is common and congenital, whereas in adults, it is largely acquired. Umbilical hernia is commonly seen in females and in patients with conditions that result in increased intra-abdominal pressure such as obesity, pregnancy, ascites, or chronic abdominal distension.²

The physical examination or ultrasound has identified up to 50% of all individuals having fascial defect of umbilical ring.³ Patients with umbilical hernia usually present as a soft bulge located anterior or adjacent to the umbilicus.⁴

Umbilical hernia is the second commonest type of hernia. The surgical management of umbilical hernia has developed over the years, and umbilical hernia can be treated by anatomical repair, open mesh repair, or laparoscopic mesh repair. The absolute indications

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for surgery are incarcerated hernia requiring reduction, strangulated hernia, perforation, and evisceration. The persistence and appearance of hernia are relative indications for operative repair.⁵

This study is done to estimate the prevalence, clinical findings, and risk factors associated with the umbilical hernia in adults and also compare the operative techniques of umbilical hernia repair. This study also compares the postoperative outcomes of the umbilical hernia repair by open mesh repair and laparoscopic mesh repair.

OBJECTIVES OF THE STUDY

- To study the clinical profile of patients opting for open mesh repair or laparoscopic mesh repair of umbilical hernia.
- To study the outcomes of open mesh repair and laparoscopic repair of umbilical hernia.

MATERIALS

Study was prospective interventional study, and study population were all the patients admitted with umbilical hernia to the surgical wards of hospitals associated with Bangalore Medical College and Research Institute. The study was conducted from November 2018 to May 2020. Institutional ethical committee approval was taken. Sample size selected was 80. Study sample was selected based on inclusion and exclusion criteria.

Inclusion Criteria

- Patients with age more than 18 years, admitted with umbilical hernia without complications and willing for informed written consent.

Exclusion Criteria

- All patients with defect size more than 3 cm.
- Patients with obstructed/strangulated/complicated umbilical hernia.
- Patients having abdominal malignancies.
- Patients having coagulopathy, severe cardiopulmonary disease, ascites, and renal failure.
- Patients not fit for surgery.

METHODS

Institutional ethical committee clearance and written informed consent were obtained, patients were then admitted in the surgical wards with the diagnosis of umbilical hernia, and those coming under the inclusion criteria were enrolled into the study. A total number of patients with umbilical hernia enrolled into the study were 80, among them 40 patients were operated by open mesh repair technique and 40 patients were operated by laparoscopic mesh repair technique. Each patient was given a unique identity number. Demographic data, medical history, and history of concomitant medications were taken at the baseline visit. Physical examination, clinical examination, and other details according to the proforma were recorded, and relevant investigations were also done at the baseline visit. After relevant investigations and confirmation of diagnosis, preanesthetic evaluation is done and patients were randomly selected for open or LAP mesh repair. Operated patients were divided into two groups.

- Group I (LAP) patients undergoing laparoscopic mesh repair.
- Group II (OPEN) patients undergoing open mesh repair.

Postoperative evaluation was done until the patient was discharged and followed up at 2, 4, and 12 weeks. At the follow-up visits, detailed physical and clinical examinations were conducted.

Data were collected during preoperative and postoperative evaluation. All the data were compiled and subjected to statistical analysis. Collected data were subjected to descriptive statistics such as mean, median, standard deviation, interquartile range, percentages, tables, and graphs wherever necessary. Chi-square test and independent *t*-test were used for significant difference between the two groups, and $p < 0.05$ was considered statistically significant.

RESULTS

Among the 40 (100%) subjects in LAP group, 18 (45%) were aged between 36 and 45 years, whereas in open group, 15 (37.5%) subjects were aged between 36 and 45 years. Chi-square test was used to check the association and showed nonsignificant association with respect to age ($\chi^2 = 1.349$; $p = 0.717$) (Table 1).

Mean age was higher for open group (42.37 years) as compared to LAP group (45.0 years). Independent sample *t*-test was used to compare the age between the two groups and showed nonsignificant difference between the groups ($p = 0.2309$) with respect to age (Table 2).

Females were higher in both the groups, 36 (90%) in LAP group and 32 (80%) in open group. Chi-square test was used to check the association and showed nonsignificant association with respect to gender ($\chi^2 = 1.56$; $p = 0.21$) (Table 3).

Out of 40 subjects in LAP group, majority 36 (90.0%) subjects had only swelling, whereas in open group, 35 (87.5%) had only swelling. Remaining subjects had mild pain with swelling. Chi-square test was used to check the association and showed nonsignificant association with respect to symptoms ($\chi^2 = 0.1252$; $p = 0.7234$) (Table 4).

Diabetes mellitus with hypertension was present in five (12.5%) subjects in LAP group, whereas in open group, there were seven (17.5%) subjects who had diabetes mellitus with hypertension. Chi-square test was used to check the association and showed nonsignificant association with respect to comorbidities ($\chi^2 = 1.041$; $p = 0.7913$) (Table 5).

Mean defect size was higher for open group (1.70) as compared to LAP group (1.66). Independent sample *t*-test was applied to compare the defect size between the two groups and showed nonsignificant difference between the groups ($p = 0.691$) with respect to defect size (Table 6).

Table 1: Age-wise distribution of the subjects

	Groups		Total
	Lap	Open	
25–35 years			
Count	8	6	14
Percent	20%	15.0%	17.50%
36–45 years			
Count	18	15	33
Percent	45.0%	37.5%	41.25%
46–55 years			
Count	10	13	23
Percent	25.0%	32.5%	28.75%
Above 55 years			
Count	4	6	10
Percent	10.0%	15.0%	12.50%
Total			
Count	40	40	80
Percent	100.0%	100.0%	100.0%

Chi-square value—1.349; *p* value—0.717

Table 2: Comparison of age between the groups using independent sample *t*-test

	Min	Max	Mean	Std. deviation	Mean diff	<i>p</i> value
Lap	25	60	42.37	9.220	–2.63	0.2309
Open	25	68	45.00	10.201		

Table 3: Genderwise distribution of the subjects

	Groups		Total
	Lap	Open	
Females			
Count	36	32	68
Percent	90.0%	80.0%	85.0%
Males			
Count	4	8	12
Percent	10.0%	20.0%	15.0%
Total			
Count	40	40	80
Percent	100.0%	100.0%	100.0%

Chi-square value—1.56; *p* value—0.21; Significance level, 0.05

Table 4: Distribution of the subjects based on symptoms

	Groups		Total
	Lap	Open	
Swelling			
Count	36	35	71
Percent	90.0%	87.5%	88.75%
Swelling, Pain			
Count	4	5	9
Percent	10.0%	12.5%	11.25%
Total			
Count	40	40	80
Percent	100.0%	100.0%	100.0%

Chi-square value—0.1252; *p* value—0.7234; Significance level, 0.05

Table 5: Distribution of the subjects based on comorbidities

	Groups		Total
	Lap	Open	
DM			
Count	4	6	10
Percent	10.0%	15.0%	12.5%
DM, HTN			
Count	5	7	12
Percent			
HTN			
Count	3	3	6
Percent	7.5%	7.5%	7.5%
NIL			
Count	28	24	52
Percent	70.0%	60.0%	65.0%
Total			
Count	40	40	80
Percent	100.0%	100.0%	100.0%

Chi-square value—1.041; *p* value—0.7913; Significance level, 0.05

Table 6: Comparison of defect size between the groups using independent sample *t*-test

	Min	Max	Mean	Std. deviation	Mean diff	<i>p</i> value
Lap	1.0	2.6	1.66	0.4634	-0.04	0.691
Open	0.9	2.6	1.70	0.4338		

Table 7: Comparison of duration of procedure (in minutes) between the groups using independent sample *t*-test

	Min	Max	Mean	Std. deviation	Mean diff	<i>p</i> value
Lap	40	65	50.38	6.444	-14.37	0.00
Open	45	90	64.75	10.497		

Mean time of procedure was more for open group (64.75 ± 10.497) as compared to LAP group (50.38 ± 6.44). Independent sample *t*-test was used to compare the duration of procedure between the groups and showed statistically significant difference between the groups ($p < 0.001$) with respect to duration of procedure (Table 7).

Table 8 shows the distribution of the subjects based on postoperative complications. Postoperative pain was present in 35 subjects (12 in LAP group and 23 in open group). Seroma was present only in open group 14 (35%). Wound infection was present in seven (17.5%) subjects in open group. Chi-square test showed statistically significant association with respect to postoperative pain ($p = 0.013$), seroma ($p < 0.001$), and wound infection ($p = 0.006$).

Mean duration of hospital stay was higher for open group (8.00 ± 2.582) as compared to LAP group (3.30 ± 0.464). Independent sample *t*-test was applied to compare the duration of hospital stay between the groups. Independent sample *t*-test showed statistically significant difference between the groups ($p < 0.001$) with respect to duration of hospital stay (Table 9).

DISCUSSION

Umbilical hernias are among one of the most common abdominal wall hernias, which is 10% of primary hernias in adult population.⁶ Umbilical hernia can either be acquired or congenital. The pathophysiology of umbilical hernia is related to a combination of mechanical deficits of the abdominal wall and/or mechanical factors impacting the abdominal wall.⁷ Umbilical hernia occurs as a consequence of pull of the abdominal muscles and connective tissue deterioration.⁸ There are no absolute contraindications to umbilical hernia repair.⁹ The repair of umbilical hernia can be by either open mesh repair technique or laparoscopic mesh repair technique. The mesh can be placed either onlay, underlay, or inlay.⁶ The risk of mesh infection is high as it acts as a foreign body. Nevertheless, tension-free mesh repair is considered ideal for umbilical hernia repair as primary repair of umbilical hernia is associated with higher recurrence rate.¹ Laparoscopic mesh repair allows for clear visualization of the abdominal wall, wide mesh coverage beyond defect, and secure fixation to the fascia of abdominal wall. The laparoscopic method is the best approach in morbidly obese patient and in patients with very large hernia.¹⁰

This study attempts to evaluate the clinical profile of patients presenting with umbilical hernia and also to compare the outcomes of open mesh repair and laparoscopic mesh repair of umbilical hernia. Eighty patients with umbilical hernia admitted in the surgical wards of hospitals associated with Bangalore Medical College and Research Institute, Bengaluru, from November 2018

Table 8: Distribution of the subjects based on post op complications

			Groups		Total	Chi-square value	p value
			Lap	Open			
Postoperative pain	N	Count	28	17	45	6.14	0.013*
		%	70.0%	42.5%	56.3%		
	Y	Count	12	23	35		
		%	30.0%	57.5%	43.8%		
Seroma	N	Count	40	26	66	16.97	0.00*
		%	100.0%	65.0%	82.5%		
	Y	Count	0	14	14		
		%	0.0%	35.0%	17.5%		
Wound infection	N	Count	40	33	73	7.67	0.006*
		%	100.0%	82.5%	91.3%		
	Y	Count	0	7	7		
		%	0.0%	17.5%	8.8%		

*Significant; Significance level, 0.05

Table 9: Comparison of duration of hospital stay between the groups using independent sample t-test

	Min	Max	Mean	Std. deviation	Mean diff	p value
Lap	3	4	3.30	0.464	-4.7	0.00*
Open	5	18	8.00	2.582		

*Significant; Significance level, 0.05

Table 10: Percentage-wise distribution of age-groups

Age	Total no. of cases	Percentage
25–35 years	14	26.2%
36–45 years	33	38.8%
46–55 years	23	26.2%
Above 55 years	10	8.8%
Total	80	100%

Table 11: Genderwise comparison of different studies

Gender	Present study	Jackson et al.	Ellis et al.
Male	15%	35%	35.4%
Female	85%	65%	64.6%
Total	100%	100%	100%

Table 12: Comparison of presenting complaints between different studies

Presenting complaint	Present study	Jackson et al.
Swelling	88.75%	89%
Pain	11.25%	11%
Total	100%	100%

to May 2020 were enrolled into the study. Forty patients were operated by open mesh repair method, and 40 patients were operated by laparoscopic mesh repair method, and the results were analyzed.

Age

Of 80 patients of umbilical hernia, most of the patients were in the age-group of 36–45 years (41.25%). A study conducted by Kulacoglu et al. published online on umbilical hernia in the month

of October 2011 showed that the mean age of presentation was 48.6 years (24–78 years).¹¹ A study by Jackson et al. had 25% of patients between the age-group of 41–50 years.¹² In the present study, the mean age of presentation was 43.69 years and the youngest patient was 25 years, while the oldest patient was 68 years (Table 10).

Gender

The international literature shows a female to male ratio of 3:1 of umbilical hernia; this study showed 85% of females and 15% of males that presented with umbilical hernia. Ellis et al. have shown a 64.6% of female patients enrolled in the study.¹³ Jackson et al. have shown a 65% of female patients enrolled in the study, while 35% were males (Table 11).¹²

Presenting Complaints

In this study, 88.75% of patients presented with swelling over the umbilicus, while 11.25% of patients presented with swelling over the umbilicus associated with pain. A study conducted Jackson et al. showed that 11% of patients presented with swelling and pain, while 89% of patients presented with swelling similar to this study (Table 12).¹²

Defect Size

The mean defect size in this study was 1.70 cm in the group of patients who underwent open mesh repair. The smallest defect size was 1.0 cm, and the largest defect size was 2.6 cm. The mean defect size in this study for the laparoscopic mesh repair group was 1.66. The smallest defect size was 0.9 cm, and the largest defect size was 2.6 cm.

Mean Duration of Surgery

The mean operating time in this study was higher for open mesh repair which was about 64.75 ± 10.497 minutes as compared to the laparoscopic mesh repair which was 50.38 ± 6.44 minutes. The p-value was <0.001 which is statistically significant. The study performed by Gonzalez et al. showed that the mean operating time was 82 ± 9 minutes for open mesh repair and 62 ± 9 minutes for laparoscopic mesh repair of umbilical hernia (Table 13).¹⁴

Table 13: Comparison of operating time between different studies

Method of repair	Present study	Gonzalez et al.
Laparoscopic mesh repair	50.38 ± 6.44 minutes	62 ± 9 minutes
Open mesh repair	64.75 ± 10.49 minutes	82 ± 9 minutes

Table 14: Comparison of duration of hospital stay between different studies

Method of repair	Present study	Gonzalez et al.
Laparoscopic mesh repair	3.30 ± 0.464	1.12 ± 0.125
Open mesh repair	8.0 ± 2.52	3.79 ± 2.2

Duration of Stay in the Hospital

In this study, the mean duration of stay in the hospital was 8.00 ± 2.52 days for the open mesh repair, while it was 3.30 ± 0.464 days for laparoscopic mesh repair of umbilical hernia. The study conducted by Gonzalez et al. showed that the mean duration of hospital stay for open mesh repair group was 3.79 ± 2.2 days and 1.12 ± 0.125 days for laparoscopic mesh repair group (Table 14).

CONCLUSION

Umbilical hernia is the most common type of ventral hernia. Women were more commonly affected by umbilical hernia as compared to men. The laparoscopic mesh repair of umbilical hernia takes statistically less time for surgery. The postoperative complications such as seroma formation, postoperative pain, and wound infection were found to be more with open mesh repair as compared with the laparoscopic mesh repair of umbilical hernia. Duration of stay in the hospital was more in patients who underwent open mesh repair of umbilical hernia. Therefore, according to our study, we arrive at a conclusion that the laparoscopic mesh repair of umbilical hernia is superior as compared to the open mesh repair of umbilical hernia.

Laparoscopic method of umbilical hernia repair is becoming the procedure of choice in public sector hospitals in terms of operating time, early recovery, less pain after surgery, less complications after surgery, and reduced duration of stay in the hospital as compared to open mesh repair of umbilical hernia. But two main limiting factors of laparoscopic umbilical hernia mesh repair noted in a public sector hospital are the availability

of dual composite laparoscopic mesh which costs more as compared to the open repair mesh, and other is the availability of an experienced surgeon to perform the laparoscopic mesh repair. If state is able to provide free dual layer mesh and train the surgeon in this field, then these limiting factors can be overcome.

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