



## Assessment of Laparoscopic Hernial Repair of Primary Paraumbilical Hernia through Transabdominal Preperitoneal Technique

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**Abstract: Background:** Para-Umbilical Hernia (PUH) is one of the most common surgical problems with rise in the repair rate annually. Previously PUHs were repaired by tension-free suture technique. Due to a high unacceptable recurrence rate this procedure lost popularity. A real change in view of PUH repair came with the introduction of meshplasty. **Objective:** To assess the outcomes, benefits and complications of laparoscopic hernial repair of primary paraumbilical hernia through Transabdominal preperitoneal technique. **Patients and Methods:** This quasi-experimental study included 20 patients with primary paraumbilical hernia patients with primary paraumbilical hernia who underwent Transabdominal Preperitoneal (TAPP) repair technique at Ain Shams University Hospital (El-Demerdash). **Results:** Our study found that female patients more than males (60% vs. 40%). Their age ranged from 25 to 48 years, with an average age of 38 years. Overweight and obese patients constituted the majority of study participants (40% and 45%, respectively). Their BMI ranged from 22 to 38 kg/m<sup>2</sup> with an average of 29.5 kg/m<sup>2</sup>. **Conclusion:** The results of our study about laparoscopic transabdominal preperitoneal in paraumbilical hernias showed that this approach to be a feasible operation with low recurrences. The main advantage of this method is avoidance of contact between the mesh and visceral organs.

[Ayman Abdullah Abdraboh, Hossam Sobhy Abdel Raheem, Abdel Rahman Ali El Saied. **Assessment of Laparoscopic Hernial Repair of Primary Paraumbilical Hernia through Transabdominal Preperitoneal Technique.** *J Am Sci* 2019;15(11):24-29]. ISSN 1545-1003 (print); ISSN 2375-7264 (online). <http://www.jofamericanscience.org>. 4. doi:10.7537/marsjas151119.04.

**Keywords:** Paraumbilical hernias, transabdominal preperitoneal

### 1. Introduction

Paraumbilical hernias (PUH) constitute 19% of ventral hernias and less than 10% of overall hernias<sup>(1)</sup>. They are commonly found in patients in their 50s and 60s, and risk factors include female gender, obesity, underlying cirrhosis or renal failure, and multiple pregnancies<sup>(2)</sup>.

Laparoscopic repair has been advocated since 1993, with advantages including smaller incisions and better delineation of the defect via an intraperitoneal view and recently via preperitoneal repair. Also, occult hernias are easily identified via laparoscopy compared to open repairs, studies have shown a lower incidence of wound infection in laparoscopic repairs than in open repairs, but the rate of visceral injury is higher. The former is theorized to be because of reduced tissue dissection during laparoscopy, which allows for better postoperative recovery. The latter complication is higher particularly in patients requiring extensive adhesiolysis and therefore longer operative times<sup>(3)</sup>.

The standard procedure for paraumbilical hernia is implantation of prosthetic mesh. Various studies have concluded that mesh repair is superior to suture repair which has 85 % higher recurrence risk

compared to mesh repair. This can be done laparoscopically using various techniques like Intraperitoneal approach and transabdominal preperitoneal approach<sup>(4)</sup>. The laparoscopic TAPP approach for umbilical hernia and rectus diastasis may be a safe surgical option when trying to avoid potential complications related to intraperitoneal approach<sup>(5)</sup>

### Aim of the Work

The aim of this study is to assess the outcomes, benefits and complications of laparoscopic hernial repair of primary paraumbilical hernia through Transabdominal preperitoneal technique.

### 2. Patients and Methods

#### Study design:

The study was a prospective, analytical, study that was conducted on 20 patients with paraumbilical hernia. The patients were recruited from Ain Shams University Hospital (El-Demerdash) during the period from January to June 2019.

#### Studied populations included:

Patients with primary paraumbilical hernia who underwent laparoscopic repair through Transabdominal preperitoneal technique.

**Ethical Statement:**

We confirm that the present study run in concordance with international ethical standards and applicable local regulatory guidelines. A written informed consent was obtained from every eligible patient. Patients were informed about the study objectives, methodology, risk, and benefit. The study's protocol was reviewed and approved by IRB, ethics committee or audit department of Faculty of Medicine, Ain Shams University.

**Inclusion criteria:**

All patients enrolled in the study were: Aged between 12 to 60 years old. Both sexes were included. Patients with primary paraumbilical hernia.

**Exclusion criteria:**

Patients with recurrent paraumbilical hernia. Patients with major systemic illness (liver cell failure, renal cell failure, musculoskeletal diseases) or contraindicated for laparoscopy. Patients have past history of open abdominal surgery. Patients with complicated paraumbilical hernia.

**Sample Size and Sampling:**

We utilized non-probability consecutive sampling Technique. Twenty patients were included.

**These patients underwent the following:**

Full history: Clinical examination:

General examination including:

Local examination including:

Full laboratory assessment:

Which included complete blood count - liver and kidney functions - bleeding profile - random blood sugar - viral markers. **Chest X-ray. Pelvi-abdominal ultrasound. ECG**

**Transabdominal preperitoneal (TAPP) technique:**

At the time of induction of anaesthesia, 1,500 mg cefuroxime antibiotic prophylaxis was administered preoperatively. Patients were operated on in supine position with the surgeon standing on either the left or right lateral side, according to the surgeon's preference. The ipsilateral arm was placed over the head of the patient, away from the surgeon. Three trocars were used: one 10–12-mm trocar for the endoscope, a 10–12-mm trocar and a 5-mm trocar as working channels. The trocars were placed in the anterior axillary line: in the upper, middle and lower quadrant on the ipsilateral side of the patient with the middle slightly more lateral than the other two.

A 30 laparoscope (Karl Storz, Tuttlingen, Germany) was used. After installing pneumoperitoneum in an open fashion and introduction of the trocars, the ipsilateral side of the peritoneum of the ventral abdominal wall was incised in a lengthwise manner, within a margin of 5 cm of the umbilical defect. The preperitoneal space was developed, thereby reducing the umbilical peritoneal sac.

External pressure on the abdominal wall by one hand of the assistant was considered helpful in order to facilitate laparoscopic extraperitoneal dissection. A polypropylene mesh (Prolene TM, Ethicon INC, Somerville, NJ, USA) was introduced in the preperitoneal space to cover the defect with at least 3 cm overlap in all directions.

Using the Endoclose TM device (Autosuture, Tyco Healthcare, Norwalk, USA), four transfascial Prolene TM sutures were placed intra-abdominally to secure the corners of the mesh to the fascia. The peritoneal defect was closed with a running Vicryl TM suture (Ethicon INC, Somerville, NJ, USA) (Fig. 5). Removal of the trocars and desufflation was performed under direct view. The skin was closed with Monocryl TM sutures (Ethicon INC, Somerville, NJ, USA).

The patients were observed post-operatively by clinical examination and ultrasonography to assess complications as regard as seroma, hematoma, infected wound, visceral injury, intestinal mobility, port-site hernia, recurrence within 3 months, duration of operation, hospital stay and recovery period.

**Study's Outcomes:**

The primary outcome in the present study was the recurrence rate within 3 months after the procedure. The secondary outcomes in the present study were the incidence of postoperative complications, duration of surgery, hospital stay, and recovery period.

**Statistical Analysis**

An Excel spreadsheet was established for the entry of data. We used validation checks on numerical variables and option-based data entry method for categorical variables to reduce potential errors. The analyses were carried with SPSS software (Statistical Package for the Social Sciences, version 24, SSPS Inc, Chicago, IL, USA). Frequency tables with percentages were used for categorical variables and descriptive statistics (median and interquartile range [IQR]) were used for numerical variables. Independent Student t-test, paired t-test, or Mann-Whitney tests were used to compare quantitative variables, while Chi-square test or McNemar-Bowker tests were used to analyze categorical variables. A p-value < 0.05 is considered statistically significant.

**The following statistics were applied:**

Descriptive statistics: in which quantitative data were presented in the form of mean, standard deviation (SD), range and qualitative data were presented in the form of numbers and percentages. Analytical statistics: used to find out the possible association between studied factors and the targeted disease. The used tests of significance included: Chi-Square test  $X^2$  was used to test the association variables for categorical data. Student's t-test was used

to assess the statistical significance of the difference between two population means in a study involving independent samples if data were normally distributed. Mann Whitney (U) test was used to assess the statistical significance of the difference between two population means in a study involving

independent samples if data were not normally distributed. Spearman correlation was used in the correlation between two parametric parameters.

### 3. Results

**Table (1):** Personal characteristics of study participants (N=20)

<b>Age (years)</b>	Mean $\pm$ SD	38.1 $\pm$ 9.6
	Range	25 – 58
<b>Gender</b>	<b>Male</b>	8 (40.0%)
	<b>Female</b>	12 (60.0%)
<b>BMI</b>	Mean $\pm$ SD	29.5 $\pm$ 4.4
	Range	22 – 38
<b>BMI Class</b>	<b>Normal</b>	3 (15.0%)
	<b>Overweight</b>	8 (40.0%)
	<b>Obese</b>	9 (45.0%)

**Table (2):** Operation duration and the length of hospital stay (N=20)

	Mean $\pm$ SD	Range
<b>Duration of operation (minutes)</b>	68.5 $\pm$ 22.4	50 – 160
<b>Hospital Stay (hours)</b>	40.8 $\pm$ 20.4	24 – 120

**Table (3):** Distribution of post-operative complications by gender (N=20)

<b>Pst-operative Complications</b>	<b>Gender</b>						<b>p-value</b>
	<b>Male (n=8)</b>		<b>Female (n=12)</b>		<b>Total N=20</b>		
	<b>No.</b>	<b>%</b>	<b>No.</b>	<b>%</b>	<b>No.</b>	<b>%</b>	
<b>Seroma</b>	1	12.5%	1	8.3%	2	10.0%	1.00
<b>Hematoma</b>	1	12.5%	3	25.0%	4	20.0%	0.619
<b>Infected Wound</b>	0	0	1	8.3%	1	5.0%	100
<b>Visceral Injury</b>	0	0	1	8.3%	1	5.0%	1.00
<b>Port Site Hernia</b>	0	0	2	16.7%	2	10.0%	0.495

**Table (4):** Distribution of selected post-operative complications by personal and operation characteristics (N=20)

		<b>Post-operative Complications</b>						<b>p-value</b>
		<b>Yes (n=8)</b>		<b>No (n=12)</b>		<b>Total N=20</b>		
		<b>No.</b>	<b>%</b>	<b>No.</b>	<b>%</b>	<b>No.</b>	<b>%</b>	
<b>Gender</b>	<b>Male</b>	2	25.0%	6	50.0%	8	40.0%	0.373
	<b>Female</b>	6	75.0%	6	50.0%	12	60.0%	
<b>BMI Class</b>	<b>Normal</b>	0	0.0%	3	25.0%	3	15.0%	0.116
	<b>Overweight</b>	2	25.0%	6	50.0%	8	40.0%	
	<b>Obese</b>	6	75.0%	3	25.0%	9	45.0%	
<b>Age (years)</b>		46.0 $\pm$ 8.1		32.8 $\pm$ 6.5		38.1 $\pm$ 9.6		<b>0.002*</b>
<b>Duration of operation</b>		80.6 $\pm$ 32.2		60.4 $\pm$ 5.4		68.5 $\pm$ 22.4		0.121
<b>Hospital stay</b>		52.5 $\pm$ 27.9		33.0 $\pm$ 7.5		40.8 $\pm$ 20.4		<b>0.032*</b>

\*. Statistically significant p-value (<0.05)

**Table (5):** Distribution of the 3-month recurrence by personal and operation characteristics (N=20)

		Recurrence within 3 months						p-value
		Yes (n=2)		No (n=18)		Total N=20		
		No.	%	No.	%	No.	%	
<b>Gender</b>	<b>Male</b>	0	0.0%	8	44.4%	8	40.0%	0.495
	<b>Female</b>	2	100.0%	10	55.6%	12	60.0%	
<b>BMI Class</b>	<b>Normal</b>	0	0.0%	3	25.0%	3	15.0%	0.432
	<b>Overweight</b>	2	100.0%	3	16.7%	8	40.0%	
	<b>Obese</b>	0	0.0%	6	33.3%	9	45.0%	
<b>Post-operative Complications</b>	<b>No</b>	0	0.0%	9	50.0%	12	60.0%	0.147
	<b>Yes</b>	2	100.0%	6	33.3%	8	40.0%	
<b>Age (years)</b>		41.5 ± 0.7		37.7 ± 10.1		38.1 ± 9.6		<b>0.001*</b>
<b>Duration of operation</b>		70.0 ± 7.1		68.3 ± 23.6		68.5 ± 22.4		<b>0.045*</b>
<b>Hospital stay</b>		36.0 ± 0.0		41.3 ± 21.5		40.8 ± 20.4		<b>0.032*</b>

\*. Statistically significant p-value (<0.05)

#### 4. Discussion

Adult umbilical hernia is a common surgical condition and many techniques have been described for its repair. This may be achieved through simple suture repair, double-breasting Mayo repair or the use of a mesh. For the Mayo repair, recurrence rates up to 30% have been described. After introduction of mesh material, hernia recurrence rates have been dramatically reduced to 1% <sup>(6)</sup>. However, the combined use of synthetic material and extensive dissection in the abdominal wall implicates a risk for local abdominal wall complications such as prolonged postoperative pain, wound infection and seroma or hematoma formation <sup>(7)</sup>. These drawbacks might be counteracted by a laparoscopic approach with minimal surgical trauma to the abdominal wall. Compared with the Mayo repair, the laparoscopic approach avoids extensive local dissection. In addition, the umbilicus can be preserved in a more natural way, giving better cosmetic outcome.

Several studies comparing laparoscopic and open ventral abdominal hernia repair suggest that laparoscopic repair is safer and more effective than open repair, although long-term benefits remain to be proven. The feasibility of laparoscopic umbilical hernia repair has been established and reported in a few series and case reports <sup>(8, 9)</sup>. These publications, however, concerned intra-abdominal mesh placement. Intra-abdominal placement of the mesh is associated with complications such as formation of intestinal adhesions, bowel occlusion and enterocutaneous fistulas <sup>(8)</sup>.

So, this study aimed to assess the outcomes, benefits and complications of laparoscopic hernial repair of primary paraumbilical hernia through Transabdominal preperitoneal technique.

This quasi-experimental study included 20 patients with primary paraumbilical hernia patients with primary paraumbilical hernia who underwent Transabdominal Preperitoneal (TAPP) repair technique at Ain Shams University Hospital (El-Demerdash).

As regard general characteristics, female showed predominance in our study more than males (60% vs. 40%). Their age ranged from 25 to 48 years, with an average age of 38 years. Overweight and obese patients constituted the majority of study participants (40% and 45%, respectively). Their BMI ranged from 22 to 38 kg/m<sup>2</sup> with an average of 29.5 kg/m<sup>2</sup>.

Similar to *Kulacoglu et al.* <sup>(10)</sup> who reported that umbilical hernias are more common in women than men.

Also *Shetty et al.* <sup>(11)</sup> reported that umbilical hernias in adults are largely acquired. These hernias are more common in women and in patients with conditions that result in increased intra-abdominal pressure, such as pregnancy, obesity, ascites, or chronic abdominal distention. The percentage of females was higher than males as compared to the study by *Hilling et al.* <sup>(12)</sup>. This is probably owing to the high BMI in women and multiple pregnancies that attribute to umbilical hernia.

All patients underwent laparoscopic TAPP; however, one patient has turned into open surgery. The mean duration of operation was 68.5 (±22.4) minutes, and ranged from 50 minutes to 160 minutes. The case that has turned into open surgery was responsible for that longer mean duration and range of operation. On the other hand, the length of hospital stay ranged from 24 hours to 120 hours, with an average of 41 hours.

In *Shetty et al.*<sup>(11)</sup> study the mean duration of TAAP operation was (105±19.8) minutes. With mean length of hospital stay (2.8±1.02) days.

Also *Hilling et al.*<sup>(12)</sup> in a study about "Laparoscopic correction of umbilical hernias using a transabdominal preperitoneal approach: results of a pilot study" found that the mean operating time was 85.6 ± 24.7 min (range 60–120 min) and estimated blood loss insignificant. No conversions to open surgery were necessary. Hospital stay averaged 2.2 ± 0.6 days (range 1–3 days).

In *Bahram*<sup>(13)</sup> study, operative time was significantly lower in TAPP (50 ± 18.9 min) than LR (70 ± 24.5 min) either unilateral or bilateral inguinal hernia repair. This result is similar to the results of *Neumayer et al.*<sup>(14)</sup> who reported in their studies shorter operative time for TAPP<sup>(15)</sup>.

Post-operative complications in our study were as the follow: eight patients (40%) developed post-operative complications. The most common complications were hematoma representing 20% of all patients; followed by seroma and port site hernia representing 10% each. The least common complications were infection and visceral injury representing 5% each.

A meta-analysis of randomised controlled trials showed that laparoscopic repair significantly decreases the risk of wound complications like haematoma, seroma, and infection following ventral hernia repair. Compared to open repair, laparoscopic repair is technically feasible, safe and effective with good clinical outcome<sup>(16)</sup>.

Laparoscopic repair is associated with less chance of infection due to small incision and location of the incision. The incision in open repair is longer and is located in highly contaminated areas as a result has increased risk of wound infection of around 15% to 45%<sup>(17)</sup>. In laparoscopic repair contact between mesh and skin is very minimal leading to less chance of mesh infection and also wound infection.

This is in agreement with *Reiner and Bresnahan*<sup>(18)</sup> study which examined outcomes of 1240 laparoscopic hernia operations in 783 patients, focusing on intraoperative and early postoperative complications, pain, and time until return to work and normal physical activities. It found that there were 106 patients who experienced a total of 114 postoperative complications (13.5% of patients, 9.2% of procedures) across the 8 categories evaluated: seroma (n = 37), and wound/mesh infection (n = 1).

Seroma formation is not unique to the laparoscopic approach. Most seroma develop above the mesh and within the retained hernial sac. The rate of seroma formation in reported series varies depending on when investigators evaluated it. The mean incidence of seroma at 4 to 8 weeks is 11.4% in

large reported series. In the largest multi-institutional trial, seroma that were clinically apparent more than 8 weeks postoperatively were considered a complication and occurred in 2.6% cases<sup>(19)</sup>.

Several factors have been responsible for recurrence after umbilical hernia repairs. However, few studies presented an independent factor after multivariate analysis. Large seroma and surgical site infection are classical complications that may result in recurrence. Obesity and excessive weight gain following repair are obviously potential risk factors. The patient's BMI >30 kg/m<sup>2</sup> and defects >2 cm have been reported as possible factors for surgical failure<sup>(20)</sup>.

In our study, two patients (10%) had developed recurrence within three months after surgery.

*Reiner and Bresnahan*<sup>(18)</sup> study reported that (9.7%) of patients (10%) developed recurrence within three months after surgery.

Numerous studies using the laparoscopic approach have reported a recurrence rate of 10%. Mechanisms of recurrence of umbilical hernia described in the literature, in decreasing order of frequency are infection, lateral detachment of the mesh, inadequate mesh fixation, inadequate mesh, inadequate overlap, missed hernias, increased intra-abdominal pressure, and trauma<sup>(19,21)</sup>

Because our study focused on the feasibility and safety of TAPP hernia repair, the follow-up period was not long enough to fully assess the long-term results of such repair.

## Conclusion

In conclusion, the results of our study about laparoscopic transabdominal preperitoneal in paraumbilical hernias showed that this approach to be a feasible operation with low recurrences. The main advantage of this method is avoidance of contact between the mesh and visceral organs.

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10/7/2019