

**Original Article:**

## **Comparison of laparoscopic versus open pre- peritoneal mesh repair for inguinal hernia**

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### **ABSTRACT:**

**INTRODUCTION:** The current standard of care of groin hernia repair is, tension free cover the hernia defect with a prosthetic mesh. The mesh is placed on one of the layers of the abdominal wall either using an open approach or a laparoscopic technique. The benefits of laparoscopic inguinal hernioplasty include a decrease in postoperative pain, reduced hospital stay and early return to normal activity with the most cited benefit being the addressal of all inherent defects resulting from the placement of a mesh in the pre- peritoneal space. However, high costs, longer learning curves and the need for general anesthesia prevent it from replacing the Lichtenstein repair as the standard of care for the surgical treatment of inguinal hernias.

The open pre- peritoneal mesh repair extrapolates the advantages of the laparoscopic repair without compromising the benefits of the Lichtenstein repair. Our study compares the laparoscopic TAPP repair to an open pre- peritoneal mesh repair in a randomized case- control trial.

This study compares outcomes of the Laparoscopic TAPP repair versus an Open Pre-peritoneal mesh repair for Inguinal Hernia.

**METHODOLOGY:** The present case-control study was conducted from June 2012 to June 2014 in the Department of Surgery, Sassoon General Hospitals, Pune. This prospective study was registered under institutional ethical committee. They were randomized into two treatment arms; the open pre- peritoneal group and the laparoscopic TAPP group. Operative time, early and late post- operative pain, time taken to ambulation, duration of hospital stays, rate of complications, 1year recurrences were the parameters assessed. Categorical data was analyzed by Chi- square and Fisher analyses and parametric data was analyzed by paired- t test. Level of statistical significance was taken as  $p < 0.05$ .

**RESULTS:** In the open group the mean operative time was 96.83 minutes whereas that in the laparoscopic group was 171.28 minutes. This difference in the operating time was statistically significant at  $p < 0.05$  at operative time more than 120mins with  $\chi^2$  statistics is 51.87.

The mean duration of stay in the hospital of patients in both group patients was 3 days ( $p = 0.484$ ). The mean pain and paresthesia for short and long term is equal effect in both groups. There were no recurrences seen in either group at 8 weeks or 12 months after surgery.

**CONCLUSIONS:** The shorter operating times, the comparable outcomes, use of regional anesthesia, minimal potential for life threatening complications, the non- requirement of an advanced laparoscopic setup and training make the open pre- peritoneal repair a safer and a more viable approach to the management of inguinal hernias across populations of all risks and across all levels of health care systems.

**KEY WORDS:** Groin hernia, Pre-peritoneal repair, Laparoscopic TAPP repair.

## INTRODUCTION

The standard of care of groin hernia repair is to cover the hernia defect with a prosthetic is presently the gold standard<sup>1,2</sup>. The benefits of laparoscopic inguinal hernioplasty over the Lichtenstein's repair can be attributed to the placement of a larger mesh in the pre- peritoneal space with minimal fixation thereby allowing for the coverage of the entire myo- pectineal orifice encompassing all existing as well as potential defects. This method of mesh placement also translates into lesser post- operative pain and faster recovery<sup>3,4,5</sup>.

Inguinal hernia is 0.6% and 25.2% of males within different age groups and populations<sup>6</sup>. With the number of trained laparoscopic surgeons today being grossly inadequate to cater to the increasing burden of inguinal hernias in the Indian society, the evaluation of a hernia repair that incorporates the advantages of laparoscopic surgery while overcoming its limitations becomes imperative. The open pre- peritoneal mesh repair for inguinal hernias allows for the pre-peritoneal placement of the mesh under local or regional anesthesia thereby combining the advantage of pre-peritoneal mesh placement of laparoscopic repair, with the accessibility that the Lichtenstein repair affords to the general population. In this study we compare the open pre- peritoneal repair to the laparoscopic TAPP repair for inguinal hernia.

## AIMS AND OBJECTIVES

To compare the outcomes of Open pre- peritoneal versus Laparoscopic TAPP repair for Inguinal Hernia.

## METHODOLOGY

**Study design:** These are the results from a randomized control trial which was conducted from June 2012 to June 2014 in the Department of Surgery, Sassoon General Hospitals, Pune, after due institutional ethics committee clearance.

**Sample size:** Patients presenting to the surgical OPD with an inguinal hernia was screened. A total of 82 male patients with a primary inguinal hernia were included in the study. The sample size was a convenient sample.

### Inclusion criteria:

- Male patients between 30 to 80 years of age with,
- A primary or first-recurrence inguinal hernia which was either Direct, Indirect or bilateral.
- Patients who had low risk of morbidity from an anesthesia (American Society of Anesthesiology [ASA] group 1 or 2).

### Exclusion criteria:

- Irreducible, Obstructed or strangulated hernia
- Needed emergency surgery.
- More than one recurrence.
- Patients with ASA group 3 or 4
- Benign Prostatic Hypertrophy (BPH) grade II and III

**Randomization:** Patients were randomly to the two study groups. 42 patients were included in the open pre-peritoneal group (Group A) and 42 patients were included in the laparoscopic TAPP repair group (Group B).

### **Standard of care**

A single dose of intravenous antibiotic (Cefotaxime1g) was given to all patients within the hour preceding the procedure. Post- operative additional antibiotics were administered to only those patients with signs of surgical site infection.

### **Open pre- peritoneal repair (Group-I)**

The open repair was approached through an inguinal incision under regional or local anesthesia. The hernial sac was identified, dissected and dealt with. After identifying and retracting the inferior epigastric artery at the medial edge of the deep inguinal ring, a pre- peritoneal space was created up to the pubic tubercle medially and the ASIS laterally, using blunt finger dissection through the deep ring and a large polypropylene mesh graft (measuring 10 × 12 cm) was inserted through it and attached to the transversalis fascia near the superior margin of the deep ring with a single non-re- absorbable monofilament suture after ensuring complete coverage of both direct and indirect inguinal and femoral openings and its placement well below the ileo-pubic tract.

### **Laparoscopic TAPP repair (Group-II)**

Laparoscopic hernia repair was done under general anesthesia through a trans-abdominal pre-peritoneal approach using three ports (10, 10, and 5 mm). The peritoneum was incised above the hernia sac and dissected free, and a large polypropylene mesh graft measuring 10 × 12 cm was placed pre-peritoneally. No staples were placed below the ilioinguinal tract lateral to Cooper's ligament. The mesh covered both direct and indirect inguinal and femoral openings and went well below the ileopubic tract. The peritoneum was closed with a continuous, absorbable suture aiming at complete peritoneal coverage of the mesh. All port sites closed with nylon 3-0 suture.

### **Data collection:**

Operative time, post- operative pain levels, as recorded by the visual analogue pain scale at 4 hours, 3 days, 1 week, 8 weeks and 12 months after surgery, time taken to achieve ambulation, duration of hospital stay, rate of complications and the rates of early and late recurrences were the parameters which were assessed.

### **Statistical analysis:**

Statistical significance for parametric data was calculated using a paired- t test whereas a Chi- square with Yates correction value, was applied for categorical data. Difference was considered statistically significant at  $p < 0.05$ . By using [www.socscistatistics.com](http://www.socscistatistics.com) website calculator.

### **RESULTS:**

The average age of the patients in the open pre- peritoneal group 58.48 years and in the laparoscopic group was 56.2 years. Both the study groups were comparable in terms of age distribution, the type of hernia (indirect inguinal hernia). Both types of surgeries were done by surgeons of the same cadre.

The operative times of both groups have been summarized in *Table 2*. The duration of surgery in the open pre- peritoneal group ranged from 60 to 120 minutes with a mean duration of 96.83 minutes whereas that in the laparoscopic group ranged from 75 to 240 minutes with a mean duration of 171.28 minutes. This difference in the operating time was statistically significant at  $p < 0.05$  at operative time more than 120mins with  $\chi^2$  statistics is 51.87. Post- operative pain score was analysed by the visual analogue scale at 4 hours, 3 days and 1 week after surgery. The mean pain scores 4 hours after surgery in the open pre- peritoneal group were 4.92 and in the

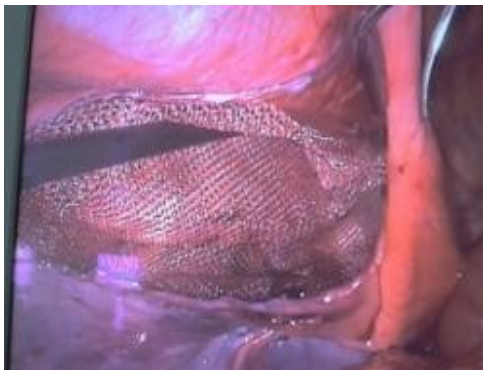
laparoscopic group were 4.72 ( $p= 0.4280$ ). Mean pain scores 3 days after surgery in the open group were 1.714 and in the laparoscopic group were 1.62. Mean pain scores 1 week after surgery in open group were 0.476 and in the laparoscopic group were 0.172.

The duration of stay in the hospital of patients in the open group ranged from 3 to 7 days with a mean of 3.595 days whereas that in the laparoscopic group ranged from 3 to 6 days with a mean of 3.448 days. This difference in the duration of stay was not statistically significant ( $p = 0.484$ ). Scrotal edema was observed in 3 patients out of 42 in the open group and in 1 patient out of 42 in the laparoscopic group. This difference was not statistically significant ( $p = 0.30$ ).

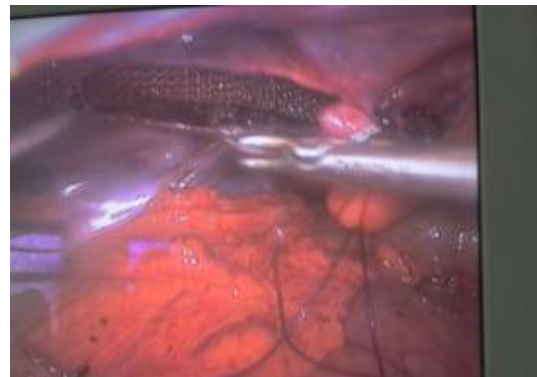
Surgical emphysema was not seen among the patients in the open group but was observed in 1 patient out of 42 in the laparoscopic group. This difference was not statistically significant.

Wound infection was seen in 2 patients out of 42 in the open group whereas it was not seen in any patients in the laparoscopic group. Those patients had grade IIb infection according to the Southampton wound scoring system<sup>7</sup>. Both responded well to conservative management. Paresthesia were seen in 3 patients out of 42 in the open group and in 1 patient out of 42 in the laparoscopic group. This difference was not statistically significant with  $\chi^2$  statistics is 1.05 ( $p = 0.31$ ). Paraneesthesia in all the patients resolved within a month with symptomatic treatment. There were no recurrences seen in either group at 8 weeks or 12 months after surgery.

**Photo: 1** TAPP repair



Mesh placement



Peritoneal closure

**Photo: 2 Open Pre- Peritoneal Repair:**



**2a. Dissection of hernia sac**



**2b. Blunt finger dissection**



**2c. Insertion of mesh**



**2d. Mesh fixation**

**Table I : Master table**

		Lap.	Open	Chi statistic value	P value	Significance at P<0.05
Hernia Site:	Left	14	12			
	Right	16	18			
	Bilateral	03	02			
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<b>Hernia Type:</b>	Direct	08	05			
	Indirect	36	37			
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on day 3:	Pain	01	03	1.05	0.305	Not significant
	No pain	41	39	Yates correction 0.262	0.608	
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Cord edema:	Yes	01	03	1.05	0.305	Not significant
	No	41	39	Yates correction 0.262	0.608	
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Seroma:	Yes	02	01	0.345	0.556	Not significant
	No	40	41	Yates correction 0.0	1.0	
<hr/>						
Recurrence:		nil	nil			

**Table 1: Operative time**

Duration of surgery (min)	Open (n)	Laparoscopic (n)
<b>40-60</b>	13	00
<b>60-80</b>	11	00
<b>80-100</b>	15	00
<b>100-120</b>	01	05
<b>120-140</b>	03	09
<b>140-180</b>	00	11
<b>180-200</b>	00	17
<b>Total</b>	42	42
<b>Mean operative time</b>	96.83min	171.28min

Chi<sup>2</sup> statistics is 51.87 **significant** at p< 0.05 at operative time more than 120mins.

Chi<sup>2</sup> statistics with Yates correction is 51.98, **significant** at p< 0.05 at more than 120mins.

**Table 2: Pain scores 4 hours after surgery**

Pain score	Open (n)	Open (%)	Laparoscopic (n)	Laparoscopic (%)
3	04	09.52	03	07.14
4	11	26.19	17	40.48
5	14	33.33	14	33.33
6	10	23.80	07	16.67
7	03	07.14	01	02.38
<b>Total</b>	42		42	

Chi<sup>2</sup> statistics is 1.59 and p=0.21, **significant** at p< 0.05 at pain score more than 5.  
 Chi<sup>2</sup> statistics with Yates correction is 1.02 and p=0.31, **significant** at p< 0.05 at pain score more than 5.

**DISCUSSION:**

The open pre- peritoneal repair has a significantly shorter operative time as compared to the laparoscopic hernia repair. This can be attributed to the early exposure during residency and hence the comfort of general surgeons with the anatomy of an open inguinal hernia repair and the technique of repair. Laparoscopic hernia repairs in addition to setup and equipment costs require formal laparoscopic training, have a much longer learning curve<sup>8,9</sup>.

Our study showed that open pre- peritoneal and the laparoscopic repairs have comparable outcomes in terms of post-operative pain, return to activity, complications and recurrence. It can be performed under regional or local anesthesia, thus sparing patients the risk of general anesthesia as well as making this a safer procedure to perform in individuals with significant co- morbidities.

One advantage of the laparoscopic repair over the open pre- peritoneal repair is that it allows for the assessment of the pre- peritoneal anatomy of the opposite site and subsequent repair of clinically inapparent, incidental hernias of the opposite side in the same sitting<sup>10</sup>. However, studies show ultra- sonography to be an excellent tool for the detection of inguinal hernias with sensitivities approaching 92.7% as opposed to clinical examination which has a sensitivity of 74.5%<sup>11</sup>. Whenever facilities are available, an ultra- sonography, which is a simple, non- invasive, non- ionizing and cost- effective investigation may be performed to rule out the presence of occult inguinal hernias. However, the European Hernia Society guidelines on the treatment of inguinal hernia in adult patients advocate watchful waiting in patients with asymptomatic hernias<sup>12, 13</sup>.

Since the open pre- peritoneal repair can be performed with basic instruments available in surgical setups of all levels, this repair can be performed by general surgeons across all levels of health care centers, thus bringing the advantages of laparoscopic hernia repair to large sections of our population who do not have access to laparoscopic facilities. Therefore, we recommend that the open pre- peritoneal repair be incorporated into standard surgical training so as to make its advantages available to a larger percentage of our population.

#### CONCLUSIONS:

India has 48 doctors (not surgeons) per 100,000 population as opposed to 280 in the United States or 300 in France. The country has less than 12% of the minimum recommended hospital bed strength by the W.H.O., and of this meager bed strength 80% is in large cities, while 70% of the population is in rural India<sup>14</sup>. Only 20% of our country's surgical work force lives and works in rural India<sup>15</sup>.

The shorter operating times, comparable outcome, utilization of regional anesthesia, and minimal potential for life threatening complications make this open pre- peritoneal repair a safer and a more viable approach to the management of inguinal hernias across populations of all risks and across all levels of health care systems in countries such as ours.

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