

Comparative Study of Laparoscopic Preperitoneal versus Open Preperitoneal Repair of Inguinal Hernias

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Abstract

Objectives: To assess the outcomes of Open Preperitoneal and Laparoscopic Preperitoneal mesh repairs in Inguinal hernia. To compare both approaches in terms of Recurrence rate, duration of the surgery, duration of hospital stay, post operative pain, wound complications and chronic pain. **Materials and Methods:** This study is a Prospective observational study of 24 months duration from 01-11-2018 to 31-10-2020 evaluated in 30 patients (15 patients in each group), who are admitted with inguinal hernia in the Department of General Surgery, Gandhi Hospital, Secunderabad. Once the patient is admitted, demography is noted, formal informed consent is taken and then enrolled into the study. The relevant physical examination and investigations are done. Every alternate case is allotted into each group preoperatively. **Inclusion Criteria:** All Patients diagnosed with uncomplicated inguinal hernias with 20-40 years age. **Exclusion Criteria:** Patients with complicated inguinal hernias, patients with sliding hernia and complete hernia, patients who refused to give informed consent and patients age more than 40 years. **Conclusion:** The laparoscopic preperitoneal inguinal hernia repair is superior to open preperitoneal inguinal hernia repair in terms of post-operative pain, duration of hospital stay, and chronic pain. However, the risk of hernia recurrence remains same in both the groups when the mesh is placed preperitoneally, and moreover, operative time is reduced drastically in open group, when compared to the laparoscopic repair.

Key words: Laparoscopic inguinal hernia repairs, Preperitoneal repairs of inguinal hernia, Inguinal hernia repairs

INTRODUCTION

A hernia is the protrusion of a viscus or part of a viscus lined by a sac through a normal or abnormal opening in the abdominal wall. Inguinal hernia is protrusion of abdominal contents through the inguinal canal. Approximately 75% of abdominal wall hernias occur in the groin. The lifetime risk of inguinal hernia is 27% in men and 3% in women.^[1] Of inguinal hernia repairs, 90% are performed in men and 10% in women. The incidence of inguinal hernias in males has a bimodal distribution, with peaks before the 1st year of age and after age of 40. Abramson demonstrated the age dependence of inguinal hernias in 1978. Those aged 25–34 years had a lifetime prevalence rate of 15%, whereas those age 75 years and over had a rate of 47%.^[2] Approximately 70% of femoral hernia repairs are performed in women; however, inguinal hernias are

5 times more common than femoral hernias. The most common subtype of groin hernia in men and women is the indirect inguinal hernia.^[3] Repair can be done by Open or Laparoscopic method. Laparoscopic inguinal hernia repair has better results than open hernia repair. It has become a best alternative operation in the past 15 years.^[4] Lap inguinal hernia repair is 2 types: Transabdominal Preperitoneal (TAPP) LIHR and Totally Extraperitoneal LIHR.^[5] This study is to know whether laparoscopic preperitoneal placement of mesh has got any benefit on the recurrence rate as compared to open preperitoneal repair.

MATERIALS AND METHODS

Open Preperitoneal Repair Pre-operative Preparation

Patients were kept NPO for about 6–8 h and were on liquid diet the before day. All patients received antibiotic prophylaxis half an hour before surgery. All patients were operated under spinal anesthesia.

Operative Technique

Transverse skin crease incision 5–6 cm long is given, deepened to the external oblique aponeurosis, and the cord is delivered. Indirect sac is dissected from the cord up to the extraperitoneal fat and inverted into the deep ring after

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Table 1: Postoperative pain

Study	Open preperitoneal	Laparoscopic preperitoneal	P-value
Abd-Elrahman Sarhana Present study (h)	3.39±1.1	1.1±1	<0.001*
6	6.53±1.02	3.13±0.61	0.00001*
12	4.53±1.02	2.27±0.44	0.003*
24	3.73±0.92	1.53±0.49	0.02*

Table 2: Duration of hospital stay

Study	Open	Laparoscopic	P-value
Abd-Elrahman Sarhan Present study	1.7±0.53	1.4±0.57	0.00001
	5.26±1.33	2.53±0.88	<0.0001

Table 3: Chronic pain

Study	Open	Lap	P-value
Abd-Elrahman Sarhana Present study	7	1	0.03
At 1 month	3	2	0.5
At 6 months	3	1	0.2
At 1 year	2	0	0.2
At 2 years	1	0	0.5

elevation of the inferior epigastric vessels anteromedial to create the preperitoneal space.^[6] Gauze is inserted through the internal ring to keep the peritoneal sac inverted. The direct sac was isolated and the transversalis fascia around its neck is circumcised and the preperitoneal space reached directly. Dissection of the preperitoneal space can be done with Gauze swabs. Dissection is continued to the pubic tubercle medially, the iliac vessel laterally, and Cooper's ligament caudally. Monofilament knitted polypropylene mesh 7.0 × 15.0 cm in size is inserted into the preperitoneal space covering the entire groin area including indirect, direct, and femoral orifices.^[7] Once the mesh was in place, its position is checked by inserting the index finger into the preperitoneal space between the inguinal ligament and mesh with boundaries of mesh covering Cooper's ligament caudally, iliac vessels laterally, and the rectus abdominis medially. Transversalis fascia is closed with vicryl suture and the mesh was fixed in place with abdominal pressure.^[8] After closure of the external oblique and Scarpa's fascia with a running 3-0 vicryl suture, the skin incision was closed.

Laparoscopic Preperitoneal Repair Pre-operative Preparation

Patients were kept NPO for about 6–8 h and were on liquid diet the before day. All patients received antibiotic prophylaxis half an hour before surgery and were operated under general anesthesia. Nasogastric tube and Foleys catheter were placed.^[9] The patient was placed in supine position with 10° head down with a tilt as per the side of

hernia. In all cases, surgeon initially stands on the left side for pneumoperitoneum creation and trocar placement then moved toward patient head end opposite to side of hernia, camera assistant stands on head end of patient toward side of hernia, and scrub nurse stands on side of the patient. Instruments were used: 30° telescope, Veress needle, one 10 mm trocar, two 5 mm trocars, holding forceps, Maryland dissector, scissors, needle holder, 10 mm to 5 mm reducing sleeve, electro-surgical apparatus – monopolar/bipolar, 15 × 12 cm 3D MAX Mesh knitted polypropylene pre-formed mesh, 2-0 vicryl suture material, 1-prolene in suture fixation cases, and non-metallic tackers in tacker fixation cases.

Operative Technique

Pneumoperitoneum creation and trocar placement

A small transverse periumbilical/infraumbilical incision made, through which Veress needle inserted perpendicular to abdomen with slight degree of tilt toward pelvis and pneumoperitoneum created. In patients with history of abdominal surgery, palmer's point used for Veress insertion. We place 10 mm camera port in the umbilicus, two working trocars just lateral to the rectus sheath each side, and few cms below the camera port.

Trocar position

Umbilical port, right pararectus, and left pararectus:

After reducing the contents, peritoneal flaps created by giving horizontal incision 2 cm above the defect extending from medial umbilical ligament to the level of anterior superior iliac spine. Incision curved down such as hockey stick on lateral aspect and dissection proceeded downward beyond the ileopubic tract by raising a flap of peritoneum.

Medial dissection

Using blunt dissection in the avascular plane (cob web like areolar tissue) peritoneum and preperitoneal fat separated from pseudo sac (in direct inguinal hernias), medially dissection extended up to pubic symphysis, inferiorly dissection extended up to obturator foramen.

Lateral dissection

Hernial sac dissected from cord structures using traction and short bursts of electrocautery. In cases of longer sac, the dissection continued close to the hernial sac distally into inguinal canal after creating a window between the sac and cord structures. In larger sacs, hernia sac is divided beyond the internal ring within the canal leaving the distal end of the sac *in situ*.

Parietalization

Peritoneum is separated from the vas and gonadal vessels as far as the mid psoas muscle. In all cases, preperitoneal dissection

is extended beyond midline on medial aspect, beyond anterior superior iliac spine exposing the psoas on lateral aspect, inferiorly up to symphysis pubis and obturator foramen and superiorly up to the level of working trocars. Medial dissection was done in direct hernia.^[10] Lateral dissection was done in indirect hernia. The mesh is reverse loaded into 10–5 mm reducer. The laparoscope is withdrawn and mesh is taken into the preperitoneal space by blind insertion through the 10 mm trocar. Mesh was properly placed in the preperitoneal space. Mesh was fixed to cooper's ligament inferiorly, and rectus muscle on superomedial aspect, medial to inferior epigastric vessels using 1-prolene.^[11] Peritoneal flaps are approximated with 2–0 vicryl in continuous manner without any gap. All port sites skin approximated with staplers after suturing rectus with 1–0 prolene. During post-operative period, all patients received same antibiotics, analgesic injections followed by oral treatment.

Post-operative Assessment of Pain

The pain experienced by the patients in post-operative period had been measured according to visual analog scale.^[12] All the patients are ambulated within 12 h of surgery and are allowed oral feeds. Nasogastric tube and Foleys were removed after 12 h. Initially, the feeds were sips of liquids followed by normal diet in a gradual manner after resolution of post-operative ileus indicated by passing of flatus and normal bowel sounds on auscultation and return of appetite. The wounds were inspected for any seroma, hemotoma, and any infection. Patients were discharged after complete ambulation and tolerating normal diet.

After discharge, patients were followed up at 1 week, 1 month, and 6 months intervals. In the initial follow-up, the patients were evaluated for short term complications such as seroma, hemotoma, and wound infection. In the long-term follow-up, patients were evaluated for chronic pain and recurrence of hernia.

Statistics

Data entry was done by Microsoft Excel 2010 version and analysis using EPI INFO version 3.01. Data were presented in percentages and proportions. Numerical data were expressed as the mean \pm standard deviation (SD) and range. Association between categorical variables was done using Chi-square test or Fisher exact test with p value less than 0.05 considered statistically significant.

RESULTS

A total number of 30 patients were included, 15 in each group, that is, laparoscopic preperitoneal repair group (TAPP) and open preperitoneal group, allocated randomly. All patients were evaluated by history and clinical examination. After

informed consent, all patients were operated under general or spinal anesthesia. Type of operation (laparoscopy/open) was chosen randomly. Laparoscopic hernia repair is done under general anesthesia. Size of mesh used was 15 \times 15 cm polypropylene mesh. Open hernioplasty (Tension-free Lichtenstein's hernioplasty) is done under spinal anesthesia. Size of mesh used was 7 \times 15 cm.^[13] Parameters assessed were pain (using visual analog scale [VAS]), post-operative complications (Seroma/hematoma formation, Mesh infection), Neuralgias, length of hospital stay, recurrence of hernia at the same site, assessed during their regular follow-up at intervals of 3 months, 6 months, 1 year, and 2 years. Age (mean \pm SD) $P = 0.9$, and duration of surgery $P = 0.00001$. Pain score at 6 hrs 6.53 \pm 1.02 for open and 3.13 \pm 0.61 for lap with P value of 0.00001, at 12 hrs 4.53 \pm 1.02 for open and 2.27 \pm 0.44 for lap with P value of 0.003, at 24 hrs 3.73 \pm 0.92 for open and 1.53 \pm 0.49 for lap with P value of 0.02 which is statistically significant.

- Hematoma $P = 0.5$ *Chi-square test with Yate's correction
- Seroma $P = 0.3$ *Chi-square test with Yate's correction
- Pus collection $P = 0.5$ *Chi-square test with Yate's correction
- Hospital stay in days $P = 0.00001$
- Recurrence at 2 years $P = 0.5$ * Chi-square test with Yate's correction
- Chronic pain (1 month) $P = 0.5$ *Chi-square test with Yate's correction
- Chronic pain (6 months) $P = 0.2$ *Chi-square test with Yate's correction
- Chronic pain (1 year) $P = 0.2$ Chi-square test with Yate's correction
- Chronic pain (2 years) $P = 0.5$ *Chi-square test with Yate's correction

DISCUSSION

The laparoscopic approach has become an excellent alternative to open repair for inguinal hernia for many patients and surgeons. There is abundant literature that emphasizes that laparoscopic inguinal hernia repair provides amazing results. Until a few decades ago, the standard method for inguinal hernia repair was suturing fascial structures around the hernia defect until Lichtenstein *et al.* introduced tension-free repair, which gained widespread recognition worldwide and surgeons mastered the technique rapidly.^[14] There are advantages and disadvantages to laparoscopic repair. Clinically, silent contralateral hernia and other intra-abdominal pathologies are easier to detect with the TAPP approach. Despite excellent long-term outcome after TAPP repair, the use of laparoscopy in hernia repair is still limited due to disadvantages such as possible organ injury at the time

of trocar entry, port site hernia, and adhesions.^[15] In this prospective study, two different techniques were used, both being tension-free (laparoscopic TAPP and open inguinal preperitoneal), with similar mesh location. The mesh was placed in the preperitoneal space between the peritoneum and the transversalis fascia, and secured over the myopectineal orifice using intra-abdominal pressure and treating the three most common types of groin hernia: Indirect, direct, and femoral hernia. Adequate dissection of the preperitoneal space with a large enough mesh avoids recurrence.^[16] In this study, it is found that both open and laparoscopic approaches are effective and safe for preperitoneal repair of inguinal hernia, with low complication and recurrence rates. Recurrence was the main outcome measure in this study.^[17] The results showed a low and similar recurrence rate in both approaches (1% in both), comparable to the results of Abd-Elrahman Sarhana study. The following was compared in both the groups: Duration of surgery, post-operative pain, seroma/hematoma formation, pus collection, length of hospital stay, recurrence of hernia, and chronic pain at intervals of 1 month, 6 months, 1 year, and 2 years.

The present prospective observational study has 30 cases. All of them were male, with mean age of 28.93 ± 5.68 (range: 20–39) in the open group. In the laparoscopic group, the mean age was 29.13 ± 5.52 (range: 20–38). The p value is 0.9, which is statistically insignificant

In Abd-Elrahman Sarhana study, the mean age was 41 ± 9.1 in the open group, and 38 ± 12.9 in laparoscopic group. The p value was 0.45.

In the present study, the mean duration of surgery in open group is 43.0 ± 8.90 and in laparoscopic group, it is 82.33 ± 12.49 , with $P = 0.00001$, which shows that it is statistically significant.

Post-operative pain was assessed at different time intervals, using VAS. The patients' pain was evaluated using Numeric Rating Scale, where 0 = no pain and 10 = extreme pain. The ranges then were divided into mild pain (1–3), moderate pain (4–6), and severe pain (7–10). In the present study, the VAS of pain at 6 h was 6.53 ± 1.02 and 3.13 ± 0.61 in open and laparoscopic groups, respectively, with $P = 0.0001$, which is statistically significant.^[18]

The VAS of pain at 12 h was 4.53 ± 1.02 and 2.27 ± 0.44 in open and lap groups, respectively, with $P = 0.003$, which is statistically significant. The VAS of pain at 24 h was 3.73 ± 0.92 and 1.53 ± 0.49 in open and lap groups, respectively, with $P = 0.02$, which is statistically significant. This is comparable to Abd-Elrahman Sarhana study, where the VAS of pain is 3.39 ± 1.1 and 1.1 ± 1 in open and lap

groups, respectively, with $P < 0.001$ which is statistically significant.

In the present study, there is one case in the open group with hematoma as a complication and none in the laparoscopic group. $P = 0.5$, which is statistically insignificant. In Abd-Elrahman Sarhana study, there is no case with hematoma occurrence.

In the present study, two cases in open group and one case in laparoscopic group developed seroma formation, which accounts to 13.3% and 6.7%, respectively, with $P = 0.3$, which is statistically significant. In Abd-Elrahman Sarhana study, six cases in open group and five cases developed seroma formation, which account to 6% and 5%, respectively.

In the present study, occurrence of wound infection is one case each in open and laparoscopic group, which accounts to 6.7% in each group, with $P = 0.5$, which is statistically insignificant. In Abd-Elrahman Sarhana study, two cases in each group had wound infection, accounting to 2% in each group, with $P = 1.0$, being statistically insignificant. Duration of hospital stay (in days).

In the present study, the mean of duration of hospital stay is 5.26 days with a SD of 1.33 days in the open group, whereas in the laparoscopic group, it is 2.53 days with a SD of 0.88 days. The p value is 0.00001, which is statistically significant.

In Abd-Elrahman Sarhana study, the mean duration of hospital stay is 1.7 ± 0.53 days in open group and 1.4 ± 0.57 days in laparoscopic group, with $P < 0.001$ which is statistically significant.

In the present study, the recurrence was seen in one case in each group, accounting to 6.7% in each group.^[19] This has $P = 0.5$, which is statistically insignificant. In Abd-Elrahman Sarhana study, the recurrence was seen in one case in each group, accounting to 1% in each group. p value is statistically insignificant.

Chronic Pain at Different Intervals

In Abd-Elrahman Sarhana study, chronic pain is present in seven cases in open group, compared to one case in laparoscopic group, with p value being 0.03.^[20] In the present study, chronic pain is seen in three cases in open group and two cases in laparoscopic group, three cases in open group and two cases in laparoscopic group, two cases in open group and 0 case in laparoscopic group, and one case in open group and 0 cases in laparoscopic group at the intervals of 1 month, 6 months, 1 year, and 2 years, respectively.^[21]

CONCLUSION

The laparoscopic preperitoneal inguinal hernia repair is superior to open preperitoneal inguinal hernia repair in terms of post-operative pain, duration of hospital stay, and chronic pain. However, the risk of hernia recurrence remains same in both the groups when the mesh is placed preperitoneally, and moreover, operative time is reduced drastically in open group, when compared to the laparoscopic repair. Furthermore, the laparoscopic technique has a longer learning curve, whereas open repair can be done with a comparatively minimal skill and equipment and can be done at any primary centers. Even though short-term results are better with laparoscopic preperitoneal repair, both are comparable to each other in terms of recurrence. However, we need more evidence-based randomized clinical trials to compare the pros and cons of the two methods.

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