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Research Article

Comparison of Laparoscopic Pre-Peritoneal Versus Retro-Muscular Mesh Hernioplasty for Simple Ventral Abdominal Wall Hernia: A Randomized Controlled Trial

Muhammad Waseem Anwar[1], M. Furqan Sharif[2], Eishah Qanita[3], Aftab Ahmed[4], Muhammad Hassan Nisar[5], Nouman Nasir[6]

[1]Professor of Surgery, Ali Fatima Hospital, Lahore, Pakistan.
[2,3]Senior Registrar Surgery, Ali Fatima Hospital Lahore, Pakistan.
[4,5,6]Postgraduate Resident Surgery, Ali Fatima Hospital, Lahore, Pakistan.
Corresponding author: M. Furqan Sharif, Senior Registrar Surgery, Ali Fatima Hospital Lahore, Pakistan.
Email: furqanshareef07@gmail.com
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ABSTRACT

Objective: To compare perioperative and postoperative outcomes of laparoscopic transabdominal pre-peritoneal (TAPP) versus transabdominal retro-muscular (TARM) mesh hernioplasty for simple ventral abdominal wall hernia.

Study design: Randomized controlled tria1

Study place and period: Surgical Unit, Ali Fatima Hospital, Lahore, from October 2025 to April 2026.

Methodology: Total 150 patients diagnosed with primary ventral abdominal wall hernias. Patients were random1y distributed into two groups. Group-I underwent laparoscopic TAPP. Group-II underwent laparoscopic TARM. Primary outcome measures included operative time, postoperative pain scores, wound infection, duration time to return to normal activities, and recurrence. Data analyses was done using SPSS v.26 with p-value ≤0.05 as significant.

Results: The mean age of patients was 46.25 ± 11.90 years in TAPP group and 48.03 ± 14.41 years in TARM group. In TAPP group, there were 31 (41.3%) males and 44 (58.7%) females. In TARM group, there were 26 (34.7%) males and 49 (65.3%) females. The mean operative time was significantly less with TARM (89.99±19.74 vs. 82.41±15.25) than TAPP, mean intraoperative blood loss was 73.67±14.77 vs. 62.87±11.26, mean time to return to daily activates was 11.48±2.35 vs. 8.85±2.14 days, Seroma formation (9.3% vs. 1.3%, p=0.063), hematoma formation (14.7% vs. 2.7%, p=0.17), wound infection rates (13.3% vs. 4%), and recurrence (8% vs. 0%) (p<0.05).

Conclusion: Both TAPP and TARM mesh hernioplasty are safe and effective ventral hernia repair methods. But the operative and postoperative parameters of TARM are better than TAPP and showed less wound-related complications.

Keywords: Ventral Hernia, Pre-Peritoneal Mesh Hernioplasty, Retro-Muscular Mesh Hernioplasty, Ventral Abdominal Wall Hernia, Laparoscopic Hernioplasty.

INTRODUCTION

One of the most popular surgical procedures in the world is ventral hernia repair. In recent years, patient prehabilitation has gained more attention as a means of lowering the likelihood of problems.[1] One of the most difficult side effects following ventral hernia repair is recurrence, which affects quality of life, resource use, and the need for further repair. Following ventral hernia repair, recurrence rates vary from 30% to 80%.[2, 3] LeBlanc and Booth published the first description of laparoscopic ventral hernia repair in 1993. Compared to the open repair procedure, it is associated with lower post-operative pain, recovery time, hospital length of stay, and wound problems because it is minimally invasive, requiring smaller incisions and less stressful tissue manipulation.[4]

Other laparoscopic procedures, such as extra-peritoneal repair and mini/less-open sublay repair, have advanced recently in addition to intra-peritoneal onlay/underlay mesh. The application of these methods is not as well supported by long-term prospective data.[5] The main goals of laparoscopic surgery were to reduce discomfort by making fewer incisions and speed up patient recovery.[6, 7] Underestimated true rates are anticipated since incisional hernia rates are rarely analyzed due to interest and short follow-up periods. There is no quantifiable evidence in the surgical literature to support the widely held belief that

laparoscopic operations will decrease incisional hernias.[8, 9]

Because it may be applied to all incisional hernia sites, retro-muscular (TARM) mesh repair is also a great and ideal technique for repair of ventral incisional hernia. The mesh is often concealed and fastened beneath the rectus sheath, and there is little chance of problems or recurrence.[10] Compared to laparoscopic TAPP, TARM is linked to a shorter duration of stay and a lower need for postoperative analgesics.[10]

The continuing debate regarding the superiority of TAPP and TARM mesh placement highlights the need for high-quality comparative trials. Although, limited number of tria1s have been done before, and evidence for local population is also scarce. Therefore, this tria1 has been planned to get the evidence for local clinical setting for management of ventral hernias. The current study aimed to provide a pivotal information to support the surgical decision-making and enhance patient care by directly comparing these two widely recognized methods.

METHODOLOGY

This prospective randomized controlled tria1 was conducted in the Department of General Surgery, Ali fatima hospital Lahore, from October 2025 to April 2026. Approval for the research was first taken from Institutional Review Board. Sample size of 150 cases (equally divided in two groups, 75 patients in both groups) was estimated with 5% significance level, 80% power of study and percentage of seroma formation i.e. 7.1% with retro-rectus Mesh Hernioplasty and 21.4% with preperitoneal Mesh Hernioplasty.[11] Non-probability, purposive sampling was used to select the patients for the trial.

Inclusion Criteria: Patients presenting to the surgical outpatient department with uncomplicated ventral abdominal wall hernias were screened for eligibility. Eligible patients fall in age 18 to 70 years, either gender, diagnosed with primary ventral hernias, including umbilical, paraumbilical, epigastric, and small incisional hernias were included with defect size 3—7 cm, and planned to undergo elective surgery.

Exclusion Criteria: ASA grade IV, recurrent ventral hernia, giant ventral hernia (>10 cm), emergency presentation, strangulated or obstructed hernia, active infection, pregnant females, cardiovascular or pulmonary diseases, immunocompromised patients were not considered for the tria1.

After enrolment, informed consent was obtained from patients and both methods were explained. Demographic information including name, sex, age, BMI, duration and size of hernia, cause of hernia, were noted. Then patients were randomized in 02 groups, using the random number tab1e. Random number table was developed in Microsoft excel. In group-I, pre-peritoneal mesh hernioplasty was performed. In group-II, retro-muscular mesh hernioplasty was performed.

In Laparoscopic Transabdominal Preperitoneal (TAPP) Mesh Hernioplasty, patients was placed in supine position after induction of general anesthesia. Pneumoperitoneum was established using a Veress needle or open (Hasson) technique, and three laparoscopic ports were inserted under direct vision. The abdominal cavity was inspected, and adhesiolysis was performed when necessary. A peritoneal incision was made approximately 5 cm from the edge of the hernia defect, and a peritoneal flap was developed to create a preperitoneal pocket extending beyond all margins of the defect. The hernia sac was carefully dissected and reduced into the abdominal cavity. The fascial defect was closed intracorporeally using non-absorbable barbed or interrupted polypropylene sutures where feasible. A lightweight polypropylene mesh was introduced into the abdomen and placed in the preperitoneal space with a minimum overlap of 5 cm beyond all margins of the defect. Depending on the extent of the defect and the surgeon's preference, mesh fixation was carried out selectively utilizing interrupted transfascial sutures or absorbable tacks. A continuous absorbable barbed suture was subsequently used to completely close the peritoneal flap, guaranteeing full coverage of the mesh and avoiding direct contact with intra-abdominal viscera. The port sites were closed in the conventional manner once the pneumoperitoneum was released under direct vision.

In Laparoscopic Transabdominal Retromuscular (TARM) Mesh Hernioplasty, patient was placed in supine position after induction of general anesthesia. Three laparoscopic ports were placed under direct vision. After inspection of the abdominal cavity and adhesiolysis as required, the posterior rectus sheath was incised bilaterally adjacent to the hernia defect. Bilateral retromuscular (retrorectus) spaces were developed by careful dissection between

the rectus abdominis muscle and the posterior rectus sheath, preserving the neurovascular bundles. The hernia sac was reduced, and the posterior rectus sheath together with the peritoneum was closed in the midline using a continuous absorbable barbed suture to recreate the posterior layer. A lightweight polypropylene mesh was then introduced and positioned within the retromuscular space with at least 5 cm overlap beyond the margins of the defect in all directions. Mesh fixation was performed selectively using interrupted absorbable sutures or left unfixed where adequate retromuscular confinement was achieved. The anterior fascial defect was closed intracorporeally using non-absorbable barbed or interrupted sutures. Hemostasis was confirmed, pneumoperitoneum was released under direct vision, and all trocar sites were closed according to standard laparoscopic practice**.**

At the time of induction of anesthesia, standard prophylaxis antibiotics and amnesia was given to all patients to prevent postoperative pain and risk of infection. Operative time and intraoperative blood loss were noted for both methods. Operative time was noted from time of incision given in the skin after administration of general anesthesia until closure of skin after removal of laparoscopic ports. Intraoperative blood loss was noted by suction tubes and gauze pieces used in surgery. After surgery, patients were moved to post-surgical wards for 24 hours stay. After 24 hours, patients were examined for severity of pain, using visua1 ana1ogue scale. Then after 24 hours, patients were discharged and were followed-up in OPD for 1 week, and 4 weeks. During follow-up, patients were examined for wound infection, if there was pus discharge from wound site, seroma or hematoma formation. Patients' day to return to normal activates was also noted. Then patients were followed-up further for 12 weeks and 24 weeks in OPD for assessment of recurrence of hernia. All the data was recorded in proforma.

Data were analyzed using SPSS version 26. Continuous variables including age, BMI, duration of hernia, size of hernia, operative time, blood 1oss, pain score, and time to return to daily activities were expressed as mean ± SD,. Categorical variables including sex, cause of hernia, and outcomes (wound infection, seroma, hematoma formation and recurrence) were expressed as f (%). Both tria1 groups were compared for mean operative time, blood loss, pain score, and time to return to daily activities using independent samples t-test, while Chi-square (χ^2) test was used to compare wound infection, seroma, hematoma and recurrence in both tria1 groups. P-valeu≤0.05 was taken as cut off for significance.

RESULTS

A total of 120 patients were enrolled and randomized into two groups. The mean age of patients was 46.25 ± 11.90 years in the TAPP group and 48.03 ± 14.41 years in TARM group. In TAPP group, there were 31 (41.3%) males and 44 (58.7%) females. In TARM group, there were 26 (34.7%) males and 49 (65.3%) females. The mean BMI of patients was 30.05 ± 3.96 and 30.69 ± 4.84 kg/m^2 in both groups. The mean duration of hernia was 5.85 ± 3.62 and 6.37 ± 3.31 months, respectively. The mean size of hernia was 4.93 ± 1.42 and 5.08 ± 1.45 cm, respectively. Details of cause of hernia is given in table below. Table 1.

Table 1. Baseline Characteristics of included patients (n = 150)

Variable	**TAPP**	**TARM**
n	**75**	**75**
Age (years)	46.25 ± 11.90	48.03 ± 14.41
Males	31 (41.3%)	26 (34.7%)
Females	44 (58.7%)	49 (65.3%)
BMI (kg/m^2)	30.05 ± 3.96	30.69 ± 4.84
Duration of hernia (months)	5.85 ± 3.62	6.37 ± 3.31
Size of hernia (cm)	4.93 ± 1.42	5.08 ± 1.45
Cause of hernia		
Prior surgery	21 (28%)	13 (17.3%)
Excess weight	6 (8%)	3 (4%)
Pregnancy	10 (13.3%)	8 (10.7%)
Heavy lifting / gym	15 (20%)	14 (18.7%)
Constant straining	16 (21.3%)	11 (14.7%)
Aging	3 (4%)	4 (5.3%)
Physical trauma	4 (5.3%)	22 (29.3%)

The mean operative time was 89.99±19.74 vs. 82.41±15.25, that was significantly less with TARM than TAPP (p=0.010). The mean intraoperative blood loss was also significantly less in the TARM group (73.67±14.77 vs. 62.87±11.26, p=<0.001) than TAPP group. Table 2

Table 2. Intraoperative Outcomes (n = 150)

Parameter	TAPP	TARM	p-value
Operative Time (min)	89.99±19.74	82.41±15.25	0.010*
Blood Loss (ml)	73.67±14.77	62.87±11.26	<0.001*
Note: * = Independent samples t-test			

In TAPP group, the mean time to return to daily activates was short with TARM than TAPP (11.48±2.35 vs. 8.85±2.14 days, p<0.001). Seroma formation was observed more frequently following TAPP group (9.3% vs. 1.3%, p=0.063). Hematoma formation was observed more frequently following TAPP group (14.7% vs. 2.7%, p=0.17). Wound infection rates was also high with TAPP (13.3%) than TARM (4%), although the difference was insignificant (P.0.05). The recurrence was observed in 6 (8%) cases who underwent TAPP, while no recurrence observed in TARM group (p<0.05). Table 3

Table 3. Postoperative Outcomes (N = 150)

Time	TAPP	TARM	p-value
Time to return to daily activities	11.48±2.35	8.85±2.14	<0.001*
Seroma formation	7 (9.3%)	1 (1.3%)	0.063!
Hematoma formation	11 (14.7%)	2 (2.7%)	0.017!
Wound infection	10 (13.3%)	3 (4%)	0.078!
Recurrence	6 (8%)	0 (0%)	0.028!
Note: ! = Fischer Exact test, * = Independent samples t-test			

DISCUSSION

In this tria1, we observed that the mean operative time was significantly less in the TARM group (89.99±19.74 vs. 82.41±15.25) than TAPP group, mean intraoperative blood loss was 73.67±14.77 vs. 62.87±11.26, mean time to return to daily activates was 11.48±2.35 vs. 8.85±2.14 days, Seroma formation (9.3% vs. 1.3%, p=0.063), hematoma formation (14.7% vs. 2.7%, p=0.17), wound infection rates (13.3% vs. 4%), and recurrence (8% vs. 0%) (p<0.05).

In 2025, Reddy and Reddy performed a tria1 on 28 patients and found that, in comparison to TAPP, the TARM showed decreased rates of seroma development (7.14% vs. 21.4%, p = 0.042) and wound infection (7.14% vs. 14.3%, p = 0.037). Additionally, there was a lower return to routine following surgery (8.5 ± 2.1 days vs. 11.3 ± 2.5 days, p = 0.018).[11] Additionally, Dougaz et al. found no difference between TARM and TAPP in terms of hematoma and seroma formation (p>0.05), postoperative complications (20.5% vs. 11.9%, p = 0.129), or operating time (85.24 vs. 65.34 min, p = 0.120). Recurrence was comparable using both methods after three years (11 vs. 9, p=0.33). For open sublay mesh repair, TARM and TAPP offer good alternatives. They have similar rates of complications and recurrence and are safe and effective.[12]

Another study was carried out in India by Chawdary et al., who found that TARM had a much shorter mean operating time than TAPP (95.89±23.335 vs. 110.89±29.252 min). Seroma was the most frequent complication in the latter, which had a higher total complication rate of 18%; nevertheless, the difference was not statistically significant (p>0.05). At the two-year follow-up, two patients (7.10%) with TAPP and three patients (10.71%) with TARM experienced recurrence.[13] In a research looking at the results of TAPP, Heniford et al. found that mesh infection occurred in 1.7% of instances and wound complications in 27.3% of cases. In 5.2% of cases, recurrence was noted.[14]

According to Anusitviwat et al., the average operating time with TAPP was 240 minutes, which was shorter than the 360 minutes with eTEP. Subgroup analysis revealed that the eTEP groups had significantly less pain at 12th and 24th hour than laparoscopic TAPP group (p < 0.001). Although the rates of complications were similar across the groups, some TAPP cases were found to have small intestinal injuries. For eTEP and TAPP, the one-year recurrence rates were 3.1% and 7.9%, respectively (p = 0.620).[15]

According to Hu et al., the e-TEP's mean operating time was significantly longer than TAPP's (98.5 ± 10.7 min vs. 65.9 ± 7.3 min, P < 0.01). Postoperative pain was substantially lower with e-TEP than with TAPP (4.2 ± 0.9 vs. 6.7 ± 0.9, P < 0.01). Neither group experienced any surgical problems.[16] Sains et al., conducted a tria1 on 351 patients with ventral hernia and observed that the mean operative time of TAPP was 12 min longer than other methods, while the mean hospital stay was 3-3 days shorter. No significant difference was noted for postoperative wound infection or recurrence of hernia.[17] After 3 years, about 1/4th of all the mesh repairs and about 50% of initial repairs fails. Furthermore, the use of prosthetic materials raises the likelihood of major wound complications, which is a risk factor for further morbidity and hernia recurrence.[18]

The current mesh placement criteria are based on relatively low certainty of evidence, which reflects an ongoing dispute about the best mesh placement for elective primary ventral hernia repair.[3, 19] Based mostly on case reports and limited series, prior research indicates a move away from TAPP as a preventative therapy to lower the incidence of intestinal adhesions and blockage.[20, 21] Surgeons' choice of the optimal overall mesh location reflects this, showing a move away from TAPP when compared to earlier survey surveys.[20, 21] While some observational studies have looked at the risks of blockage and bowel adhesions, they frequently lack adequate power or comparators to make firm conclusions on the safety of TAPP.[20, 22]

CONCLUSION

Both TAPP and TARM mesh hernioplasty are safe and effective ventral hernia repair methods. But the operative and postoperative parameters of TARM are better than TAPP and showed less wound-related complications and early return to routine life. The risk of recurrence also reduced with TARM. Thus in future, we will use TARM for ventral hernia repair instead of TAPP to achieve better surgical outcomes and patients satisfaction level.

Conflict of Interest: None.

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