https://doi.org/10.29309/TPMJ/2025.32.07.9713

The Professional Medical Journal
www.theprofesional.com
2025, Volume, 32 Issue, 07

ORIGINAL ARTICLE

The feasibility and efficacy of TIPP (Trans inguinal preperitoneal repair) versus (TAPP) Transabdominal preperitoneal repair for inguinal hernia.

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Article Citation: Iqbal MN, Mengal MZ, Anwar M, Sindhu AA. The feasibility and efficacy of TIPP (Trans inguinal preperitoneal repair) versus (TAPP) Transabdominal preperitoneal repair for inguinal hernia. Professional Med J 2025; 32(07):865-872. https://doi.org/10.29309/TPMJ/2025.32.07.9713

ABSTRACT… Objective: To compare the feasibility and efficacy of TIPP versus TAPP in terms of operating time, postoperative acute and chronic inguinal pain, complication rate, recurrence rate and hospital stay. **Study Design:** Prospective Comparative study (RCT). **Setting:** Bahawal Victoria Hospital, Bahawalpur. **Period:** 01-02-21 to 30-11-24. **Methods:** 100 patients were equally divided into group A and group B by simple random sampling. In Group A, the trans inguinal preperitoneal (TIPP) repair was performed, and in group B trans abdominal preperitoneal (TAPP) repair was performed. Mean operating time, postoperative acute and chronic inguinal pain, complication rate, recurrence rate and hospital stay were recorded. Pain was evaluated by visual analogue score ranging from 0-10. Data was collected on a pro forma and analysed using SPSS Statistics version 27. The Pearson chi-squared test was used for the categorical variables and t tests for continuous variables. **Results:** Mean operating time in TIPP group was significantly shorter than TAPP group (59.54 ± 11.71 versus 95.40 ±15.81 and p-value <0.001). Acute postoperative pain score after 24 and 48 hours was significantly was higher in TIPP group than TAPP group (4.98± 0.99 vs.4.92 ± 0.92, p-value 0.05 and 2.36± 0.96 vs.1.94± 0.93 p-value 0.029 respectively). Complication rate was lower in TAPP than TIPP (9% vs.15%). However, recurrence rate was equal in both groups (1% vs. 1%) but hospital stay was significantly shorter in TIPP than TAPP (.1.26± 0.69 vs1.66± 0.68, p-value 0.005). **Conclusion:** Both TIPP and TAPP repair are effective for the treatment of inguinal hernia. TIPP repair has higher feasibility in terms of significantly shorter operating time than TAPP repair where as TAPP has higher efficacy in terms of lower post operative pain (acute and chronic) and complication rate than TIPP repair. TIPP may be a better approach in older patients who are unfit for general anesthesia and TAPP for the younger patients.

Key words: Inguinal Hernia, Preperitoneal Repair, Pain, Recurrence, TAPP, TIPP.

INTRODUCTION

Hernia is one of the commonest surgical problems worldwide. It affects all age groups. Its incidence in male and female is 27% and 3% respectively. Patients of inguinal hernia present with swelling in the groin but sometimes with clinical features of obstruction/strangulation.[1] Surgery is the only treatment for inguinal hernia which includes herniotomy, open suture repair, open mesh repair (anterior-Lichtenstein and posterior), laparoscopic mesh repair-Totally extraperitoneal (TEP) and the transabdominal preperitoneal (TAPP) approach and robotic surgery.[2] More than 20 million inguinal hernia surgery is performed annually.[3] Anterior mesh repair (Lichtenstein repair) for inguinal hernia is the most commonly used technique due to its lower recurrence and complication rate[4,5] but with this approach, patients experience severe chronic postoperative inguinal pain.[6] Preperitoneal mesh placement widely cover Myo pectineal orifice of Fauchard (MPO) making it preferred approach than anterior mesh repair (Lichtenstein's repair). With preperitoneal placement of mesh, mesh is supported by abdominal wall during raised intrabdominal pressure as compared to anterior placement of mesh.[7] Average recovery time reported is 6.5 days. This makes this procedure more cost effective.[8] International guidelines also recommend that posterior mesh placement is associated with less acute postoperative pain and chronic pain with advantage of faster recovery.[9]

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Article received on: 09/04/2025
Accepted for publication: 13/06/2025

Similarly, transabdominal preperitoneal (TAPP) repair and totally extra-peritoneal repair (TEP) have caused reduction in rates of early post-operative complications (seroma /hematoma formation, wound infection and visceral injury), chronic pain and recurrence rates. These have shortened the hospital stay compared to Lichtenstein repair.[5,10]

The cost and resources needed for laparoscopic and robotic inguinal hernia can be reduced by the open trans inguinal preperitoneal approach (TIPP). TIPP can also be performed under local anaesthesia with i/v sedation while laparoscopic repair requires general anaesthesia.

The aim of this study was to compare the feasibility and efficacy of TIPP versus TAPP repair in the treatment of inguinal hernia. Primary outcome was feasibility in terms of mean operating time and secondary outcome was efficacy in terms of acute postoperative pain, early complication rate (seroma /hematoma formation, wound infection and retention of urine), late complications rate (chronic pain and recurrence) and duration of hospital stay.

METHODS

This prospective comparative study (RCT) was conducted in the Surgical Department of Bahawal Victoria Hospital, Bahawalpur, from 01-02-2021 to 30-11-24 after approval from the Institutional Ethical Review Board (letter No.960 dated 16-01-2021). This study included 100 patients of unilateral inguinal hernia who were equally divided in to group A and B by simple random sampling. Sample size was calculated using formula[11],

$$n = \frac{(r+1)(Z_{1-\beta} + Z_{1-\alpha/2})^2 \sigma^2}{rd^2}$$

(r = 1; because n1 = n2; the number of patients is the same in each group).
Z = Standard Normal deviate function value, α = type I error rate; it is taken as 5% = 0.05.
Z1–α/2= 1.960, β = type II error rate = 10% = 0.1; so, power of study = 1–β =1–0.1 = 0.9 or 90%; Z1–β = Z1–0.1 =1.282, d= difference of mean operating time between group A and B=10 σ = population/sample standard deviation (it was assumed as σ =15). σ2=population variance On the basis of the above calculation, we recruited 50 patients in each group and total 100 subjects assuming standard deviation of 15 and 90% power of the study and 95% confidence interval.

A consent form was filled out before registering the patients for the study. Group A patients underwent TIPP (trans inguinal preperitoneal) repair, and group B patients TAPP (transabdominal preperitoneal hernioplasty). Patients with age > 20 years ASA grade greater than 3, bilateral, obstructed/strangulated hernia, recurrent hernia, and previous laparoscopic repair were excluded. Data was collected on a pro forma. This included the patient's name, age, sex, preoperative risk factors, site of hernia, type of hernia, type of procedure, type of anaesthesia, operative time, postoperative acute pain, early postoperative complications (seroma/haematoma, wound infection, visceral injury), and late complications (chronic inguinal pain and recurrence. Chronic pain was defined as pain persisting for more than three months after the operation). Postoperative pain was assessed by a visual analogue scale (VAS) pain scoring system ranging from 0–10. Acute pain was recorded at 12, 24, 48 hours postoperatively and chronic pain after three and six months.

In TIPP, a supra-inguinal incision was made. The external oblique was cut. The spermatic cord was lifted. In case of indirect inguinal hernia sac was dissected out, contents were reduced and sac was excised after trans fixation. Fascia transversalis was cut and preperitoneal space was made. A poly propylene mesh of 10×15 cm was placed in preperitoneal space. Fascia transversalis was closed then external oblique aponeurosis was closed.

In the TAPP procedure, three ports were inserted after creating pneumoperitoneum by open technique. A transverse peritoneal incision extending from the upper border of the inguinal hernia defect to the level of the iliac spine. Preperitoneal space was created. A 10 × 15-cm polypropylene mesh was positioned in the preperitoneal space. The peritoneum was closed

with prolene number 2/0.

Intraoperatively, the type of anaesthesia, type of hernia (direct/indirect), operating time, and intraoperative complications were noted. The duration of surgery was recorded from the skin incision to the last skin stitch.

Continuous variables (numerical values) were presented in the form of mean ± SD and categorical variables as frequency with percentage. The Pearson chi-squared test was used for the categorical variables and student t test for continuous variables. SPSS (Statistical Package for Social Sciences) version 27 was used for statistical analysis.

RESULTS

There was one female patient who presented with right sided, indirect inguinal hernia in group A. Mean age in group A was 43.24 ±15.71 while in group B was 40.98± 15.06 but that was not statistically significant (P-value 0.465).

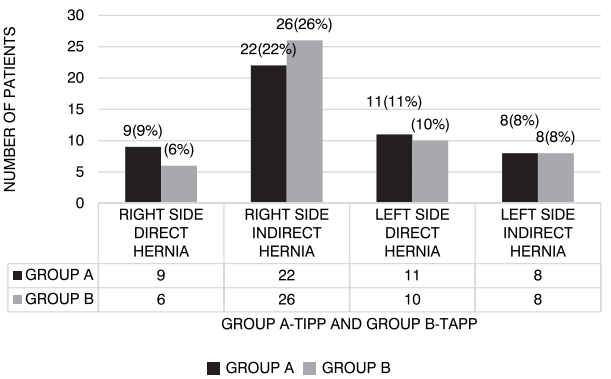

Figure-1.

The most common type of hernia in each group was right sided indirect hernia (46%) as shown in Figure-1.

No	Comorbidity	Group A	Group B	P-value
1	Diabetes mellitus	5(5%)	10(10%)	0.161[a]
2	Hypertension	5(5%)	5(5%)	1.00[a]
3	Chronic cough	8(8%)	5(5%)	0.391[a]
	Total	18	20	

Table-I. Co-morbidities

a-dichotomous variable and chi square test used for statistical analysis

43% patients were smokers and 38% were labourer by occupation. Bladder outlet obstruction due to benign prostatic hyperplasia (BPH) was present in 8(8%) patients in group A and 5(5%) patients in group B for which either they had been operated or on medical therapy. As regards the comorbidity, in group A, 32 patients had no comorbidity and chronic cough was the most common comorbidity whereas in group B, 30 patients had no comorbidity and Diabetes mellitus was the most common comorbidity but that was not also statistically significant.

All the patients in group B were operated in general anaesthesia whereas 23 patients in group A were operated in local anaesthesia and i/v sedation and remaining 27 patients were operated in spinal anaesthesia. Mean duration of surgery was significantly longer in TAPP group than in TIPP group (p-value .001). This may be because open hernia repairs are more frequently performed procedures. TAPP repair has long learning curve and is technically demanding procedure. Acute postoperative pain was more severe in TIPP group than TAPP group. Acute post operative pain was assessed after 12 hours, 24 hours and 48 hours. It was significantly more severe in TIPP group after 24 and 48 hours as shown in table No.2. 15 (15%) patients in group A whereas 9 (9%) patients in group B developed postoperative complications. Retention of urine was the most common complication in group A and B. Hospital stay was significantly longer in group B (1.66± 0.68 vs. 1.26± 0.69 in group B and A respectively).. Chronic pain was assessed after 3 and 6 months. In group A, 6 patients complained of chronic mild pain and 2 patients in group B after 3 months follow up and after 6 months, 3 (6%) patients complained of chronic mild pain in group A and one (2%) patient in group B. But this difference was not statistically significant. One patient in each group complained of recurrence and unluckily, both were suffering from COPD.

No.	Variable	Group A	Group B	P-Value
1	Duration of surgery in minutes (mean ±SD)	59.54 ± 11.71	95.40 ±15.81	<0.001[b]
2	Acute Postoperative pain			
	Pain after 12 hours (VAS Score-mean ±SD)	5.92 ± 0.965	5.74 ± 0.964	0.353[b]
	Pain after 24 hours (VAS Score-mean± SD)	4.98± 0.99	4.92 ± 0.92	0.05[b]
	Pain after 48 hours (VAS Score-mean ±SD)	2.36± 0.96	1.94± 0.93	0.029[b]
3	Complications (n, %)			
	Seroma	4(4%)	2(2%)	0.400[a]
	Hematoma	3(3%)	2(2%)	0.646[a]
	Surgical site infection	3(3%)	2(2%)	0.646[a]
	Retention of urine	5(5%)	3(3%)	0.461[a]
	Total	15(15%)	9(9%)	0.196
4	Hospital stays in days (mean ±SD)	1.26± 0.69	1.66± 0.68	0,005[b]
5	Chronic pain			
	After 3 Months (VAS Score-mean ±SD)	0.12± 0.328	0.04± 0.139	0.143[b]
	After 6 Months (VAS Score-mean ±SD)	0.06 ± 0.239	0.02 ± 0.141	0.312[b]
6	Recurrence (n, %)	1(1%)	1(1%)	1[a]

Table-II. Outcomes of TIPP repair versus TAPP repair

n-number of patients, %-percentage of total, SD-standard deviation, VAS-Visual analogue score, a-dichotomous variable and chi square test used for statistical analysis, b-continuous variable and student t test used for statistical analysis

DISCUSSION

In this study, mean operating time in TIPP group was significantly shorter than TAPP. Whereas the complications rate, postoperative acute pain and chronic pain (VAS) score were higher in TIPP group than TAPP group. There were 2 cases of recurrence, one from each group. Mean hospital stay was longer in TAPP than TIPP group.

There was one female patient who presented with inguinal hernias. Male gender is considered as a risk factor for inguinal hernia.[12] Incidence of hernia is increasing and inguinal, femoral, and abdominal types, have become big health concern worldwide.[13] In this study, 63% hernia were right sided and 64% were indirect hernia. Gawale S et al. reported in their study that 55 % hernia were right sided hernia and 75% were indirect inguinal hernia[14] Smoking, lifting heavy weights, chronic obstructive airway disease, BPH and Diabetes Mellitus are the known risk factors for inguinal hernia.[14,15] In our study, 43% patients were smokers, 38% patients were labourers, 13% had chronic cough, 13% patients had BPH and 15% were diabetics.

The feasibility of TIPP and TAPP repair was assessed by mean duration of surgery and type of anaesthesia required. TAPP group had longer mean operating time than TIPP group (59.54 ± 11.71 versus 95.40 ±15.81 and p-value <0.001) and all patients in group B were operated in general anaesthesia but in group A 23 (46%) patients were operated in local anesthesia and i/v sedation and remaining 27(54%) patients were operated in spinal anesthesia. This difference may be because open surgery is performed more frequently in our set up and TAPP repair has long learning curve. Most of the studies favour our finding but some studies reported shorter mean operating time for TAPP repair as compared to TIPP. Bhushan Kumar et al. reported significantl longer operating time for laparoscopic hernia repair than open preperitoneal repair (p=0.001013).[16] But in contrast to our study, in a RCT by Haider Abid et al, they reported shorter operating for TAPP repair than TIPP repair.[17]

Pain whether acute or chronic is the major concern of patients after hernia repair. According to international guidelines for groin hernia management, TAPP and TEP repair are preferred over open repair because of less acute pain and faster recovery.[18] Bittner et al also reported in their study that open inguinal hernia repair was associated with more severe acute postoperative pain than laparoscopic and robotic repair.[19]

In our study, acute pain was significantly severe in TIPP group after 24 and 48 hours after surgery (4.92 ± 0.92 versus 4.98± 0.99 p-value 0.05 1.94± 0.93 versus 2.36± 0.96, p-value 0.029 respectively). It is published in many studies that mesh fixation increase rate and intensity of pain.[20] That is why, we did not fix the mesh in TAPP group. This may be the reason of less severe pain in the TAPP group. Mesh non-fixation also decreases the risk of chronic pain.[21] After inguinal hernia surgery, 9%-15% of patients suffer from chronic pain.[22] In our study, chronic pain was more severe in TIPP group than TAPP group after 3 months (0.12± 0.328 versus 0.04± 0.139, p-value 0.143) but after six months, chronic pain was reported in 3 patients in group A and one patient in group B that was very mild and there was almost no difference in severity of pain in both groups (0.06 ± 0.239 versus 0.02 ± 0.141, p-value 0.312). Some studies reported lower risk of chronic pain in TAPP repair than open repair[23,24] Hurel R et al, in their comparative study of TIPP versus TAPP reported that chronic postoperative inguinal pain rates after one year of follow up were similar (9.3% vs 10.5%, p = 0.19 and 9.8% vs 11.8%, p = 0.05, respectively).[25] The most recent update to the Hernia Surge guidelines suggests that minimally invasive surgery (TAPP/TEP) are better than open techniques with regard to chronic pain.[26]

As far as complications were concerned, no intraoperative complication was recorded in both groups. There were few postoperative complications in both groups but overall complication rate in our study was higher in TIPP group than TAPP group (15% versus 9%). Our results are comparable to other study which reported that there was no significant difference between the TAPP and open hernia Repair group for rates of haematoma, Seroma, urinary retention, infection and hernia recurrence.[27,28]

After pain, major concern of the patients is the recurrence. In our study, there were 2 cases of recurrence, one (2%) from each group. But in literature, TAPP repair has a low recurrence rate as compared to TIPP because in TAPP repair , mesh is placed over the defect under direct visualization.[29] There is controversy regarding the recurrence rate after open TIPP and TAPP. Most of the studies discussed the recurrence rate after open preperitoneal repair of inguinal hernia within the range of 0 up to 2.8%.[30] where as in other study, a 15.1% recurrence rate after TAPP repair for inguinal hernias within a 12-month follow-up has been revealed.[31]

Low recurrence rate in our study may be due to short follow up.

In our study, mean hospital stay was longer in TAPP group than TIPP group. (1.66± 0.68 versus 1.26± 0.69, p-value 0,005). This is in contrast to some studies which have reported shorter hospital stay after TAPP repair.[16,17] but the mean hospital stay for TAPP was still shorter than reported by Thakur et al[16] in their study (2.04 versus 1.66 days). Longer stay in TAPP group may be because all cases were operated in general anaesthesia and older patients took longer time to recover.

To reduce the bias, surgery was performed by senior surgeons who had already performed more than 50 TAPP and TIPP procedures. The difference in mean operating time between 2 groups may be because In group A, 40 patients were operated in either local or spinal anaesthesia but in group B all the patients were operated in general anaesthesia.

There are a few limitations of our study including, small sample size, shorter follow up time and single centre study. Results may be different if study is done on a larger scale, for longer period of time and involving multiple centres. However, this study will encourage others to do study on a larger scale.

CONCLUSION

Both TIPP and TAPP repair are effective for the treatment of inguinal hernia. TIPP has higher feasibility in terms of significantly shorter operating time than TAPP repair where as TAPP has higher efficacy in terms of lower post operative pain (acute and chronic) and complication rate than TIPP repair. TIPP may be a better approach in older patients who are unfit for general anesthesia and TAPP may be a better approach in younger patients.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

SOURCE OF FUNDING

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

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AUTHORSHIP AND CONTRIBUTION DECLARATION	
1	**Muhammad Najam Iqbal:** Study design, data collection, interpretation.
2	**Muhammad Zafar Mengal:** Data analysis.
3	**Muhammad Anwar:** Literature review.
4	**Awais Ashraf Sindhu:** References writing.