

Comparing Open Preperitoneal Versus Laparoscopic Totally Extra Peritoneal Repair of Inguinal Hernia

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Abstract

Background: Hernia repair is one of the most common operation performed by general surgeons. The aim of our study is to compare the outcome results of the laparoscopic total extraperitoneal TEP hernia repair with mesh to those of open preperitoneal repair with mesh. Methods: 60 patients were included divided on two groups, 30 for each. Group O; underwent open preperitoneal repair with mesh, Group L; underwent laparoscopic TEP repair with mesh. Follow up of patients was done in the outpatient clinic at Benha university hospitals , 7 days after discharge then at 1, 3, 6 and 12 months postoperatively till December 2020. Both groups were compared in terms of operative technique, operative time, intra & post operative complications, early post operative pain within one week, hospital stay, restriction of physical activity and incidence of recurrence and chronic pain. Results: TEP repair appeared technically more difficult as evidenced by increased operative time, conversion and more intraoperative –although minor- complications. It needs a long learning curve and a dedicated team for technique excellence. However, it is preferred because it is associated with less acute postoperative pain, less wound-related complications, shorter hospital stay and rapid return to normal activity. It is also followed by good cosmetic result and general patient satisfaction. Conclusion: Both techniques are considered safe and effective with similar rates of recurrence and chronic pain although further wider scale studies are recommended.

Keywords: Preperitoneal; Laparoscopic; Extra Peritoneal; Repair; Inguinal; Hernia

1.Introduction

Hernia is defined as an abnormal protrusion of an organ or tissue through a defect in its surrounding walls. Hernias of the anterior abdominal wall include: inguinal and ventral hernias. Hernia repair is one of the most common operation performed by general surgeons. Despite the frequency of this procedure, no surgeon has ideal results, and complications such as postoperative pain, nerve injury, infection, and recurrence remain [1].

Inguinal hernia repair is the most frequently performed hernia operation in general surgery. The standard method for inguinal hernia repair had changed a little over a hundred years until the introduction of synthetic mesh. This mesh can be placed by either using an open approach or by using a minimal access laparoscopic technique. There is no apparent difference in incidence of recurrence between laparoscopic and open mesh methods of hernia repair. It was found that there is suggested less pain and numbness following laparoscopic repair. Return to usual activities is faster [2].

Laparoscopic techniques are being used increasingly in the repair of abdominal hernias and offer the potential benefits of minimal access surgery, possibly a lower recurrence rate and lower cost according to a randomized controlled study conducted by Olmi et al. [3].

They are effective for the vast majority of patients with primary or recurrent hernias and results in low recurrence rates, with high patient satisfaction scores, However, operation time is longer and there appears to be a

higher risk of serious vascular injuries in less experienced surgeons [2].

Therefore, surgeons repairing abdominal wall defects should be familiar with both laparoscopic and open approaches to hernias to offer the patient the most appropriate repair technique on the basis of unique patient factors and hernia defect characteristics [4].

The aim of this study is to compare open preperitoneal technique with laparoscopic totally extra peritoneal (TEP) technique in repair of inguinal hernia and throw some light on intra operative difficulties and post operative patients satisfaction and complications.

2.Patients and methods

This is a prospective randomized comparative study between open preperitoneal versus laparoscopic totally extraperitoneal mesh repair of inguinal hernia. The study included 60 adult patients that were presented in the outpatient clinic at Benha University Hospitals at the period between January 2019 and December 2019 and followed up till December 2020. Follow up is designed for 12 months duration.

The clinical diagnosis of inguinal hernia was based on symptoms and signs elicited during clinical assessment.

2.1Patients were classified into

- **Group (O):** 30 patients underwent open preperitoneal mesh hernioplasty.
- **Group (L):** 30 patients underwent laparoscopic total extraperitoneal (TEP) mesh hernioplasty

2.2The inclusion criteria

Include all adult patients with inguinal hernias either unilateral or bilateral or recurrent.

2.3 Exclusion criteria

- Patients with strangulated or obstructed hernias.
- Patients with morbid obesity.
- Patients with history of recent lower abdominal surgery or irradiation or previous preperitoneal surgery.
- Patients with active skin infection.
- Patients with mental disorders.
- Patients with chronic liver disease with ascites.
- Old patients with benign prostatic hypertrophy and having obstructive urinary symptoms.
- Patients with score ≥ 3 on American Society of Anesthesiologists (ASA) scale

2.4 Preoperative assessment:

- Clinical history
- Clinical examination
- Routine preoperative work up including:
 - Pelvi abdominal ultrasonography and inguino scrotal ultrasonography.
 - Complete blood count.
 - Liver and kidney functions tests.
 - Coagulation profile.
 - Random blood sugar
 - ECG, chest X-ray and echocardiography when needed.

2.5 Preoperative Preparation:

- All the patients were asked to fast for 6 hours preoperatively.
- Patients were asked to micturate before surgery. A urinary catheter was not routinely inserted before either procedure.
- Abdominal and groin hair was shaved from costal margin till midhigh at operating theatre.
- All cases received general anaesthesia.
- Prophylactic antibiotic in the form of 1.2 gm Amoxicillin Clavulanate injection was given at induction of anaesthesia.
- The operations will be performed by staff surgeons using the same technique and rules.

2.6 Operative Techniques:

- A) Open preperitoneal repair with mesh
- B) Laparoscopic TEP repair with mesh

2.7 Data recorded:

- The duration of operation in minutes (skin to skin).
- Type of hernia according to the Nyhus classification.
- Intraoperative complications.

2.8 Postoperative management:

- Patients were assessed regularly during hospital stay.
- Postoperative analgesia was received as Diclofenac sodium 75 mg IM. / 12 hours

for one day. Then, Diclofenac sodium 50 mg tablets were given on demand later on.

- The postoperative pain assessment was done in the first postoperative day six hours after last analgesic dose administration at rest. Patients were asked to describe their pain levels and the five points verbal rating pain scores (VRS) was documented as follows: 0= no pain, 1=mild pain, 2= moderate pain, 3=severe pain and 4= unbearable pain) (Loos et al., 2007).
- Patients were asked to report their total on-demand intake of oral analgesics during the first week after surgery and to stop analgesia six hours before coming to the clinic and also were asked to bring with them the medicines strips.
- Before discharge, all patients received the same postoperative instructions (limitation on heavy weight lifting for 4 weeks) and were encouraged to return to normal activities as soon as possible.
- Patients were discharged if pain is adequately controlled and free of significant complications.

2.9 Data recorded:

- Early postoperative complications e.g.: urine retention, wound or scrotal haematoma, etc.
- Hospital-stay in days from day of operation till day of discharge.
- Verbal rating pain score at first postoperative day (VRS1).

2.10 Statistical analysis

The collected data was revised, coded, tabulated and introduced to a PC using Statistical package for Social Science (SPSS 15.0.1 for windows; SPSS Inc, Chicago, IL, 2001). Data was presented and suitable analysis was done according to the type of data obtained for each parameter. **Descriptive statistics:** Mean Standard deviation (\pm SD), median and range for numerical data. Frequency and percentage of non-numerical data. **Analytical statistics:** Student T Test was used to assess the statistical significance of the difference between two study group means. Mann Whitney Test (U test) was used to assess the statistical significance of the difference of a non parametric variable between two study groups. Chi-Square test was used to examine the relationship between two qualitative variables. Fisher's exact test: was used to examine the relationship between two qualitative variables when the expected count is less than 5 in more than 20% of cells. Correlation analysis (using Pearson's method): To assess the strength of association between two quantitative variables. The correlation

coefficient denoted symbolically "r" defines the strength and direction of the linear relationship between two variables. P- value: level of significance: P>0.05: Non significant (NS). P< 0.05: Significant (S).

3.Results

The study was performed at Benha university hospitals, and included 60 patients all of them were adult males reflecting the great sex predilection of this disease. The age of the study group ranged between 20 and 65 years with a mean of 42.5± 12.3 years. The study group's BMI ranged between 18 and 32 with a mean of 24.9 ± 2.45 Kg/m2. Sixty patients were included in this study, all of them were males. Their age ranged between 20 and 65 years with a mean and standard deviation (SD) of 42.5± 12.3 years.

Group (O): 28 patients (93.3%) had unilateral inguinal hernia, while 2 cases (6.6%) had bilateral oblique inguinal hernia. So we had 30 patients with 32 hernias. 27 patients (90%) had primary hernias, while 3 (10%) had recurrent hernias after anterior repair. 71.8 % (n = 23) of hernias were oblique inguinal hernias, 18.7% (n = 6) of hernias were direct inguinal hernias and 9.3 % (n = 3) were dual hernias. **Group (L):** 26 cases (86.6%) had unilateral inguinal hernia, while 4 cases (13.3%) had bilateral inguinal hernia, two of them were oblique. So we had 30 patients with 34 hernias. 27 patients (90%) were primary, while 3 hernias (10%) were recurrent. 73.5% (n = 25) of hernias were oblique inguinal hernias, 20.5% (n = 7) of hernias were direct inguinal hernias and 5.8 % (n = 2) were dual hernias. figure 1&2.

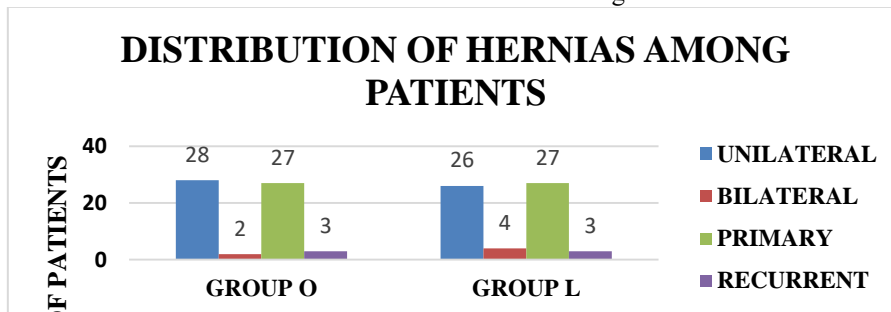


Fig 1: General hernia distribution among patients of the study group

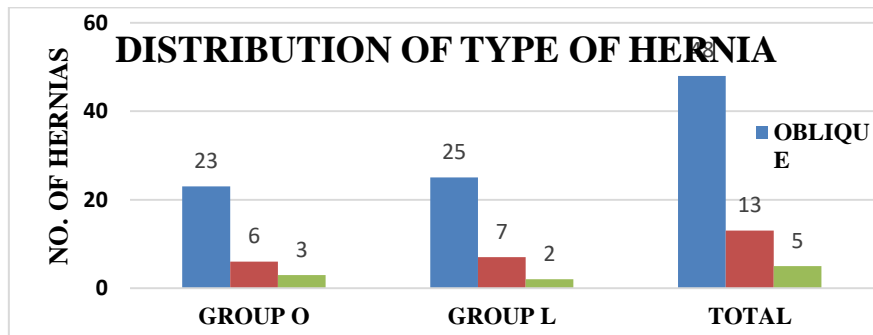


Fig 2: Distribution of type of hernias in the study group.

Comparison between both study groups as regards operative time in table 1

Table 1: Description and Comparison between both study groups as regards operative time:

Operative time	Group Group O			Group L			P*	Sig
	Mean	±SD	Median	Mean	±SD	Median		
Total	65.2	19.7	60.0	83.8	19.8	85.0	.001*	HS
unilateral cases	59.80	14.47	60.00	78.91	13.48	85.00	.049*	S
bilateral cases	95.00	21.21	95.00	100.00	37.42	95.00	.874*	NS
recurrent cases	90.00	26.45	91.00	100.00	20	95.00	.629*	NS

* Student t test

Intraoperative complications in table 2

Table 2: Intraoperative complications in Group O and L.

Intraoperative complications	V ₂	Group		P*	Sig		
		Group O	Group L				
		N	%	N	%		
Peritoneal tears	No	26	86.7%	26	86.7%	1.0**	NS
	Yes	0	.0%	2	6.7%		
Bleeding	Yes	0	.0%	2	6.7%	0.492**	NS
	No	30	100.0%	28	93.3%		
Total		4	13.3%	6	20%		

There was no statistically significant difference between Group O and L cases as regard postoperative complications. However, wound-related complications occurred exclusively in group O. Early postoperative complications are shown in table 3

Table 3: Early postoperative complications in Group O and Group L:

postoperative complication		Group		P*	Sig		
		Group O	Group L				
		N	%	N	%		
Urine retention	Yes	2	6.7%	1	3.3%	1.0**	NS
	No	28	93.3%	29	96.7%		
Testicular discomfort	Yes	1	3.3%	1	3.3%	1.0**	NS
	No	29	97.7%	29	97.7%		
Inguinoscrotal hematoma	Yes	3	10.0%	4	13.3%	1.0**	NS
	No	27	90.0%	26	86.7%		
inguinoscrotal seroma	Yes	5	16.7%	3	10.0%	.706**	NS
	No	25	83.3%	27	90.0%		
Wound hematoma	Yes	1	3.3%	0	.0%	1.0**	NS
	No	29	96.7%	30	100.0%		
Wound seroma	Yes	2	6.7%	0	.0%	.492**	NS
	No	28	93.3%	30	100.0%		
Wound infection	Yes	2	6.7%	0	.0%	.492**	NS
	No	28	93.3%	30	100.0%		
total		16	53.3%	9	30%		

There was a significant difference between Group O and L cases as regard VRS at 1st postoperative day, as group O cases showed higher mean VRS compared to group L cases (1.73 vs 1.27). This was also evident in the unilateral and bilateral subgroups. The recurrent cases showed no significant difference in pain scores between both groups. table 4

Table 4: Description and Comparison between both study groups as regards VRS at 1st postoperative day:

VRS at postoperative (VRS1)	1st day	Group			Group L			P*	Sig
		Group O	Group O	Group O	Group L	Group L	Group L		
		Mean	±SD	Median	Mean	±SD	Median		
Total		1.73	.74	2	1.27	.78	1	.021*	S
Unilateral cases		1.52	.59	2.00	1.00	.60	1.00	.004*	HS
Bilateral cases		3.00	.00	3	1.2	.82	2	.021*	S
Recurrent cases		2.67	.58	3	2.33	.58	2	.456*	NS

No significant difference was detected between Group O and L cases as regards hospital stay. figure 3

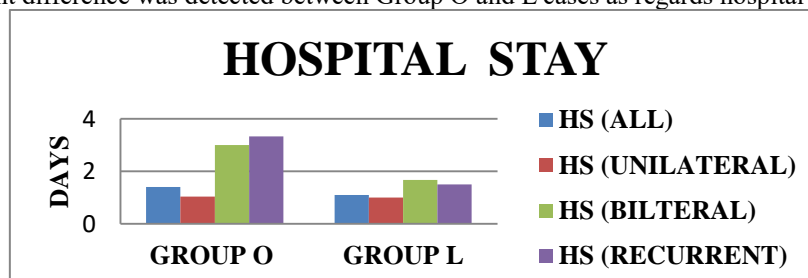


Fig 3: Postoperative Hospital stay (HS) in group O and L.

No significant difference was detected between Group O and L cases as regards functional limitation score. However, there was significant difference in subgroup of bilateral patients favoring group L. table 5

Table 5: Description and Comparison between both study groups as regards functional limitation score at 7th postoperative day (FLS7):

Functional limitation score	Group O			Group L			P*	Sig
	Mean	±SD	Median	Mean	±SD	Median		
Total	3.93	1.26	3	3.50	.78	3	.114*	NS
Unilateral cases	3.48	.71	3.00	3.22	.42	3.00	.132*	NS
Bilateral cases	6.50	.71	7	4.25	.96	5	.045*	S
Recurrent cases	6.00	1.00	6	4.67	1.15	4	.205*	NS

None of our patients can be tagged as having chronic pain. Nevertheless, we had two patients of group (O) suffering from non specific groin pain and discomfort with occasional parathesia around the incision line and foreign body sensation in the groin. At the three months postoperative visit, all patients of both groups returned to their usual ordinary activity. There was no case of recurrence in either group during the follow-up period of 12 months.

4. Discussion

In this study, the incidence of *postoperative complications* was encountered in 26/60 (43.3%) of patients. All of our encountered postoperative complications were well controlled and tolerated by our patients. There was no need for a second operative intervention as most complications were managed conservatively reflecting the general safety of the procedures.

Comparing postoperative complications revealed a 53.3% vs. 30% in group O and L respectively. This is clearly in favour of the TEP group showing significantly lower postoperative complications than the open group.

The most common postoperative complication was *inguinoscrotal swelling* due to haematoma and/or seroma (including haematocele and hydrocele) formation which affected 15/60 (25%) of our patients and nearly equally distributed between both of the study groups (8/30 26.6% vs. 7/30 23.3%) in group O and L respectively). This happened mainly in patients suffering from long hernial sacs including congenital type of inguinal hernia. It was also evident in cases with large direct hernias and bilateral hernias. It also affected patients with chronic liver disease.

In those patients our technique aims at limiting the dissection of hernia from the cord by ligating and transecting the hernia and reducing the proximal part while leaving the distal part open. The distal end accumulated operative blood and discharge. Those patients were managed conservatively without the need

for operative drainage and haematoma gradually diminished in size till resolution within one month. In addition, our technique adheres to Stoppa principle of avoiding suture repair of the groin muscles. However, the cost of leaving weak abdominal wall bulging seems to be accumulating postoperative fluids.

Another factor may be that creation of a relatively large operative space involves cutting of more lymphatics and small venules thus impairs drainage of body fluids. To reduce dead space in large direct sacs, the redundant fascia transversalis can be grasped at its bulging apex, invaginated, then its apex taked to the anterior abdominal wall or to Cooper's ligament. Plication of the redundant TF can also be tried with placement of endoloop of PDS at its base [5]. On the contrary, other surgeons thought that this is not necessary and the dead space will collapse spontaneously after absorption of fluids [6].

The *inguinoscrotal haematoma* resembled recurrent hernia and necessitated ultrasonography in two patients to rule out recurrence. Postoperative pressure dressing and scrotal support was applied together with "α-chemotrypsin" injection for three days followed by "Alphentern" for one week. Reassurance and watchful waiting was the basis of treatment. Literature reports the occasional need for aspiration or surgical evacuation of haematoma but this was not needed in our patients. However, in the late cases of our study we started to put a drain in those risky patients with satisfactory results.

Unlike inguinoscrotal seroma/haematoma, *wound haematoma and seroma* are more common in group O (3/30 or 10%) as opposed to nil in the TEP group.

Superficial wound infection rate was 3.3% (2/60). It was discovered in 2/30 patients belonging to group O in spite of routine prophylactic dose of antibiotics given to patients of both groups. One of the two cases was diabetic and the other was suffering from COPD on steroid inhaler and had bilateral inguinal hernia.

A recent Cochrane review, of 17 studies assessing the use of prophylactic antibiotics, reported that the overall infection rates were in the range of 3.1% and 4.5% [7].

None of our patients suffered from deep infections related to the mesh. The deep infection rate is generally rare in the groin and is found to be in the range of 0.3% -0.6% [8]. This may be further helped by the deeper location of the mesh in the preperitoneal approach.

Urine retention occurred in 3 (5%) patients, two in group O and one in group L which is in accordance to most studies (4-8%) [9]. In these patients, this can be attributed to old age (> 55 years) with history of prostatism due to senile prostatic enlargement. All were managed conservatively without catheterization.

In our study we did not routinely insert urinary catheter and asked our patients to urinate before surgery. However, the anaesthetist sometimes asked for on table catheterisation if the operative duration is long and patient received large amount of intravenous fluid. Nelaton catheter is used and removed before patient's recovery.

Testicular discomfort occurred in 2/60 patients (3.3%) and was equally distributed over both groups O and L. These patients presented in the first two postoperative days with unexplained testicular discomfort or pain. The testis was mildly swollen and tender in one patient for whom duplex examination excluded disturbance of testicular blood flow. Both patients were afebrile and having normal leukocytic count. The condition resolved spontaneously in both patients within 4-7 days postoperatively.

Testicular problems are well documented in the literature and is ranging from 0.9% to 9% of all inguinal hernia repairs [10]. They include pain, orchitis and atrophy. The etiology of pain is obscure and is thought to be due to trauma to the genitofemoral nerve or sympathetic plexus to the testis. Postoperative orchitis is a result of testicular venous thrombosis rather than an arterial flow obstruction due to the rich collateral circulation between the branches of the vesical, prostatic, testicular and deferential arteries. The scrotal branches of the internal and external pudendal arteries also anastomose with the vessels of the spermatic cord. It is believed that the artery of the vas deferens provides sufficient blood supply to the testicle [11].

Similarly, *postoperative hospital stay* was longer in group O compared with the TEP group (1.4 vs. 1.1 days). In many of the available literature, the laparoscopic procedure

shows a small decrease in length of stay although this is not universal [12].

There is a surprisingly large number of studies with very wide range of differences describing the length of hospital stay in the literature. The duration of hospital stay, although a good indication of early postoperative outcome and cost, is much more affected by the hospital policy than by the technique. There were greater differences in the mean length of stay between different hospitals than between different operative techniques [2].

Our results agree with the findings of many studies comparing laparoscopic vs. open groups as regards pain and regain of physical activity [2], [13].

5. Conclusion

In our study, the TEP repair appeared technically more difficult as evidenced by increased operative time, conversion and more intraoperative –although minor- complications. Both techniques are considered safe as all perioperative complications are well tolerated by patients and there was no need for a second operative intervention. Both techniques showed similar results as regards early postoperative complications except for wound-related complications which were higher in the open group. Patients treated by TEP repair suffered less acute postoperative pain compared with the open repairs as expressed by lower pain scores and analgesic consumption. TEP repair is associated with shorter hospital stay and rapid return to normal activity. Our data suggested a beneficial tendency of TEP repair compared to open group in bilateral and recurrent cases. However, further more targeted wider scale studies are recommended. Both techniques are effective in the management of inguinal hernia and were associated with 0% recurrence. However, due to small sample size and short follow up duration, longer-term studies are also recommended.

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