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A Comparative Study Between Open Lichtenstein Mesh Repair and Laparoscopic Totally Extra Peritoneal Repair of Inguinal Hernia

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ABSTRACT
Numerous repair techniques have been described among which selection of best technique for inguinal hernia repair stands a challenge. There is a paucity of data with respect to the comparative studies of newer endoscopic repairs v/s others like open Lichtenstein mesh repair especially in the low resource settings like India. Thus this study was conducted to compare and assess the duration of procedure, complications encountered, post-operative pain and post-operative recovery, duration of hospital stay and time taken in resumption to work between two techniques of open Lichtenstein mesh repair and totally extra peritoneal (TEP) repair. After obtaining the written informed consent the patients were assigned randomly for both the groups. Pain in the post-operative period was rated by each patient using a Visual Analogue Scale (from 0-10). Total duration of the procedure was calculated from skin incision to skin closure. The median of post-operative pain scores in TEP group was significantly lower (4) compared to open mesh repair group (7) ($P<0.001$). The mean duration of post-operative recovery time among the study participants in TEP (3.08 ± 0.4 days) group was significantly lower compared to open mesh repair (5.00+0.00 days) group ($t = 24.00$, $P<0.001$).

INTRODUCTION

The repair of inguinal hernia results in rare and minor complications in elective type. Though complications developing after emergency repairs may be more intense and frequent, even mortality may be reported[1].

Numerous repair techniques have been described since Eduardo Bassini published his first successful anatomy-based repair in 1890. During the 20th century, the repair trend has changed several times. Currently available repair options for inguinal hernias are viz., Lichenstein repair, Open type through inguinal incision, Laproscopic total extra peritoneal repair, Transabdominal pre-peritoneal repair etc. Prosthetic repairs are accepted to be superior to "non-mesh" suture repairs now a days. All the techniques will have both proponents as well as opponents. Nonetheless, the risk for hernia recurrence increases from repair to repair[2].

Currently, hernia repair techniques differ greatly depending upon the availability of proper setting, skilled surgeons, insurance systems, resources and logistics. Selection of best technique for inguinal hernia repair stands a challenge. There is no sole technique to manage every single type of hernia. The best operative technique selected should have a low risk of complications (e.g. pain, recurrence), be easy to adopt, ensure faster recovery, have consistent results and be cost-effective[3].

Open mesh repair, primarily the Lichtenstein repair, is the most frequent choice of surgeons. As endoscopic repairs have a steep learning curve and requires costlier infrastructure they still are yet to be a preferred approach specially for bilateral and recurrent hernias. However it is said that the endoscopic repairs may be offered for primary inguinal hernia only if the expertise and proper resources are available[4].

The use of endo-laparoscopic surgery for inguinal hernias differs globally, constituting from 0%-55% of repairs in some high resource countries. The average use in most countries is unknown, but then the rates recorded in Australia, Switzerland and Sweden is 55%, 45% and 28% respectively. Sweden in its national registry has noted the rates of surgeries being 64% Lichtenstein, 25% TEP, 3% TAPP, 2.7% combined open and preperitoneal and 0.8% tissue repair. Other registry revealed that between 2009 and 2016 an extensive variety of hernia repair techniques were in practise, including 39.0% TAPP, 25.0% TEP, 24.0% Lichtenstein, 3.0% plug, 2.6% Shouldice, 2.5% Gilbert prolene hernia system and 0.2% Bassini. The reliable data from Asia and the United States are still deficient[5].

Schmedt CG *et al.*, in a meta-analysis has noted that endo-laparoscopic procedures in expert hands, especially when performed at a high volume, as cost-effective and very safe. On comparing TEP and TAPP techniques with the Lichtenstein repair, the endo-laparoscopic procedures had significant advantages over the Lichtenstein repair, including lower incidence of wound infection, reduced hematoma formation, reduced nerve injury, an earlier return to normal activities or work and fewer incidences of chronic pain syndrome. There were no differences in total morbidity or in the incidence of intestinal lesions, urinary bladder lesions, major vascular lesions, urinary retention, or testicular problems. Lichtenstein repair however showed an advantage in shorter operating time and a lower incidence of seroma formation[6].

Thus this background indicates that there is a paucity of data with respect to the endoscopic repairs is concerned especially in the low resource settings like India. Thus this study was conducted to compare results of open Lichtenstein mesh repair and totally extra peritoneal (TEP) repair, in an effort to determine the proposed advantages of one over the other.

MATERIALS AND METHODS

Study Design: Cross-sectional, comparative study.

Sample Size: 50 cases.

Sample Size Calculation: Considering an average of prevalence of inguinal hernias among males as per other studies in a tertiary care setting in India[9-11] as 89.0% with 95% confidence interval and permissible error (L) in the estimate of 'p' as 10%, total sample size of 47.46 was calculated using the formula $n=z^2 (pq/L^2)$, where, z=1.96 at 95% confidence interval, p=estimated prevalence (89.0%), q=100-p (11.0%) and L=permissible error (10% of p). The total sample size of 47.46 ~ 50 was considered for the study. The sample size of 50 was divided equally among the two groups undergoing different hernia surgeries.

Study Subjects: 50 males based on inclusion and exclusion criteria admitted in surgical wards for elective Surgery with proven unilateral inguinal hernia were considered for the study.

Inclusion Criteria:

- Male Patients.
- Aged between 20-60 years of age.
- Proven cases of unilateral inguinal hernia by clinical examination and abdominal ultrasound.
- Patients fit for hernia repair under anaesthesia.
- Patients willing to give consent.

Exclusion Criteria:

- Patients with recurrent hernia.
- Hernia with complications. (Irreducible hernia, strangulated hernia).
- Patients associated with co morbid diseases.

Table 1: Comparison of Duration of Procedure Between Two Techniques

Particulars	Open Lichtenstein Mesh Repair (Mean ± SD)	Total Extra-peritoneal Repair (Mean ± SD)	t-value [95% C.I]	P-value
Duration of procedure (Mins)	45.96±4.63	49.60±3.62	-3.097 [-6.003 to -1.277]	0.003*

*Indicates a significant statistical difference between the groups with p<0.05.

Table 2: Comparison of Rated Post-Operative Pain Scores Between two Techniques

Variable	Type of Hernial Repair	No. of people (N)	Median [IQR]	Mean Rank	U	P-Value
Pain scores	Open Lichtenstein Mesh Repair	25	7 [2]	37.68	8.00	<0.001*
	Total Extra-peritoneal Repair	25	4 [2]	13.32		

*indicates a significant statistical difference between the groups with P<0.05 (Mann Whitney U test

Table 3: Comparison of Duration of Stay in the Hospital (Post-Operative Recovery) Between two Techniques

Particulars	Open Lichtenstein Mesh Repair (Mean ± SD)	Total Extra-peritoneal Repair (Mean ± SD)	t-value [95% C.I]	P- value
Duration of hospital stay in the post-operative period (Days)	5.0±0.0	3.08±0.4	24.00 [1.76-2.08]	<0.001*

*indicates a significant statistical difference between the groups with p<0.05.

Table 4: Comparison of Time Taken for Resumption to Work Between two Techniques

Particulars	Open Lichtenstein Mesh Repair (Mean ± SD)	Total Extra-peritoneal Repair (Mean ± SD)	t-value [95% C.I]	P-value
Time taken for resumption to work (Days)	10.08+0.76	5.08+0.28	30.93 [4.67-5.33]	<0.001*

*indicates a significant statistical difference between the groups with p<0.05.

Table 5: Association of Complications of Per-Operative and Post-Operative Complications Among the two Different Types of Hernia Repairs

	Complications		
Type of Hernial Repair	Present (Column %)	Absent(Column %)	Fisher's Exact (P-Value)
Open Lichtenstein Mesh Repair	6 (100.0)	19 (43.2)	(0.02)*
Total Extra-peritoneal Repair	0 (0.0)	25 (56.8)	
Total	06 (100.0)	44 (100.0)	

*Indicates a significant statistical association between the type of hernia repair and the complications at p<0.05

- The patients who were admitted with the diagnosis of inguinal hernia and who were willing to undergo an Open and laparoscopic repair, at Sri Siddhartha Medical College Hospital and Research Centre, were considered for the study based on the inclusion and exclusion criteria mentioned above.
- After obtaining the written informed consent patients were assigned randomly for open Lichtenstein mesh repair group and totally extra peritoneal repair group based on random number table method.
- Detailed clinical history was taken from patients as per the proforma.
- All the patients were examined and subjected to routine blood investigations and abdominal ultrasonography and were subjected to surgery either under General Anaesthesia or Spinal Anaesthesia.
- Pain in the post-operative period was rated by each patient using a Visual Analogue Scale (from 0-10). All patients were administered analgesics as required in oral or injectable form.
- Total duration of the procedure was calculated from skin incision to skin closure.
- Procedure related complications like injury to bowel, bladder, vessels and nerves, post-operative wound infection and other reasons for prolonged hospitalization were recorded and compared among both the groups.
- Patients were discharged from the hospital once they were fully mobilized and able to tolerate a normal diet.
- Evaluation of post-operative complications were made during OPD visits after 1 week, 2 weeks, 4 weeks, 12 weeks and 24 weeks.

RESULTS AND DISCUSSIONS

The mean duration of surgery among the study participants in TEP (49.60±3.62 mins) group was significantly higher compared to open mesh repair (45.96±4.63 mins) group (t=-3.097, P=0.003).

Post-operative pain scores in TEP group was significantly lower (4) compared to open mesh repair group (7) (P<0.001).

The mean duration of post-operative recovery time among the study participants in TEP (3.08±0.4 days) group was significantly lower compared to open mesh repair (5.00±0.00 days) group (t=24.00, P<0.001).

The mean duration of time taken for resumption to work among the study participants in TEP (5.08 +0.28 days) group was significantly lower compared to open mesh repair (10.08+0.76 days) group (t = 30.93, P < 0.001).

Among the study subjects with inguinal hernia who underwent Open Lichtenstein Mesh Repair, 6/25, 24.0% had complications and none suffered any complications in the other group. Among the study population, who developed complications, everybody belonged to open mesh repair group and the complications were significantly higher among the open mesh repair group compared to the TEP group (p<0.05).

The mean duration of surgery among the study participants in TEP (49.60±3.62 mins) group was significantly higher compared to open mesh repair (45.96±4.63 mins) group (t=-3.097, P=0.003) which is similar to the finding of Bringman S *et al.*, who noted mean operative time of 50 minutes (range 25-150) which was significantly higher in TEP group as compared to 45 minutes (range 24-100) in the Lichtenstein group (P < 0.0001)[7]. Gokalp A *et al.*, also noted that operating time for totally extraperitoneal

hernia repair was 16 minutes longer than Lichtenstein open tension free technique[8] whereas in a study conducted by Vidovic D *et al.*, the average operative time in the open group was 58.2±17.8 minutes and the average operative time in the TEP group was 58.6±18.1 minutes[9].

Hundred percent of the study subjects in Open mesh repair rated higher post op-pain between 5-10 and in TEP group, everybody reported lesser pain between 3-7 on a VAS of 1-10. The median of post-operative pain scores in TEP group was significantly lower compared to open mesh repair group (P<0.001). Similarly Neumayer L *et al.*, noted that laparoscopic-surgery group had less pain initially than the open-surgery group on the day of surgery (difference in mean score on a visual-analogue scale, 10.2 mm., 95% confidence interval, 4.8-15.6) and at two weeks (6.1 mm., 95% confidence interval, 1.7 to 10.5) and returned to normal activities one day earlier[10]. According to Kouhia ST *et al.*, chronic pain was more prevalent in the Lichtenstein group compared with the TEP group (13 [27.7%] versus 4 [8.2%] patients, respectively, P= 0.02). Postoperatively, the Lichtenstein group needed more pain medication than the TEP group (4.4 versus 3.0 doses, respectively, P = 0.02)[11].

All the study subjects in Open mesh repair group had higher (5 days) duration of hospital stay post-operatively, however, majority (96.0%) in TEP group had lesser duration (3 days) of hospital stay post-operatively which is similar to the findings of Momin RS *et al.*, where the average duration of hospital stay in Open Hernioplasty was 3.5 days (1- 15 days) which is higher than the TEP group which was 1.5 days (1-7 days)[12].

The mean duration of time taken for resumption to work among the study participants in TEP (5.08±0.28 days) group was significantly lower compared to open mesh repair (10.08±0.76 days) group (t=30.93, P<0.001) which is similar to study by Kouhia ST et al., which noted postoperatively, the TEP group returned to work earlier (14.8 versus 17.9 days, respectively, P=0.05) compared to Lichtenstein group[11]. In another study by Andersson B *et al.*, patients in the TEP group returned to work earlier (p<0.01) and had a shorter time to full recovery (p<0.01)[13]. According to Liem MS et al., patients in the laparoscopic-surgery group had a more rapid recovery (median time to the resumption of normal daily activity, 6 vs. 10 days., time to the return to work, 14 vs. 21 days., and time to the resumption of athletic activities, 24 vs. 36 days., (P<0.001 for all comparisons)[14].

None of the study subjects in TEP group had any post-op complications. However, in Open mesh repair group 24.0% of the study subjects had complications viz., Seroma (16.0%) followed by Haematoma (8.0%). In a study by Andersson B *et al.*, a higher frequency of postoperative hematomas was seen in the open group (p<0.05)[13].

The mean duration of post-operative recovery time among the study participants in TEP (3.08±0.4 days) group was significantly lower compared to open mesh repair (5.00±0.00 days) group (t=24.00, P<0.001) which is similar to the findings by Bringman S *et al.,* where the median time to full recovery was significantly shorter in the TEP group compared to Lichtenstein group (P < 0.0001)[7].

Among the study population, who developed complications, everybody belonged to open mesh repair group and the complications were significantly higher among the open mesh repair group compared to the TEP group (p<0.05). According to the meta-analysis conducted by Karthikesalingam A et al., there was no significant difference in the rate of seroma or haematoma formation between the two groups[15].

CONCLUSION

The mean duration of surgery among the study participants in TEP group was significantly higher compared to open mesh repair group. The median of post-operative pain scores in TEP group was significantly lower compared to open mesh repair group. The mean duration of post-operative recovery time among the study participants in TEP group was significantly lower compared to open mesh repair group. The mean duration of time taken for resumption to work among the study participants in TEP group was significantly lower compared to open mesh repair.

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