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Inguinal Hernia Repair: Contrasting Open Preperitoneal Mesh vs Lichtenstein Technique

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ABSTRACT

The Liechtenstein tension-free hernioplasty began in 1984 and evolved (between 1984 and 1988) to a procedure that is now considered the gold standard of hernia repair by the American College of Surgeons. The worldwide reported result of the operation by experts and non-experts alike is a recurrence and complication rate of <1%. There is a need to not only decrease an extensive dissection in the inguinal canal with less manipulation of the inguinal nerves, but also to minimize the interaction between the mesh and major surrounding structures. As a result, placing the mesh in the preperitoneal space is a valuable option. The data was obtained from 50 patients undergoing hernioplasty (25 by LR and 25 by PPMR) in the Department of General Surgery, of a tertiary care center, with a follow up period of 3-18 months. Randomized comparative study was done. Consent for the procedure was obtained from patients. LR and PPMR procedures were performed using Polypropylene mesh. The mean operative time required for LR was 102 minutes and that for PPMR 110 minutes. 28% of the LR patients had a pain score of 5-6 according to visual analogue scale and 8% of the PPMR patients had a pain score of 5-6. Minor complication rate was 16% for LR group and 12% for PPMR group. The recurrence in LR and PPMR group was equal with a recurrence rate of 4%. The hospital stay in LR group was 8.2 days and 7.32 days in PPMR group. Liechtenstein mesh repair has significantly less duration of surgery when compared to the Open pre-peritoneal repair. For surgeons in training the Liechtenstein open mesh technique is a better choice of inguinal hernia repair than other PPMR hernia repairs.

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Key Words
Hernia, pre-peritoneal mesh, lichenstein, inguinal, surgery

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INTRODUCTION

Hernia in Latin means 'tear' or 'rupture'. It is defined by Sir Astley Cooper as "a protrusion of any viscous from its proper cavity"[1]. The development of hernia surgery is one of the most interesting chapters in the field of surgery, since hernias have always been the most common applications of man amenable to surgical treatment. Though there are so many methods in repair of hernia, no one is exempted from complications hence surgery on hernia is still a challenging subject. Watson said "in the entire history of surgery, no subject has been as controversial as the repair of groin hernias"[2]. The Liechtenstein repair is the most commonly performed surgery in inguinal hernias as compared to open pre-peritoneal mesh repair. The Liechtenstein tension-free hernioplasty began in 1984 and evolved (between 1984 and 1988) to a procedure that is now considered the gold standard of hernia repair by the American College of Surgeons[3]. The worldwide reported result of the operation by experts and non-experts alike is a recurrence and complication rate of <1%. When the key principles of the procedure, which, as reported by many authors are easy to learn, perform and teach are respected, the operation results in an effectiveness (external validation) that is virtually the same as its efficacy (results of the experts), attesting to the simplicity of the procedure Usher is credited with popularizing the use of polypropylene mesh, which has been in use since the mid-1950s with a negligible complication rate[4,5]. As the name implies, the main goal of the tension-free hernioplasty is achieving a repair that is free of all tension, not only on the operating table, where the patient is in a supine position but also postoperatively despite adverse effects, such as the intra-abdominal pressure gradient and contraction of the mesh.

Currently, there is a wide range of mesh-based inguinal hernia repairs showing similar recurrence rates. Therefore, as chronic pain is a major post-operative complaint, surgeons have to choose a technique which is associated with fewest manipulation or damage to the nerves. Moreover, a simple technique with a short learning curve is advantageous. Hence, the above study was undertaken to compare contrasting open pre-peritoneal mesh vs Liechtenstein Technique in Inguinal Hernia Repair. This finding can play a decisive role when surgeons have to choose their preferred inguinal hernia technique.

MATRIALS AND METHODS

Study place: Tertiary care center.

Study design: Prospective study.

Inclusion criteria: Patient aged 18 years and above diagnosed as having unilateral or bilateral inguinal hernia, with recurrent inguinal hernia, medically fit to undergo the procedure and ready to give written valid consent.

Exclusion criteria: Patients with complicated inguinal hernia and who require emergency exploration for complications of hernia like, bowel obstruction, strangulation, gangrene etc. and unwilling to give written consent.

Sample size: 50 patients of inguinal hernia treated with hernioplasty (25 by LR and 25 by PPMR).

Data analysis: Descriptive statistical analysis has been carried out in the present study. Significance is assessed at 5 % level of significance. Student t. test (two tailed, independent) has been used to find the significance of study parameters on continuous scale between two groups Chi-square/Fisher Exact test has been used. The findings were tabulated and the following observations were made.

Ethical considerations: All the necessary ethical permissions were obtained from the Institutional Ethics Committee before beginning of the study. All the patients were admitted, and a detailed history and clinical examination was carried out as per written proforma. After taking consent for the procedure, the patient is investigated thoroughly. Once the patient is deemed fit for surgery, consent is taken for the same. Apart from the routine investigations, pre-operative evaluation of patient for hernioplasty was done.

Ultrasound of abdomen and pelvis to rule out prostate enlargement. A dose of prophylactic antibiotic was given 30 min before surgery. A nasogastric tube and Foleys catheter were inserted (if required). Post operatively the patients were kept nil by mouth and advised complete bed rest till the effect of anesthesia is completely worn out, till then they were given supportive maintenance intravenous fluids. Foley's catheter was removed once the patient becomes ambulatory, usually on the first post-operative day. Patients were advised and encouraged to ambulate and start their activities of daily life as early as possible. Prophylactic oral antibiotics are given for duration of 5-7 days, of which parenteral antibiotics are given for at first 48 hrs. Analgesics were given at 12-hrs interval for a period of 5-7 days, shifted on to oral tablets as early as possible. Patients were observed for any complications like urinary retention, distension of abdomen, guarding and rigidity and signs of any bowel injury in the immediate post-operative period and hematoma, seroma, wound sepsis during their stay in hospital and also assessed for postoperative pain and its severity. Patients were discharged once free of complications and once they resumed their activities

Table 1: Age distribution of patients studied

Age in Years	LR		PPMR	
	No	Percentage	No	Percentage
21-30	4	16	3	12
31-40	6	24	4	16
41-50	8	32	4	16
51-60	3	12	8	32
61-70	3	12	6	24
71-80	1	4	0	0
Total	25	100	25	100
Mean±SD	45.8±14.48		50.48±12.69	

of daily normal life. Patients were discharged within 9 days suture removal was done at the time of discharge.

- 1st follow up-After 1 week of Discharge
- 2ndfollow up-After 1 month of Surgery
- 3rd follow up-After 3 months of Surgery
- 4th follow up-After 5 months of Surgery

RESULTS

Mean operative time in our study is as follows, it was calculated from time of incision till the time of wound closure. The mean operative time was 102 minutes for LR mesh repair and 110 minutes for PPMR mesh repair with t = 1.02 and p = 0.018.

DISCUSSIONS

In the above study, patients were aged between 21-80 years in Liechtenstein Repair (LR) group, with the mean age being 45 years. Patients were aged between 27-66 years in Pre-peritoneal Mesh Repair (PPMR) group, with the mean age being 50 years. In Liechtenstein (LR) mesh repair group there were 17 (68 %) right sided hernias, 4 (16 %) left side hernias, 4 (16 %) bilateral hernias with 7 direct, 16 indirect and 2 recurrent hernias. In Pre-peritoneal (PPMR) mesh repair group there were 11 (44 %) right sided hernias, 8 (32 %) left sided hernias, 6 (24 %) bilateral hernias with 4 direct, 19 indirect and 2 recurrent hernias.

In above study, right sided inguinal hernias were more common. Among direct and indirect, indirect hernias were more common. In above study, the mean operative time was 102.6 min for Liechtenstein hernia repair and 110 min for open pre-peritoneal hernia repair. Hence, the overall mean operative time was significantly less in Liechtenstein repair as compared to open pre-peritoneal repair. The long learning curve of open pre-peritoneal repair of inguinal hernia coupled with lack of proper documentation has and is delaying the proficient application of this procedure. As reported by many authors, Liechtenstein Repair is easy to learn, perform and teach, are respected, the operation results in an effectiveness (external validation) that is virtually the same as its efficacy (results of the experts), attesting to the simplicity of the procedure. So this difference of understanding the surgical anatomy and practice by the young surgeons has made the PPMR take more time compared to LR. Post-Op Pain was assessed by means of Visual Analogue Scale. In above study, pain score in LR group was as follows. 7 patients (28 %) with a score of 1-2 (mild pain), 11 patients (44 %) with a score of 3-4 (discomfort) and 7 patients (28 %) with a pain score of 5-6 (distressing).

In our study, pain score in PPMR group was as follows, 9 patients (36 %) with a score of 1-2 (mild pain), 14 patients (56 %) with a score of 3-4 (discomfort) and 2 patients (8 %) with a pain score of 5-6 (distressing). Post-operative pain is significantly less in PPMR group compared to LR Group with p = 0.014. The difference between the two groups was Strongly Significant with p-value of 0.014 with Post-Operative pain comparatively less in PPMR as to LR Group.

According to Cochrane Database of Systematic Reviews 2012 Currently, there is a wide range of mesh-based inguinal hernia repairs showing similar recurrence rates. Therefore, as chronic pain is a major postoperative complaint, surgeons have to choose a technique which is associated with fewest manipulation or damage to the nerves. Moreover, a simple technique with a short learning curve is advantageous. This review shows some evidence that open pre-peritoneal mesh-based repair offers less or comparable chronic pain compared to the standard Lichtenstein procedure[14]. This finding can play a decisive role when surgeons have to choose their preferred inguinal hernia technique. Randomized trial comparing the Prolene Hernia System, mesh plug repair and Lichtenstein method for open inguinal hernia repair was done by S. W. Nienhuijs *et al*.[6] where in A total of 334 patients were allocated blindly and at random to receive one of these three meshes for open hernia repair. Quality of life was assessed with the Short Form 36 and pain by a visual analogue scale 14 days and 3 and 15 months after surgery. Operative complications were rare and comparable between the groups. Long-term follow-up was completed by questionnaire in 95·8 per cent of patients. There were no significant differences in pain parameters between the three meshes, overall, 43·3 per cent of patients reported some form of groin pain. The severity of the chronic pain correlated with a higher pain score in the first 2 weeks after surgery (p<0·001). A significant reduction in scores for role emotional (short term) and vitality (long term) quality of life domains was found in patients who had a Lichtenstein repair.

Complications of inguinal hernia repair:[7-11] Include Anesthesia complication, Testicular complication, Ischemic orchitis-vas deferens may be obstructed or transitioned. Painful ejaculation, Fibrosis around vas, Lymphatics complications, Nerves complications, Visceral injuries, Bone infections, Infection like Prosthetic infections.

Table 2: Diagnosis

Diagnosis	LR n = 25		PPMR n = 25	
	No	Percentage	No	Percentage
Right direct inguinal hernia	3	12	1	4
Right indirect inguinal hernia	12	48	8	32
Left Direct inguinal hernia	1	4	2	8
Left indirect inguinal hernia	3	12	6	24
Bilateral direct inguinal hernia	3	12	1	4
Bilateral indirect inguinal hernia	1	4	5	20
Right recurrent inguinal hernia	2	8	2	8

Table 3: Comparison of complications

Post-Op Complications	LR (n = 25)		PPMR (n = 25)	
	No	Percentage	No	Percentage
Major	-	-	-	-
Minor	4	16.0	3	12.0

Table 4: Post operative pain

Post-Op Pain	LR (n = 25)		PPMR (n = 25)	
	No	Percentage	No	Percentage
1-2	7	28.0	9	36.0
3-4	11	44.0	14	56.0
5-6	7	28.0	2	8.0
Inference	Post-Op pain is significantly less in PPMR group compared to LR Group with p = 0.014 (2x3 Fisher Exact test)			

Table 5: Comparison of operative time (minutes) between the lr and ppmr group

Operation Time	LR (n = 25)	PPMR (n = 25)
Min-Max	75-180	75-195
Mean±SD	102.6±23.37	110±26.16
Inference	Operative time is significantly less in LR with t = 1.02, p = 0.018	

Table 6: over all comparison of procedures

Criteria	LR (n = 25)	PPMR (n = 25)	Better Procedure
Operative time (minutes)	102.6±23.37	110±26.16	LR
Post-op pain (higher)	28%	8%	PPMR
Complications	16%	12%	Statistically insignificant
Post-op hospital stay(days)	8.2±2.78	7.32±3.12	Statistically insignificant
Return to normal work	33.36±12.36	25.8±6.99	PPMR
Recurrence	4%	4%	Similar
Inference	Overall view supports that LR and PPMR repair of inguinal hernia is safe and efficacious with each procedure having its own advantages and disadvantages over each other		

- There were no major complications but we had 7 patients with minor complications in our study
- There were 4 patients with minor complications in Lichtenstein Repair group (16 %)
- There were 3 patients with minor complications in Pre-peritoneal Repair group (12 %)
- Incidence of minor complications were more in LR, with p = 0.219
- The complications observed in our study were Seroma-3 cases, Urinary Retention-2 cases
- Wound Infection, Exposure of mesh1 case

There was one case reported with Wound Infection and Exposure of mesh with Liechtenstein Repair. The patient was suspected with Tuberculosis which might have contributed to Wound Infection and Exposure of mesh. The patient was started on Anti Tuberculosis Treatment following which we could find a significant outcome.

In above study the recurrence in LR group and PPMR group is equal with recurrence rate of 4% when followed up for a minimum period of 3 months and with maximum follow up duration of 18 months. In the Muldoon *et al*.[12] and Berrevoet *et al*.[13] studies, there are no early hernia recurrence found. In the Nienhuijs *et al*.[6] study the Relative Risk for an early hernia recurrence in pre-peritoneal repair was 0.99 compared to the Liechtenstein technique. The Cochrane Central Register of Controlled Trials[14] (The Cochrane library 2011, Issue 4), The review authors identified three eligible controlled trials in which 569 patients were randomized to Liechtenstein or pre-peritoneal mesh repair. Due to methodological limitations in the included trials, the data were not pooled. Comparison of pain results in the individual trials showed that pre-peritoneal repair causes less chronic pain (relative risk (RR) 0.18, number needed to treat (NNT) 8, RR 0.51, NNT 5) compared to the Lichtenstein procedure in two trials involving 322 patients. One trial, including 247 patients, described more chronic pain after this repair (RR 1.17, NNT 77). The same trials favored the pre-peritoneal technique concerning acute pain (RR 0.17, NNT 3, RR 0.78, NNT 7), whereas in the third trial it was almost omnipresent and thus comparable in both intervention arms (RR 0.997, NNT 333). This method also showed similar low recurrence rates after both types of repair. The results for other early complications were not consistent across the included trials. No mesh infections were reported. In conclusion, both techniques are valid

causing few recurrences. Analysis of pain results in each trial shows some evidence that pre-peritoneal repair causes less or comparable acute and chronic pain compared to the Lichtenstein technique.

The main advantages of the pre-peritoneal approach are mesh placement in the pre-peritoneal space where the hernia is produced and avoiding the disadvantage of re-operating through scar tissue in recurrent hernias[14]. In above study, the mean length of post-operative hospital stay in LR group was 8.2 days and in PPMR group it was 7.32 days with p = 0.20. Post-operative hospital stay is statistically insignificant between two groups with p = 0.2.

In above study, patients in PPMR group were able to resume their normal work within 25.8 days when compared to LR group who took 33.36 days to resume their normal work, with p = 0. 016. This early return to work in PPMR group was due to comparative less post-operative pain and less duration of hospital stay in PPMR group.

CONCLUSION

Liechtenstein mesh repair has significantly less duration of surgery when compared to the Open pre-peritoneal repair. Although PPMR group has less post-operative pain, less duration of post-operative hospital stay, early return to work as compared to LR group, it needs a good understanding of the surgical anatomy and skill for mesh placement and fixation. The long learning curve of open pre-peritoneal repair of inguinal hernia coupled with lack of proper documentation has and is delaying the proficient application of the Open pre peritoneal mesh repair technique. For young surgeons Liechtenstein repair is easy to learn. For surgeons in training the Liechtenstein open mesh technique is a better choice of inguinal hernia repair than other PPMR hernia repairs. Moreover, a simple technique with a short learning curve is advantageous.

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