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To Compare the Efficacy and Feasibility of Trans Abdominal Pre Peritoneal Mesh Repair over Open Lichtenstein Repair of Inguinal Hernia: A Prospective Non Randomized Control Trial

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Abstract: *Hernia is defined as an abnormal protrusion of a viscous or part of a viscous through an abnormal opening in the wall of its containing cavity[1]. Approximately 75% of all abdominal wall hernias are seen in the groin. Femoral hernias comprise only 3% of all groin hernias. The lifetime risk of developing a groin hernia is approximately 27% in males and 3% in females. Of inguinal hernia repairs, 90% are performed in males and 10% in females. The primary aetiology behind the indirect inguinal hernia is believed to be a patent processus vaginalis, which in essence represents a hernia sac. Once intra-abdominal contents find their way into the sac, an indirect inguinal hernia is formed. In 1884 Italian surgeon Edoardo Bassini first approached the hernia at the anterior side, resected the hernia sac, incised the fascia transversalis and reconstructed the posterior wall of the inguinal canal by a triple layer method. In 1945 Canadian surgeon Earle Shouldice used to reconstruct the posterior wall of the inguinal canal by a four layer method. Lichtenstein introduced performing the tension-free mesh repair under local anaesthetics and popularized this technique. It is now considered to be the gold standard in anterior inguinal hernia repair. In 1982 the South African surgeon Ralph Ger (1921-2012) was the first to describe the laparoscopic approach of the inguinal canal. In modern era laparoscopic approach is gaining popularity due to less hospital stay, better cosmesis and reduced pain. In order to ascertain which procedure either laparoscopic or open hernia repair is superior to the other, we have taken this study comparing open and laparoscopic hernia repair(Trans Abdominal Pre Peritoneal) 15 cases each in respect of technique i.e. length of operation time, post-operative complications, post-operative hospital stay and time taken to return to unrestricted activity.*

Keywords: *Lichtenstein tension free mesh repair, Trans abdominal pre peritoneal (TAPP), laparoscopic hernia repair, indirect inguinal hernia.*

I. Introduction

Hernia is defined as an abnormal protrusion of a viscous or part of a viscous through an abnormal opening in the wall of its containing cavity.[1]The word "hernia" is from the Latin word "rupture" the condition occurs when an organ normally contained in one body cavity protrudes through the lining of that cavity.[2] Approximately 75% of all abdominal wall hernias are seen in the groin. Inguinal hernia is much more common in men than women. Although femoral and umbilical hernias are more common in female population, indirect inguinal hernia is still the most common type of hernia in women. Indirect hernia is more common in young and direct hernia in the elderly[3]. Femoral hernias comprise only 3% of all groin hernias. Inguinal hernias are nine times more common in men than in women. The lifetime risk of developing a groin hernia is approximately 27% in males and 3% in females. Of inguinal hernia repairs, 90% are performed in males and 10% in females.[3] Indirect inguinal hernia, the most common form of groin hernia across all ages and both genders, is thought to be congenital in aetiology. The primary aetiology behind the indirect inguinal hernia is believed to be a patent processus vaginalis, which in essence represents a hernia sac. Once intra-abdominal contents find their way into the sac, an indirect inguinal hernia is formed. It is commonly thought that repeated increases in intra-abdominal pressure contribute to hernia formation; hence, inguinal hernias are commonly associated with pregnancy, chronic obstructive pulmonary disease, abdominal ascites, patients who undergo peritoneal dialysis, labourers who repeatedly flex the abdominal wall musculature, and individuals who strain from constipation.

It is also thought that collagen formation and structure deteriorates with age, and thus hernia formation is more common in the older individual. There is evidence that cigarette smoking is associated with connective tissue disruption, and hernia formation is more common in the chronic smoker[4]. The groin hernia can present in a variety of ways, from the asymptomatic hernia to frank peritonitis in a strangulated hernia. The most common presenting symptomatology for a groin hernia is a dull feeling of discomfort or heaviness in the groin region that is exacerbated by straining the abdominal musculature, lifting of heavy objects, or defecating. All types of groin hernias are at risk for incarceration and strangulation, although the femoral hernia seems be more predisposed to this complication.

1.1 Groin Hernia are divided into

1. Inguinal Hernia-Indirect, Direct, Combined
2. Femoral Hernia

1.2 History

The basic principles of modern inguinal hernia surgery derive from 1884 when the Italian surgeon Edoardo Bassini introduced a new surgical technique[5, 6]. Bassini approached the hernia at anterior side, resected the hernia sac, incised the fascia transversalis and reconstructed the posterior wall of the inguinal canal by a triple layer method. The three layers consisted of the fascia transversalis, the aponeurosis of the musculus transversus abdominis and the aponeurosis of the musculus obliquus internus adbominis, which he all sutured to the inguinal ligament. In 1945 when the Canadian surgeon Earle Shouldice reconstructed the posterior wall of the inguinal canal by a four layer method[7]. In 1958, Usher described a hernia repair using Marlex mesh[8]. He had developed a polyethylene mesh, which he placed at the anterior side of the posterior wall of the inguinal canal for reinforcement. In 1962 he introduced the polypropylene mesh, which is still the mesh of choice nowadays[9]. With this technique the recurrence rates dropped significantly and excellent long-term results were obtained. The surgical technique proposed by Usher was adapted by the American surgeon Irving Lichtenstein. In 1964 Lichtenstein introduced tension-free mesh repair under local anaesthetics. The tension-free mesh repair considered to be the gold standard in anterior inguinal hernia repair is nowadays referred to as the "Lichtenstein repair"[10]. In 1975 Stoppa approached the abdominal cavity onto the preperitoneal space through a midline incision and placed a large mesh at the posterior side of the abdominal wall for bilateral augmentation, known as the giant prosthetic reinforcement of the visceral sac, resulting in equally low recurrence rates[11]. In 1982 the South African surgeon Ralph Ger describe first laparoscopic approach of inguinal canal. Endeavours to find the ideal position led to the introduction of intra-abdominal placement of the mesh in 1991[12]. It is another method of tension-free mesh repair. An intraperitoneal onlay mesh was placed intra-abdominally covering the hernia defect by fixating it to the peritoneum of the abdominal wall. This technique was generally perceived to be inferior compared to other minimal invasive techniques[13]. The laparoscopic technique is gaining popularity due to advantages such as short recovery and less post-operative pain compared to open tension-free mesh repair. The recurrence rate after laparoscopic repair is comparable to open repair and varies between 1-4%. In both the techniques of laparoscopic inguinal hernia surgery the hernia defect is approached at posterior side of abdominal wall, and a mesh is placed in the preperitoneal space. The difference is however that in Total Extra peritoneal Preperitoneal repair (TEP) the preperitoneal space is entered and intra-abdominal space is left untouched. The hernia orifice is visualized from the preperitoneal space and a mesh is place to cover the defect. While in the Trans-Abdominal Preperitoneal Plasty (TAPP) the intra-abdominal space is entered and the hernia orifice is visualized from within the abdominal cavity. The peritoneum at the groin is opened laparoscopically and the mesh is placed in the same location as with TEP repair, where after the peritoneum is closed. Up till now, no technique seems to be superior towards the other[14]. After laparoscopic inguinal hernia repair less chronic pain, less impairment of inguinal sensibility, less functional loss in the lower extremity, shorter hospital stay and faster recovery is reported compared to an open mesh repair[15].

Today, laparoscopic techniques have been validated as safe and effective in the treatment of groin hernias and have become common place. In order to ascertain which procedure either Laparoscopic or Open hernia repair is superior to the other, we have taken this study comparing Open and Laparoscopic Hernia Repair(Trans Abdominal Pre Peritoneal) 15 cases each in respect of technique i.e. length of operation time, post-operative complications, post-operative hospital stay and time taken to return to unrestricted activity.

II. Review Of Literature

2.1 Epidemiology of Inguinal Hernia:

The epidemiology of inguinal hernia: A survey in western Jerusalem study was conducted by Abramson et al .[16] Prevalence rose markedly with age; the lifetime prevalence was 24 per 100 in men aged 25 and over, the lifetime prevalence rate reached 40 per 100 men at the ages of 65-74 and 47 per 100 at 75 and over. The prevalence of hernia was significantly higher in the presence of varicose veins, in men who reported

symptoms of prostatic hypertrophy, and, among lean men only, in the presence of haemorrhoids. The prevalence of hernia was low in the presence of overweight or adiposity, suggesting that obesity is a protective factor. No significant age-independent associations were found with chronic cough, constipation, physical activity at work, or a number of other variables. The prevalence of unrepaired hernias rose with age; 13 % of all men aged 65-74 and 23 % of those aged 75 and over had unoperated groin swellings.

2.2 Comparison between laparoscopic and open mesh repair:

Payne et al[17] conducted a study to determine whether transabdominal preperitoneal laparoscopic hernia repair can equal or surpass an established open method at an acceptable cost. A randomized, prospective comparison with a follow-up of 7 to 18 months (median, 10 months; planned, 5 years) was conducted. Operative and hospitalization times were not significantly different between the two types of repair. Patients with laparoscopic unilateral repairs returned to work faster (9 verses 17 days). The laparoscopic repair was more expensive than the open approach ($3093 vs $2494).

Liem et al[18] conducted study on comparison of conventional anterior surgery and laparoscopic surgery for inguinal-hernia repair. 487 patients with inguinal hernias were treated by extra peritoneal laparoscopic repair and 507 patients were treated by conventional anterior repair. Six patients in the open-surgery group but none in the laparoscopic-surgery group had wound abscesses (p=0.03), and the patients in the laparoscopic-surgery group had a more rapid recovery (median time to the resumption of normal daily activity, 6 verses. 10 days; time to the return to work, 14 verses. 21 days; and time to the resumption of athletic activities, 24 verses. 36 days; p<0.001 for all comparisons). With a median follow-up of 607 days, 31 patients (6 percent) in the open-surgery group had recurrences, as compared with 17 patients (3 percent) in the laparoscopic-surgery group (p=0.05). All but three of the recurrences in the latter group were within one year after surgery and were caused by surgeon-related errors. In the open-surgery group, 15 patients had recurrences during the first year, and 16 during the second year.

Tanphiphat et al [19] conducted a randomised control study on Laparoscopic vs open inguinal hernia repair in 120 eligible patients admitted for elective hernia repair. Operative time for laparoscopic repair was significantly longer, mean (standard deviation) 95 (28) min vs 67 (27) min (p< 0.001). The mean analogue pain score during the first 24 h after surgery was 36.2 (20.2) in the laparoscopic group and 49.3 (24.9) in the open group (p= 0.006). The requirement for narcotic injections and postoperative disability in walking 10 m and getting out of bed were also significantly less following laparoscopic repair. The postoperative hospital stay was not significantly different, mean 2.6 (1.2) days for laparoscopic repair and 3.0 (1.5) days for open repair (p= 0.1). Patients were able to perform light activities without pain or discomfort sooner after laparoscopic repair, median interquartile range 8 (5–14) days verses 14 (8–19) days (p= 0.013). Patients also resumed heavy activities sooner, but not significantly, after laparoscopic repair, median 28 (17–60) days verses 35 (20–56) days (p= 0.25). The return to work was not significantly different, median 14 (8–25) days after laparoscopic repair and 15 (11–21) days after open repair (p= 0.14). After a mean follow-up of 32 months one patient developed a recurrent hernia 3 months after a laparoscopic repair. Laparoscopic repair was more costly than open repair by approximately $400.

Wellwood et al [20] conducted a randomised controlled trial of laparoscopic versus open mesh repair for inguinal hernia - outcome and cost on 400 patients with a diagnosis of groin hernia, 200 in each group. More patients in the open group (96%) than in the laparoscopic group (89%) were discharged on the same day as the operation (χ^2=6.7; 1 degree of freedom; p=0.01). Although pain scores were lower in the open group while the effect of the local anaesthetic persisted (proportional odds ratio at 2 hours 3.5 (2.3 to 5.1)), scores after open repair were significantly higher for each day of the first week (0.5 (0.3 to 0.7) on day 7) and during the second week (0.7 (0.5 to 0.9)). At 1 month there was a greater improvement (or less deterioration) in mean SF-36 scores over baseline in the laparoscopic group compared with the open group on seven of eight dimensions, reaching significance on five. Patients randomised to laparoscopic repair were more satisfied with surgery at 1 month and 3 months after surgery. The mean cost per patient of laparoscopic repair was £335 (95% confidence interval £228 to £441) more than the cost of open repair.

Johansson et al[21] conducted a randomized multicentre trial on Laparoscopic Mesh Versus Open Preperitoneal Mesh Versus Conventional Technique for Inguinal Hernia Repair .To evaluate the influence of the laparoscopic technique in hernia repair regarding time to full recovery and return to work, complications, recurrence rate, and economic aspects. Six hundred thirteen male patients aged 40 to 75 years were randomized to the conventional procedure, preperitoneal mesh placed by the open technique, or laparoscopic preperitoneal mesh (Trans Abdominal Pre Peritoneal). Follow-up was after 7 days, 8 weeks, and 1 year. Of 613 patients undergoing surgery, 604 (98.5%) were followed for 1 year. Patients who underwent Trans Abdominal Pre Peritoneal repair gained full recovery after 18.4 days, compared with 24.2 days for open mesh (p = 0.001) and 26.4 days for the conventional procedure (p = 0.001). Patients who underwent Trans Abdominal Pre Per returned to work after 14.7 days, compared with 17.7 days for open mesh (p = 5 0.05) and 17.9 days for the

conventional procedure (p = 50.04). They also had significantly less restriction in physical activities after 7 days. Complications were more common in the Trans Abdominal Pre Peritoneal group, with a varying pattern between the groups. Four recurrences in the conventional, 11 in the open mesh, and 4 in the Trans Abdominal Pre Peritoneal group were recorded after 1 year (p = 5).

McComark et al [22] conducted a study on laparoscopic techniques versus open techniques for inguinal hernia repair**.** 41 published reports of eligible trials were included involving 7161 participants. Sample sizes ranged from 38 to 994, with follow-up from 6 weeks to 36 months. Duration of operation was longer in the laparoscopic groups (weighted mean difference 14.81 minutes, 95% confidence interval 13.98 to 15.64; p<0001). Operative complications were uncommon for both methods but more frequent in the laparoscopic group for visceral (overall 8/2315 versus 1/2599) and vascular (overall 7/2498 versus 5/2758) injuries. Length of hospital stay did not differ between groups (weighted mean difference =0.04 days, 95% confidence interval =0.08 to 0.00; p=0.05, but return to usual activity was earlier for laparoscopic groups (hazard ratio 0.56, 95% confidence interval 0.51 to 0.61; p<0.0001 - equivalent to 7 days). The data available showed less persisting pain (overall 290/2101 versus 459/2399; Peto odds ratio 0.54, 95% confidence interval 0.46 to 0.64; p<0.0001), and less persisting numbness (overall 102/1419 versus 217/1624; Peto odds ratio 0.38, 95% confidence interval 0.4286 to 0.49; p<0.0001) in the laparoscopic groups. In total, 86 recurrences were reported amongst 3138 allocated laparoscopic repair and 109 amongst 3504 allocated to open repair (Peto odds ratio 0.81, 95% confidence interval =0.61 to 1.08; p = 0.16).

Colak et al [23] performed a study to compare laparoscopic transabdominal preperitoneal approach (TAPP) repair with tension-free open mesh repair in inguinal hernia. One hundred thirty-four patients were allocated randomly to undergo Trans Abdominal Pre Peritoneal repair (n = 67) or open mesh repair (n = 67). Operative and postoperative outcomes were determined. The mean of operating time (49.67 +/- 14.11 vs. 56.64 +/- 12.32; p = 0.001), visual analogue scale score (2.73 +/- 1.69 vs. 4.61 +/- 1.77; p = 0.001), hospital stay (1.8 +/- 0.7 vs. 2.7 +/- 1.6; p = 0.001), and duration of recovery (10.8 +/- 7.4 vs. 15.2 +/- 8.5; p = 0.001) was significantly less for Trans Abdominal Pre Peritoneal repair when compared with open mesh repair. The incidence of complications (13.4% vs. 16.4%; p = 0.631) and recurrence (2.9% vs. 5.9%; p = 0.407) was approximately equal in each group. Their results showed that laparoscopic Trans Abdominal Pre Peritoneal repair is superior to open mesh repair.

Gokalp et al[24] conducted a prospective, randomized study to compare Lichtenstein open tension free mesh technique with the laparoscopic totally extra peritoneal technique. 62 male patients with Lichtenstein open tension free mesh technique and 61 male patients with totally extra peritoneal technique were operated and compared postoperatively. In terms of recurrence, postoperative pain, analgesic requirement, complications, hospital stay length, duration of limitation of normal daily activities there were no significant differences between the two groups. Operating time for TEP hernia repair was 16 minutes longer than Lichtenstein open tension free technique. The Totally Extra Peritoneal (TEP) technique was considerably expensive than Lichtenstein technique, however the duration of returning back to work was shorter in patients repaired with TEP technique.

Data from all patients undergoing Totally Extra Peritoneal (TEPP) repair since 1997 and open mesh repair (OPEN) since 1999 were collected prospectively by Winslow et al[25]. Totally Extra Peritoneal repairs were performed in 147 patients and open repairs in 198 patients. Operative times (min) were significantly shorter in the TEP group for both unilateral (63 +/- 22 TEP, 70 +/- 20 OPEN; p = 0.02) and bilateral (78 +/- 27 TEP, 102 +/- 27 OPEN; p = 0.01) repairs. Patients undergoing TEP were more likely (p < 0.01) to develop urinary retention (7.9% TEP, 1.1% OPEN), but were less likely (p < 0.01) to have skin numbness (2.8% TEP, 35.8% OPEN) or prolonged groin discomfort (1.4% TEP, 5.3% OPEN).

A qualitative analysis of randomized trials comparing Totally Extra Peritoneal with open mesh or sutured repair was performed by Kuhry et al.[26] In this review 4,231 patients were included in 23 trials. In 10 of 15 trials, TEP repair was associated with longer surgery time than open repair. A shorter postoperative hospital stay after Totally Extra Peritoneal repair than after open repair was reported in 6 of 11 trials. In 8 of 9 trials, the time until return to work was significantly shorter after Totally Extra Peritoneal repair. Most trials (n = 14) reported no differences in subsequent recurrence rates between Totally Extra Peritoneal and open repair.

Hallen et al[27] conducted a randomized controlled trial of totally extra peritoneal hernia repair (TEP) versus tension-free open repair (Lichtenstein repair) to compare patient outcome in both groups at a median follow-up of 7.3 years after operation. Overall, 89% of patients in the TEP group and 95% of patients in the open group reported complete long-term recovery (p = 0.23). Permanent impaired inguinal sensibility was more common in the open group (p = 0.004), whereas the proportion of patients with reported testicular pain was higher in the TEP group (p = 0.003). Three recurrences were found in the TEP group, and 4 recurrences were found in the open group (p =0 .99). Four patients in the TEP group underwent operations for complications related to the hernia repair (small bowel obstruction, umbilical hernia, testicular pain, and neuralgia).

McNally et al[28] conducted a study on laparoscopic versus open inguinal hernia repair: Expeditionary Medical Facility Kuwait. One hundred seventy-six consecutive patients who underwent inguinal hernia repair by six different surgeons were analyzed. One hundred and four patients had an open repair and 72 patients underwent laparoscopic repair. The mean operative time was significantly longer in the laparoscopic group (20.2 minutes, $p < 0.001$). The mean time to return to duty was significantly shorter in the laparoscopic group (2.3 days, $p = 0.008$). Karthikesalingam et al [29] conducted a meta-analysis of randomized controlled trials comparing laparoscopic with open mesh repair of recurrent inguinal hernia. Four trials were included in the analysis. There was no effect on recurrence or chronic pain. There was no difference in haematoma formation or the need for additional operations.

Laparoscopic Totally Extra Peritoneal (TEP) versus Lichtenstein inguinal hernia repair (LR): a comparison of quality-of-life outcomes was conducted by Myers et al[30]. Three hundred fourteen procedures were performed during the study period, 164 (52%) had a TEP repair and 150 (48%) had a LR. Ninety TEP repairs were matched with 90 LR. Recurrence rates were 3% following TEP repair and 2% following LR. There was a significant difference between the laparoscopic and open groups in terms of physical function ($p = 0.0001$), physical role ($p < 0.0001$), bodily pain ($p = 0.0029$), general health ($p = 0.0025$), and emotional role ($p < 0.0001$). There was no significant difference between the groups in terms of vitality ($p = 0.2501$), mental health ($p = 0.08$), or social functioning ($p = 0.1677$).

A study was conducted by Feliu et al (2011), to investigate outcomes in the treatment of bilateral inguinal hernia, comparing the laparoscopic totally extra peritoneal (TEP) and open tension-free mesh repair approaches[31]. We performed a prospective controlled non randomized clinical study in 128 patients with bilateral inguinal hernia over a period of 3 years. Open repair was used in 106 cases (53 patients) while TEP was employed in 150 cases (75 patients). There were three recurrences (2.3%): two in the open group (3.8%) and one (1.3%) in the TEP group p = NS. The TEP procedure was faster than the open repair (48.8 ± 10.8 vs. 70.4 ± 11.2 min) $p < 0.01$. Postoperative complications were more frequent in open group (16%) than TEP group (5.3%) $p < 0.01$. Hospital stay was significantly shorter in the TEP group (0.6 ± 0.8 vs. 1.3 ± 1.2 days) $p < 0.001$. The TEP approach is an effective option for the treatment of bilateral inguinal hernia when performed by experienced surgeons.

Prospective randomized trial of laparoscopic (transabdominal preperitoneal-TAPP) versus open (mesh) repair for bilateral and recurrent inguinal hernia: incidence of chronic groin pain and impact on quality of life: results of 10 year follow up was conducted by Bignell et al.[32] One hundred and twenty patients were recruited into the original study. Overall, there was a higher incidence of chronic groin pain in the laparoscopic group compared with the open group (15 vs. 8 %, ns), but the severity of the pain in the laparoscopic group was less (2 vs. 3.5, $p = 0.0558$).

Mahesh et al [33] conducted a study to compare Laparoscopic Versus Open Mesh Repair for Inguinal Hernia.100 patients with a diagnosis of groin hernia. Patients with open hernia repair group (>95%) were discharged on the same day compared to laparoscopic hernia group (90%). The open hernia group patients had less pain initially with the effect of local anaesthesia but subsequently developed pain later. Pain scores after open repair were significantly higher for each day of the first week. Laparoscopic repair patients were more satisfied with surgery at 1st month and 3 months after surgery.

III. Aims And Objects

To compare the efficacy and feasibility of Trans Abdominal Pre Peritoneal mesh repair over Open Lichtenstein repair of inguinal hernia.

IV. Materials And Methods

4.1 Study Design:
Prospective Non-Randomized Control Trial.
4.2 Setting:
Dept. of Surgery, RIMS, Imphal.
4.3 Duration of Study:
Two years, from September 2014 to August 2016.
4.4 Study Population:
Patients undergoing open and laparoscopic repair for inguinal hernia in Department of Surgery, RIMS, Imphal.
4.5 Inclusion criteria:
1. Patients who presented with Inguinal Hernias.
2. Patients with Uncomplicated Inguinal Hernias.
3. Medically fit patients for surgery.
4.6 Exclusion criteria:
1. Patients presenting with other types of Hernias.

2. Pediatric cases of Hernia.
3. Patients with complicated Inguinal Hernias (Irreducible, Obstructed, Strangulated hernia)
4. Patients unfit for Surgery
5. Candidates who were reluctant to oblige for the study.

4.7 Sample Size: Taking mean+SD of hospitalized stay for TAPP as 1.8±0.7 days and for Open as 2.7±1.6 days from a study conducted by Colak T et al[23 was] calculated using:
$N= (S_1^2+S_2^2) \times 4/e^2$
S_1=standard deviation for TAPP
S_2=standard deviation for OPEN
e=L/2 (where L=margin of error i.e. 1)
Therefore, N=4 x 3.05/1=12.2
Hence sample size for TAPP=15 and for Open=15.

4.8 Sampling:

A total of thirty (30) patients were selected by convenient sampling technique. 15 patients underwent Trans Abdominal Pre Peritoneal repair and 15 patients underwent Open Lichtenstein repair.

4.9 Study variables:
1. Age
2. Sex
3. Religion
4. Occupation
5. Duration of operation
6. Length of post-operative hospital stay.
7. Post-operative complications.
8. Time taken to return to unrestricted activity.

V. Statistical analysis

Data were entered in Microsoft excel 2 and analysed by IBM SPSS ver. 16. For categorical (qualitative data) frequency and percentage were calculated and chi-square test was advocated for significance test between the case and control groups whilst for quantitative data, mean and standard deviation were calculated and independent sample t-test was applied to test the difference between the groups. The p value for distribution according to sex and time taken to return to unrestricted activity was calculated using the Fisher exact test. The p value of operative time taken and length of post operative stay was calculated using the Mann Whitney test and for the complications chi-square test was used. The p-values<0.05 and <0.001 were adopted as the cut off values for significance and highly significance respectively.

VI. Procedures

After getting consent for either of procedure, patients were investigated for fitness for surgery. Operative steps and per operative complication were noted. Follow up done for a period of six months following surgery as follows. One week after surgery, once a month for three months and at the end of six months after surgery. At the end of study comparison was made between TAPP and Open Lichtenstein method as described under aims and objectives.

VII. Conflict of interest

The author did not have any conflict of interest.

VIII. Results And Observations

To achieve the objectives of present study following parameters have been compared between open and laparoscopic inguinal hernia repair. The parameters are duration of operation time, length of hospital stay, post-operative complications, time taken to return to unrestricted activity. After thorough checking of the data obtained, statistical analysis was performed using SPSS software. For categorical (qualitative data) frequency and percentage were calculated and chi-square test was advocated for significance test between case and control groups whilst for quantitative data, mean and standard deviation were calculated and independent sample t-test was applied to test the difference between the groups. P value for distribution according to sex and time taken to return to unrestricted activity was calculated using Fisher exact test. P value of operative time taken and length of post operative stay was calculated using the Mann Whitney test and for the complications chi-square test was used. P values<0.05 and <0.001 were adopted as the cut off values for significance and highly significant respectively.

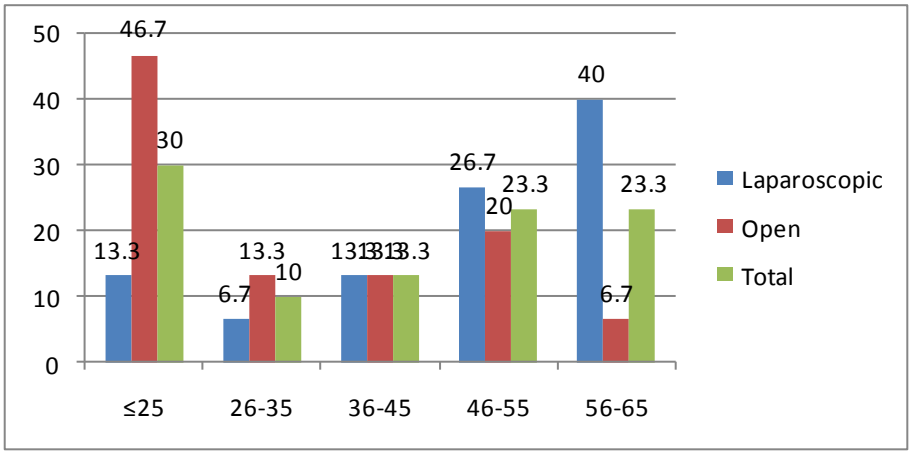

Figure 1: Bar diagram showing age distribution of respondents.

Mean age in laparoscopic and open group was 39.4 ± 12.0 years and 49.2 ± 15.1 years respectively. This difference observed is not significant (p>0.05). So, two groups were comparable regarding with respect to age.

Table 5: Relation between length of operative procedure and length of post operative hospital stay among the two groups.

Variable	Type of procedure		t-test#/Mann Whitney u test*
	Laparoscopic	Open	
Length of Operative	96.0 ± 16.8	39.0 ± 7.6	t=-11.960
Length of Post-operative	1.74	4.4	Z=4.43

Length of Operative procedure was higher in laparoscopic group (96.0 ± 16.8 min vs 39.0 ± 7.6 min) than open group (p<0.05). But length of post operative hospital stay (in days) in laparoscopic group was 1.74 which was less than in open group i.e. 4.4 days. This finding is statistically significant (p<0.05).

Table 6: Relation between complications among the two groups

Complication	Type of procedure		Total (%)	Chi-square test p-value
	Laparoscopic (%)	Open (%)		
No*	9 (60.0)	2 (13.3)	11 (36.7)	Chi-square value=7.033 p-0.008
Yes *	6 (40.0)	13 (86.7)	19 (63.3)	
Pain	4 (26.7)	7 (46.7)	11 (36.7)	
Seroma	0 (0.0)	4 (26.7)	4 (13.3)	
Wound infection	0 (0.0)	1 (6.7)	1 (3.3)	
Urinary retention	2 (13.3)	1 (6.7)	3 (10.0)	
Total	15 (100.0)	15 (100.0)	30 (100.0)	

*chi-square test performed

Complications were more in open group (86.7%) than laparoscopic group (40%) and this finding is found to be significant (p<0.05). All complications were more in open group than laparoscopic group except urinary retention which was more in laparoscopic group.

Table 6: Relation between time taken to return to unrestricted activity among the two groups

Time taken to return to unrestricted activity in days	Type of procedure		Total (%)	Fisher exact test p-value
	Laparoscopic (%)	Open (%)		
7	10 (66.7)	0 (0.0)	10 (33.3)	Value=30.0 p-0.000
10	5 (33.3)	0 (0.0)	5 (16.7)	
21	0 (0.0)	13 (86.7)	13 (43.3)	
28	0 (0.0)	1 (6.7)	1 (3.3)	
35	0 (0.0)	1 (6.7)	1 (3.3)	
Total	**15 (100.0)**	**15 (100.0)**	**30 (100.0)**	

Time taken to return to unrestricted activity in days was lesser in laparoscopic (7 to 10 days) than open group (21, 28 and 35 days) and this finding is statistically significant (p<0.05).

IX. Discussion

Objective of this study was to ascertain which procedure either laparoscopic or open repair of inguinal hernia is superior to other. Currently both open and laparoscopic repair are employed in the repair of inguinal hernias and confer various advantages and disadvantages. Technique of laparoscopy was initially used in gynaecology for diagnosis and later, after technical advances, for therapeutic purposes. Since the concept of laparoscopic hernia repair was first described by Ger in 1982, the surgical procedure has undergone many changes. In our study majority of patients were from age group ≤25 years which constituted around one third of the patients. Mean age in laparoscopic and open group was 39.4 ± 12.0 years and 49.2 ± 15.1 years, the difference is statistically insignificant so comparable.

Inguinal hernia was more common in males than females which were also same for both groups. Similar finding was observed in Joseph B et al[16] where males outnumbered females by a ratio of 36.7:1. Length of Operative procedure was significantly increased in laparoscopic group (96.0 ± 16.8 min vs 39.0 ± 7.6 min) than open group ($p<0.05$). Similar findings were observed in the study by Tanphiphat et al[19] where Laparoscopic surgery was slightly longer than Open surgery to perform [95 min vs 67 min ($p< 0.001$)] and also in the study by McCormack K et al.[22] But in a study by Colak T et al[23] mean operative timing was shorter for TAPP repair when compared with Open mesh repair (49.67 +/- 14.11 vs. 56.64 +/- 12.32; $p = 0.001$).

Most common complication was post operative pain in 36.7% of cases followed by seroma (13.2%), urinary retention (10%) and wound infection (1.3%). Complications were more in open group (86.7%) than laparoscopic group (40%) and this finding was found to be significant ($p<0.05$). Regarding post-operative days, most patients stayed for 5 days in 26.7% of cases. Median of laparoscopic group was 1.74 days which was lesser than open group (4.4 days).This finding was statistically significant ($p<0.05$). Time taken to return to unrestricted activity in days was lesser in laparoscopic (1 to 2 days) than open group (4, 5 and 6 days) and this finding is statistically significant ($p<0.05$) in this study.

X. Summary

Although Open hernia repair is still today the Gold standard for treatment of inguinal hernia, Laparoscopic hernia repair is fast gaining acceptance. This prospective non-randomised control trial study was conducted to assess the advantage and disadvantage of open and laparoscopic inguinal hernia repair. Mean age in laparoscopic and open group were 39.4 years and 49.2 years respectively. The males (86.7%) outnumbered the female patients (13.3). Length of Operative procedure in minutes was significantly longer in laparoscopic group (96.0) than open (39.0). As regard to duration of post-operative hospital stay it was significantly shorter in laparoscopic group which was about 1.74 days in average as against 4.4 days in open group. As for complications there were more complications in open group (86.7%) than in laparoscopic group (40%). Time taken to return to unrestricted activity was lesser in laparoscopic than in open group.

Opponents of laparoscopy states that: "Why to hit a donkey with a golden stick; when you can hit the same by an ordinary stick". The complex laparoscopic hernia anatomy makes the learning curve very steep. It depends on expertise of the individual surgeon who is familiar and well versed with a particular procedure. In spite of criticisms and adverse remarks at initial stages, laparoscopic hernia repair is being increasingly performed these days because of usual advantages of minimal access surgery such as faster recovery, fewer morbidities and early resumption of work. Therefore this study makes a point that laparoscopic method is a more feasible option for inguinal hernia repair.

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