A comparative study of lichtenstein tension free mesh repair vs transinguinal pre-peritoneal mesh repair for inguinal hernias

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ABSTRACT

Surgery for Inguinal hernia is one of the most frequently performed surgical interventions worldwide. The Lichtenstein tension free hernioplasty is currently considered to be the reference technique worldwide. However there is still no consensus as to which is the best technique. The Lichtenstein tension free hernioplasty has significantly decreased the incidence of recurrence in inguinal hernia ranging from 2–5 per cent when compared with nonmesh repair. However, chronic groin pain, presently the main complication after LTF hernioplasty, has been reported to occur in 15–40 per cent of patients. Chronic pain as described by the International Association for the Study of Pain (IASP) is: 'any VAS score above zero which lasts for more than three months. The precise components involved in the prevalence of chronic groin pain is poorly appreciated but is thought to be multifactorial. The etiological factors inducing chronic groin pain postoperatively include nerve entrapment by the sutures/mesh, inflammatory reaction against the mesh, foreign body reaction and bio-incompatibility of the mesh. Transinguinal pre-peritoneal hernioplasty has been proclaimed as a safe-anterior access with pre-peritoneal suture-less mesh placement. This approach has a shorter learning curve and also economical. Hypothetically, TIPP technique is allied with lesser chronic groin pain postoperatively when compared to Lichtenstein's tension free technique as the placement of mesh is in the pre-peritoneal plane, avoiding nerve dissection and their vulnerability to bio-reactive polypropylene mesh.

Keywords: COMPARATIVE, LICHTENSTEIN TENSION FREE MESH REPAIR, TRANSINGUINAL PRE-PERITONEAL MESH REPAIR, INGUINAL, HERNIAS

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Introduction:

The word "Hernia" has its origin from the Greek word implying" rupture". A Hernia is described as an abnormal protrusion of viscous or a part of it through the wall of its containing cavity. Inspite of the fact that a hernia can develop at numerous sites, these defects most frequently comprise the anterior abdominal wall, commonly the groin region. Abdominal wall hernias develop particularly at sites where the fascia and aponeurosis are not enclosed by striated muscle. The sites most commonly included are the inguinal (~75% of all hernias), Linea Alba, sites of prior incision, femoral, and umbilical regions and the lower portion of the semilunar line. Inguinal hernia repair is among the most commonly performed surgical interventions globally, the morbidity and recurrence rates of which have declined significantly in the past two decades because of the introduction of tension-free hernia repair with mesh and laparoscopic inguinal hernia repair. Ever since Bassini presented his monumental technique of anatomical tissue repair(1,2) of inguinal hernia in 1887, various alterations have been recommended. There has been an evolution in surgical interventions for hernia repairs worldwide after the additional use of prosthetic material by Usher(3) in 1958. Pre-peritoneal mesh repair (Open) devised by Stoppa(4) was found to drastically decrease recurrence rate among recurrent groin hernia patients. The concept of Tension Free Meshplasty for inguinal hernia was first introduced by Lichtenstein in1989[5]. Inguinal hernias can be classified as indirect (~75%) or direct (~25%). In indirect inguinal hernia, the sac passes through the deep inguinal ring obliquely towards superficial inguinal ring and finally enters the scrotum. In comparison, direct inguinal hernia protrudes forward and outward and lies medial to the inferior epigastric artery. Even though at times it may be difficult to discriminate between a direct and an indirect inguinal hernia, this discrepancy is of little consequence as the operative procedure for either hernias is similar. A pantaloon hernia is one in which there is both indirect and direct hernia component [6].

AIMS AND OBJECTIVES

In this study we aim to ascertain the role of transinguinal pre-peritoneal mesh repair in reducing the incidence of chronic groin pain without influencing the rate of post-operative complications such as hernia recurrence.

And also to assess:

- Operative time,
- Hospital stay,
- Return to normal activities.
- Complications (recurrence, mesh/wound infection, seroma / hematoma formation)

Materials and Methods:

SOURCE OF DATA

The Patients admitted at JSS Medical College and Hospital, Mysuru during November 2019 to April 2021 who underwent Open inguinal hernia repair.

SAMPLE SIZE: 60 patients split into two groups

Group A: LTF Mesh repair

Group B: TIPP Mesh repair

DURATION OF THE STUDY : November 2019 to April 2021 .

INCLUSION CRITERIA:

Direct inguinal hernia Indirect inguinal hernia Patients willing to give informed written consent

EXCLUSION CRITERIA

Irreducible hernia Obstructed hernia Strangulated hernia Patients unwilling to participate in the study 60 patients diagnosed with inguinal hernias who underwent Open inguinal repair are included in the study after getting written and informed consent.

Post procedure pain will be assessed using a visual analog scale (VAS) on a score of 0-10, 0 being no pain and 10 being agonizing pain.

- Assessment will be done at 2 weeks and 6 months post procedure.

STUDY DESIGN: A PROSPECTIVE COMPARATIVE INTERVENTIONAL STUDY.

SAMPLING: SIMPLE PURPOSIVE SAMPLING. **RANDOMIZATION:**

The patients satisfying the inclusion criteria were informed of the benefits and complications of each surgery and their informed consent obtained

SELECTION OF CASES:

Following clinical examination and evaluation, the patients were grouped into two groups, Group A- LTF Mesh Repair and Group B- TIPP Mesh repair accordingly as per the surgery chosen by the patient.

PROCEDURE:

All 60 patients were admitted, comprehensive history obtained and relevant clinical examination was done according to the proforma. All the patients were offered the choice of inguinal hernia repair either LTF or TIPP method and were enlightened about the advantages, disadvantages, and complications of each technique.

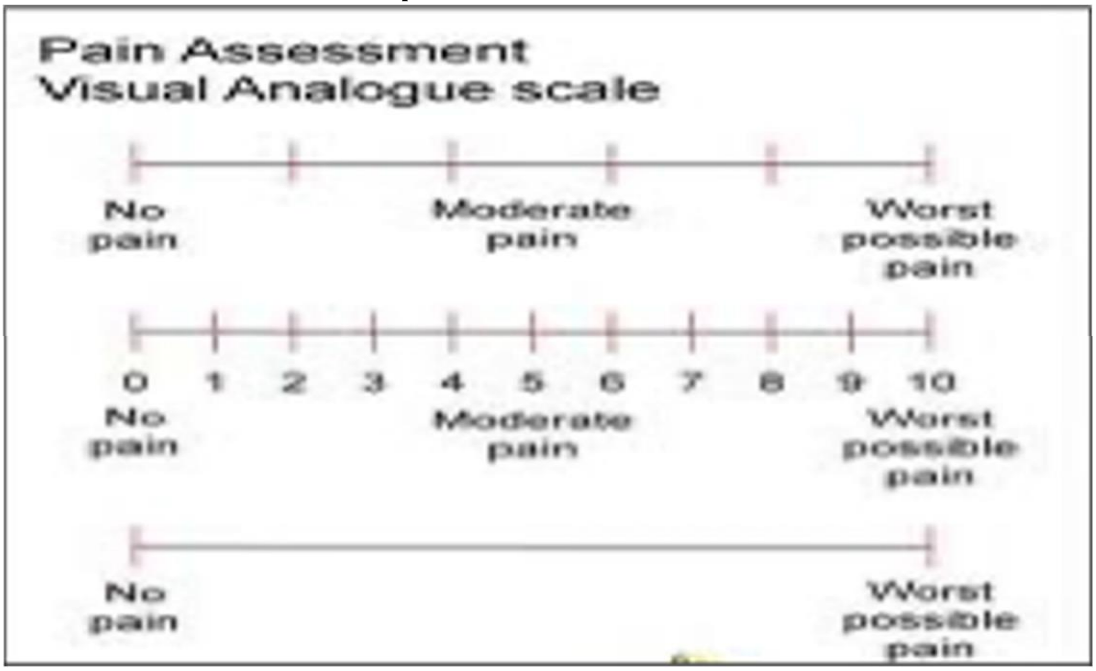
Once the patients were deemed fit for surgical intervention, the patients were grouped as per the surgical intervention opted by the patient.

A total of 60 patients were inducted in this interventional study and were split into 2 groups of 30 patients each, of which one group had surgery done via LTF mesh repair (group A) and the other group had surgery done via TIPP mesh repair (group B).

A shot of prophylactic antibiotic (Inj. Cefuroxime) was given prior to incision as per the hospital antibiotic policy. Post operatively the patients were kept nil per orally and advised complete bed rest till the effect of spinal anesthesia wore out, maintenance IV fluids. Patients were encouraged to mobilise and start their routine day to day activities as soon as possible. Prophylactic oral antibiotics (Cefuroxime) were prescribed for 5 days, of which Intravenous antibiotics were given for the first 24 hours. Analgesics were given twice daily for a period ranging between 3 to 5 days and converted to oral form as soon as possible.

The post-operative pain scores were analysed using the visual analogue scale at 2 weeks and 6 months in both groups. Pain severity had been assessed using a Visual Analogue Scale – VAS [0 (no pain) to 10 (agonising pain)]. The Visual Analogue Scale (VAS) is a subjective measure of pain. Patients are asked to rate their pain corresponding to their current severity of pain. This VAS score can be used as a baseline quantity for the assessment of pain with follow- up scores indicating whether pain is reducing or not.

(No pain) 0 10cm (Worst pain)



Visual Analogue Scale

The incidence of post-operative complications such as recurrence of hernia and wound infections will also be studied during the same period.

STATISTICAL METHODS:

The collected data will be analysed by the following statistical methods:

Descriptive Statistics –Mean, Standard deviation, Frequency, Percentage Inferential Statistics – Chi-square test, 't'test (independent samples), 't'test (paired samples), repeated measure ANOVA.

Statistical Analysis

VAS score was considered to be the primary outcome variable. Recurrence was considered to be the secondary outcome variable. Group (LTF mesh repair and TIPP mesh repair) was considered as explanatory variable. Baseline characteristics, the mean duration of surgery, mean duration of hospital stay and associated complications were other study relevant variables.

The association between categorical outcomes and categorical variables were assessed by cross tabulation and subsequent comparison of percentages. Chi- square test was used to verify the statistical significance. In case of zero or low frequency in few of the categories, simulated p-value was calculated wherever required. For continuous variable, mean and standard deviation was presented and independent t-test was used to compare it.

A P value of < 0.05 was considered to be statistically significant. RStudio Version 1.2.1093 was used for statistical analysis. (Reference: ***RStudio*** *Team (2020).* ***RStudio****: Integrated Development for R.* ***RStudio****, PBC, Boston, MA URL http://www.**rstudio**.com/.)*

Results:

60 patients were split into two groups Group A – Lichtenstein tension free mesh repair (LTF) Group B – Transinguinal pre-peritoneal mesh repair (TIPP)

Table 1: Comparison of baseline characteristics between LTF and TIPP group

Variables		Group		P-value
		LTF mesh repair (n=30)	**TIPP mesh repair (n=30)**	
Age		48.97±18.38	52.37±18.23	0.475
Gender	Male	29(96.7)	30(100.0)	1.000
	Female	1(3.3)	0(0.0)	
Side of hernia	Right	12(40.0)	13(43.3)	0.961
	Left	13(43.3)	12(40.0)	
	B/L	5(16.7)	5(16.7)	
Direct/Indirect hernia	Direct	15(50.0)	13(43.3)	0.775
	Indirect	14(46.7)	15(50.0)	
	Pantaloon	1(3.3)	2(6.7)	

Age is presented as Mean ± SD; other variables is presented as Frequency (%)

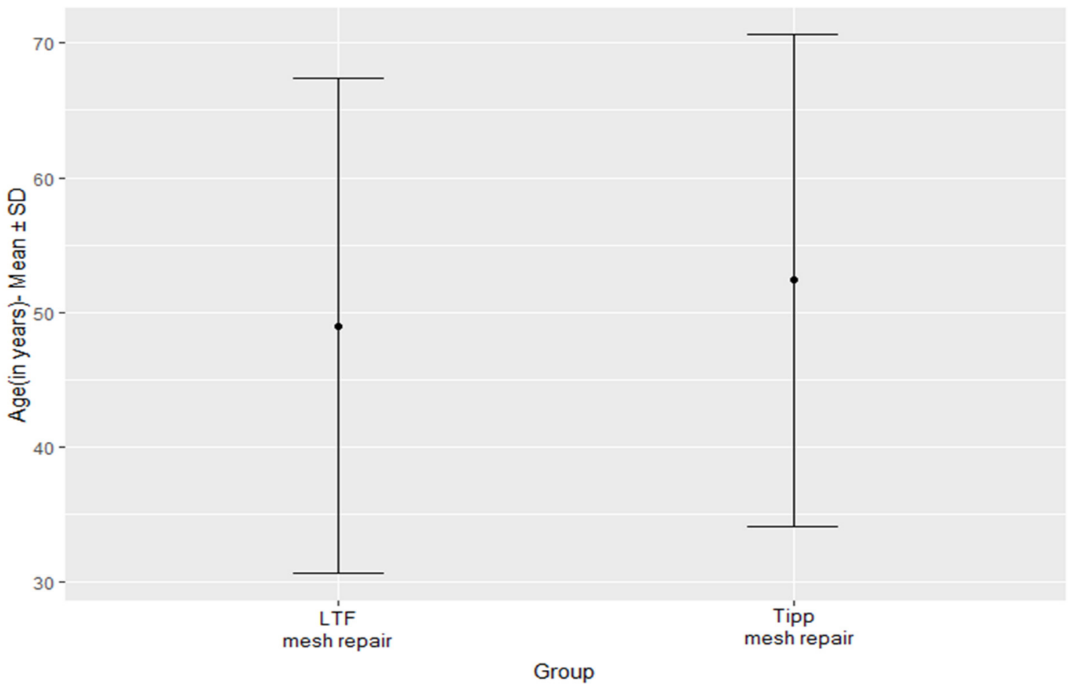


Figure 1: Comparison of age between LTF and TIPP group

The mean age in LTF mesh repair group was 48.97(±18.38)yrs whereas the mean age in TIPP mesh repair group was 52.37 (±18.23)yrs. However, there was statistically insignificant difference between the two groups (p>0.05) with mean age being the parameter.

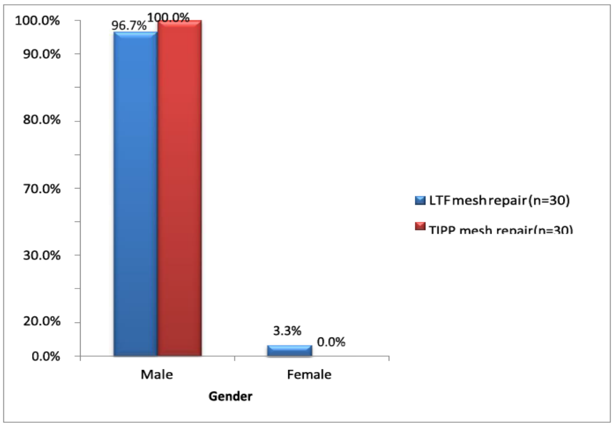


Figure 2: Comparison of gender between LTF and TIPP group

Since only 1 patient was female in LTF mesh repair group and none were female in TIPP mesh repair group, there was no statistical significance between the two groups according to gender (p>0.05).

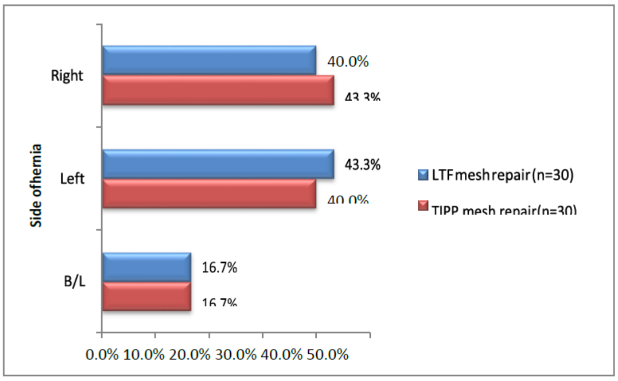


Figure 3: Comparison of side of hernia between LTF and TIPP group

The side of hernia in LTF mesh repair group was right for 12 patients (40%), left for 13 patients (43.3%) and B/L for 5 patients (16.7%) whereas the side of hernia in TIPP mesh repair group was right for 13 patients (43.3%), left for 12 patients (40%) and B/L for 5 patients (16.7%). There was statistically no significance between the two groups according to side of hernia (p>0.05).

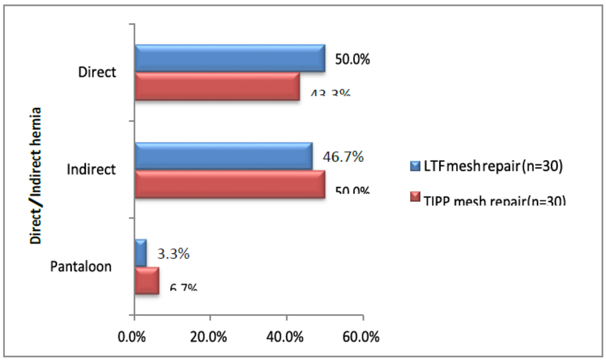


Figure 4: Comparison of direct/indirect hernia between LTF and TIPP group

In LTF mesh repair group, 15 patients (50%) had direct hernia, 14 patients (46.7%) had indirect hernia and 1 patient (3.3%) had pantaloon hernia whereas in TIPP mesh repair group, 13 patients (43.3%) had direct hernia, 15 patients (50%) had indirect hernia and 2 patients (6.7%) had pantaloon hernia.

There was statistically no significance between the two groups according to direct/indirect hernia (p>0.05).

Table 2: Comparison of VAS score between LTF and TIPP group

Variables		**Group**		**P-value**
		LTF mesh repair (n=30)	**TIPP mesh repair (n=30)**	
VAS 2 weeks	0	1(3.3)	16(53.3)	**<0.001**
	1 to 3	29(96.7)	14(46.7)	
VAS 6 months	0	19(63.3)	27(90.0)	**0.015**
	1 to 2	11(36.7)	3(10.0)	

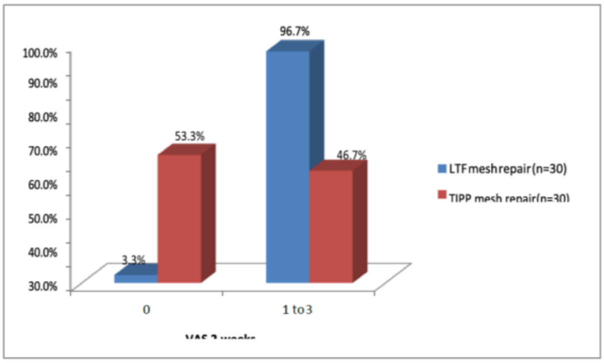


Figure 5: Comparison of VAS score 2 weeks between LTF and TIPP group

In LTF mesh repair group, 1 patient (3.3%) had VAS score (2 weeks) of 0 and 29 patients (96.7%) had VAS score (2 weeks) of 1 to 3.

In TIPP mesh repair group, 16 patients (53.3%) had VAS score (2 weeks) of 0 and 14 patients (46.7%) of 1 to 3.

Therefore, there was statistically significant difference between the two groups according to VAS score (2 weeks) ($p<0.05$).

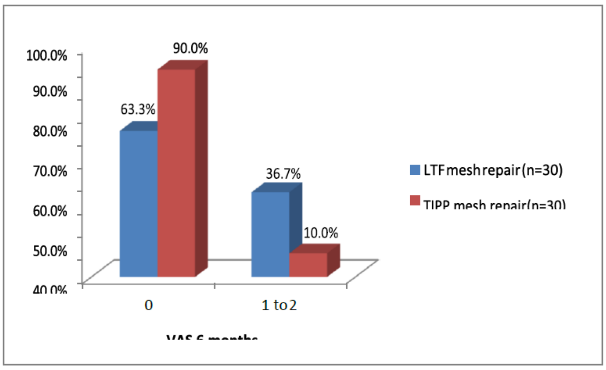


Figure 6: Comparison of VAS score 6 months between LTF and TIPP group

In LTF mesh repair group, 19 patients (63.3%) had VAS score (6 months) of 0 and 11 patients (36.7%) had VAS score (6 months) of 1 to 2.

In TIPP mesh repair group, 27 patients (90%) had VAS score (6 months) of 0 and 3 patients (10%) of 1 to 2.

Therefore, there was statistically significant difference between the two groups according to VAS score (6 months) ($p<0.05$).

Table 3: Comparison of recurrences between LTF and TIPP group

Recurrences	Group		P-value
	LTF mesh repair (n=30)	TIPP mesh repair (n=30)	
No	30(100.0)	30(100.0)	-
Yes	0(0.0)	0(0.0)	

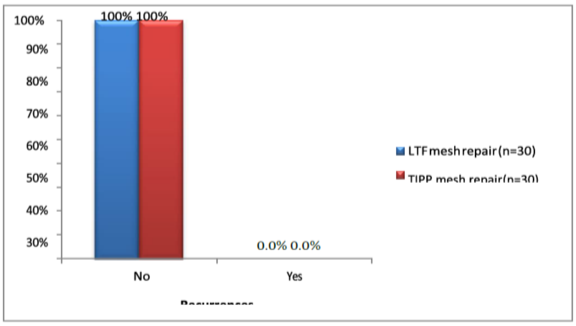


Figure 7: Comparison of recurrences between LTF and TIPP group

None of the patients had recurrences in either groups.

Table 4: Comparison of duration of surgery and hospital stay between LTF and TIPP group

Variables	Group		P-value
	LTF mesh repair (Mean ± SD)	Tipp mesh repair (Mean ± SD)	
Duration of surgery	69.17±14.45	47.03±8.26	**<0.001**
Hospital stay	3.60±1.13	2.83±0.59	**0.002**

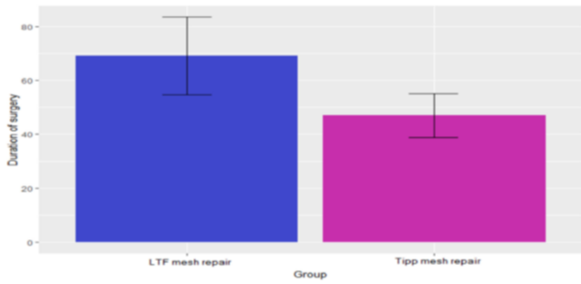


Figure 8: Comparison of duration of surgery between LTF and TIPP group

The mean duration of surgery was 69.17 (±14.45) minutes in LTF mesh repair group whereas it was 47.03 (±8.26) minutes in TIPP mesh repair group.

The mean duration of surgery was recorded to be statistically significantly higher in LTF mesh repair group as compared to TIPP mesh repair group ($p<0.05$).

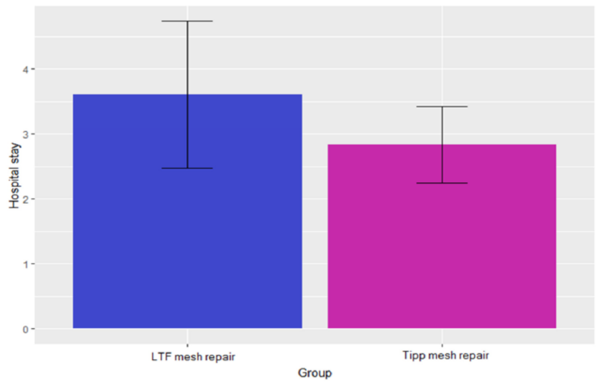


Figure 9: Comparison of hospital stay between LTF and TIPP group

The mean hospital stay was 3.60 (±1.13) days in LTF mesh repair group whereas it was 2.83 (±0.59) days in TIPP mesh repair group.

The mean hospital stay was recorded to be statistically significantly higher in LTF mesh repair group as compared to TIPP mesh repair group ($p<0.05$).

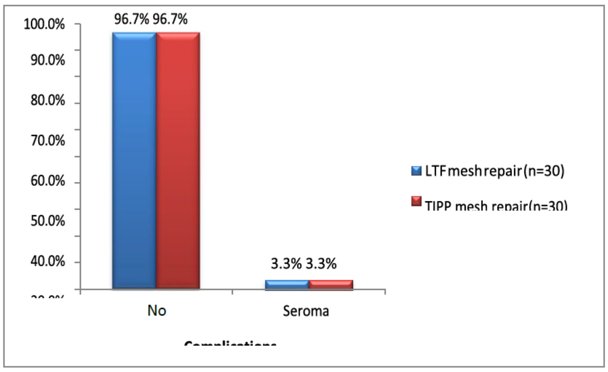


Figure 10: Comparison of complications between LTF and TIPP group

Among complications, both the group had one seroma each; therefore, there was no statistical significance differentiating the two groups according to complications ($p>0.05$).

DISCUSSION

The present study was carried out to investigate the efficacy of TIPP hernia repair in decreasing the occurence of chronic groin pain when compared to LTF hernia repair.

The cause of hernia is probably multifactorial(7,8). It is assumed that 3 main factors are involved. The presence of performed sac, repeated elevation in the intra- abdominal pressure and weakening of the body muscles and tissue with time.

A. Congenital

Predisposing factors for indirect inguinal hernia genesis is anatomic configuration and the patent processes vaginalis. But, it is not the sole cause of hernia genesis as many persons at postmortem had patent processus vaginalis without suffering from hernia during life. The descent of the testis carries along with it the processes, hence predisposes to hernia. Sex wise males are more common suffers from inguinal hernia. Subtle variants in the attachment and arrangement of the abdominal muscles also play a role in hernia genesis as direct do not occur in the females because of narrowness between the inguinal ligament and transverses arch.

Congenital defects in tissue metabolism, relating to enzyme deficiency also suffer from hernia. There are deranged collagen synthesis disorders such as Ehler- Danlos Syndrome, where the tissues are defective. This leads to direct hernia formation.

Similarly, persons with high arched lower border of transversus abdominis also develop direct hernia because of congenital posterior inguinal weakness.

B. Contributory Factors

1) Age: as age advances, abdominal muscle tissue weakness develops because of gradual tissue breakdown, hence most common in elderly persons. The reason for hernias in elderly people may be linked to finding of Rodrigues, who in 1990, reported a decrease in Oxytatum fibres and an increase in the amorphous substances of the elastic fibres as a function of age, which may be responsible for alterations in the transversalis fascia.

2) Obesity:Increased fat layers in the various layers of the abdominal wall leads to weakness of the layers, predisposing to hernia formation.

3) Pulmonary Causes: Emphysema, chronic bronchitis, pneumonitis causes laborious and difficult respiration which leads to raise in intra- abdominal pressure.

4) Raised Intraabdominal Pressure: Prostatism, constipation, diverticular disease, colonic carcinoma, all lead to straining to expel the excreta, causing raised intra abdominal pressure.

5) Cardiac Problems: Patients suffering from congestive heart failure will have ascites, which opens up dormant patent processus leading to hernia.

6) Pregnancy: Stretching of the abdominal wall in pregnancy disrupt muscles and later replaced by collagen tissue which prevents effective action of these muscles thus predisposing to hernia.

C) Precipitating and existing causes:

1) Sudden increase in intra abdominal pressure as occurs with coughing, straining, heavy weight lifting, sneezing and crying.

2) Trauma- severe sudden blow or crush injury may lead to hernia formation.

D) Biological Factors:

1) Malnutrition: Sailors who suffer from scurvy had hernia and rupture of healed scars. This is because of vitamin C deficiency which is essential for collagen synthesis and healing.

2) Environmental Toxins: Smokers had the potentially undesirable combination of increase in proteolytic and reductions in alpha- antitrypsin, the major naturally occurring circulating protease. This combination could set the stage for the evolution of a hernia by affecting the synthesis- degradation equilibrium of groin collagen and could be a pathologic sequence initiated by excessive smoking.

E. latrogenic Factors: Previous Operations:

1) Appendicectomy may predispose to the later appearance of ipsilateral inguinal hernia. The Presumptive mechanism is that damage to the innervation of the muscular constrictors of the internal ring shutter mechanism.

2) Increased intra abdominal pressure associated with chronic ambulatory peritoneal dialysis frequently results in hernia.

The results were in favour of the TIPP technique, revealing a significantly smaller proportion of patients had incidence of chronic groin pain at the end of 2 weeks and 6 months when compared to LTF hernia repair.

The advantages of TIPP technique were reinforced when the study revealed lesser operative time and hospital stay as compared to LTF technique

The results were analyzed and compared to various other studies done on the same subject.

In the present study, chronic groin pain scores were the following

In LTF mesh repair group, AT THE END OF 6 MONTHS, 19 patients (63.3%) had VAS score of 0 and 11 patients (36.7%) had VAS score of 1 to 2.

n TIPP mesh repair group, AT THE END OF 6 MONTHS. In TIPP mesh repair group, 27 patients (90%) had VAS score of 0 and 3 patients (10%) of 1 to 2.

Koning et al in his study showed that 20 patients in LTF group and 5 patients in TIPP group had incidence of chronic groin pain with p value of 0.004 which is statistically significant (10)

In our study, The mean duration of surgery was 69.17 (±14.45) minutes in LTF mesh repair group whereas it was 47.03 (±8.26) minutes in TIPP mesh repair group with p value of <0.001 which is statistically significant. The mean duration of surgery was shorter in the TIPP group. It must be emphasized, however that it is variable and individual surgeon dependent.

In Koning et al study, mean duration of surgery was 39.9min in LTF group and 34.1min in TIPP group with p value of <0.001 which is statistically significant(1).

In the present study, mean duration of stay at the hospital was 3.60 (±1.13) days in LTF mesh repair group whereas it was 2.83 (±0.59) days in TIPP mesh repair group with p value of 0.004 which is statistically significant.

Both groups of patients had similar incidence of complications in the form of seroma (1 in each group)

Neither of the groups reported recurrence of hernia.

CONCLUSION

We may therefore conclude that the TIPP technique has significant advantages when compared with the Lichtenstein technique as it includes all the advantages of an open approach and the preperitoneal sutureless placement of polypropylene mesh.

The absence of suture fixation of polypropylene mesh and limited dissection around the regional nerves has better outcomes in terms of chronic groin pain, operative time and hospital stay

Therefore, TIPP can be considered a good alternative to the Lichtenstein technique.

References:

1. Koning GG, Keus F, Koeslag L, Cheung CL, Avçi M, van Laarhoven CJHM, et al. Randomized clinical trial of chronic pain after the transinguinal preperitoneal technique compared with Lichtenstein's method for inguinal hernia repair. Br J Surg. 2012 Sep 7;99(10):1365–73.
2. Sakorafas GH, Halikias I, Nissotakis C, Kotsifopoulos N, Stavrou A, Antonopoulos C, et al. Open tension free repair of inguinal hernias; the Lichtenstein technique. BMC Surg. 2001;1:3.
3. Usher FC, Cogan JE, Lowry TI. A new technique for the repair of inguinal and incisional hernias. Arch Surg Chic Ill 1960. 1960 Nov;81:847–54.
4. Stoppa RE, Rives JL, Warlaumont CR, Palot JP, Verhaeghe PJ, Delattre JF. The use of Dacron in the repair of hernias of the groin. Surg Clin North Am. 1984 Apr;64(2):269–85.
5. Lichtenstein IL, Shulman AG, Amid PK, Montllor MM. The tension-free hernioplasty. Am J Surg. 1989 Feb;157(2):188–93.
6. Jenkins JT, O'Dwyer PJ. Inguinal hernias. BMJ. 2008 Feb 2;336(7638):269–72.
7. Beattie GC, Kumar S, Nixon SJ. Laparoscopic total extraperitoneal hernia repair: mesh fixation is unnecessary. J Laparoendosc Adv Surg Tech A. 2000 Apr;10(2):71–3.
8. Verhagen T, Zwaans WAR, Loos MJA, Charbon JA, Scheltinga MRM, Roumen RMH. Randomized clinical trial comparing self-gripping mesh with a standard polypropylene mesh for open inguinal hernia repair. Br J Surg. 2016 May 12;103(7):812–8.