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## Comparison of self fixating mesh with Lichtenstein tension free mesh hernioplasty in open inguinal hernia repair

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### Abstract

**Aims and Objectives:** differences in two methods of inguinal hernia repair in terms of operative time, chronic pain at 3 months and recurrence at 6 months.

**Materials and Method:** This study conducted in the department of Surgery, Indira Gandhi Medical College, Shimla from 1<sup>st</sup> June 2013 to 31<sup>st</sup> May 2014 included 40 patients admitted in department with inguinal hernia who were fit for surgery. Patients were randomized to self-fixating/gripping Mesh hernioplasty and Lichtenstein tension free/ sutured mesh Hernioplasty groups randomly in groups of 20 each.

**Results:** Self-fixating mesh group was associated with significantly decreased operative time (mean 27 minutes) as compared to sutured mesh hernioplasty (mean 44.7 minutes). However, no significant difference was found in post-operative pain (VAS score), analgesia requirement, chronic pain at 3 months, postoperative hospital stay or recurrence at 6 months in either group.

**Conclusion:** The only benefit of using self-fixating of using self-fixating/self-gripping mesh is decreased operative time.

**Keywords:** Self fixating mesh/Gripping Mesh (GM), Lichtenstein Tension Free/sutured Mesh (SM) Hernioplasty VAS (visual analogue scale)

### Introduction

Hernias are a common problem; however, their true incidence is unknown. It is estimated that about 5 % of population will develop hernia but prevalence may be higher. Since Lichtenstein introduced the method of tension free hernia repair by using modern mesh properties in 1986 it became the most often used technique. This technique used sutures for mesh fixation, which was regarded as cause of chronic pain hence alternative methods of fixation have been proposed.

### Material and methods

This comparative study was carried out in the department of Surgery, IGMC Shimla from 1<sup>st</sup> June 2013 to 31<sup>st</sup> May 2014 and included 40 patients with diagnosis of inguinal hernia.

Comparison was made of sutured mesh with self-fixating mesh in open inguinal mesh hernioplasty in terms of: -

- Total operative time.
- Post – operative pain [assessed by visual analogue score].
- Duration of postoperative hospital stay.
- Incidence of chronic pain at 3 months [assessed by visual analogue scale].
- Recurrence rates at 3 months

### Inclusion criteria

All patients with primary unilateral inguinal hernia fit for surgery.

### Exclusion Criteria

Patients with the following conditions were excluded from the study:

1. Patients with bilateral inguinal hernia.
2. Previously operated patients who had earlier surgery scars/adhesions which were likely to

- interfere with the present procedure.
3. Incapable of filling the questionnaire
  4. Complicated inguinal hernia and recurrent inguinal hernia.
  5. Poor cardio-pulmonary reserve and immunocompromised state.
  6. Patients who did not give consent for the study.

Preoperative assessment with complete history and physical examination was done. Patients were examined in both standing and supine position. Swellings other than hernias in the groin were ruled out and so were strangulated and incarcerated hernias. A clear disclosure of the benefits and pertinent risks of both Lichtenstein mesh hernia repair and repair using self-fixating mesh was made. Patients were alternated into two equal groups of 20 patients each. Group A included patients in whom tension free hernioplasty using sutured mesh was done and Group B in whom self-fixating mesh was used. The results were statistically evaluated and analyzed using Chi square test.

Briefly mentioning, in Lichtenstein tension free mesh hernioplasty, polypropylene mesh prosthesis with a minimum size of  $16 \times 8$  cm for an adult was positioned over the inguinal floor after tailoring its medial end to the standard shape resembling the tracing of the footprint, with a lower sharper angle to fit into the angle between the inguinal ligament and rectus sheath and & was secured with a polypropylene suture (2.0) to the insertion of rectus sheath to the pubic bone overlapping the bone by one to two centimeter.

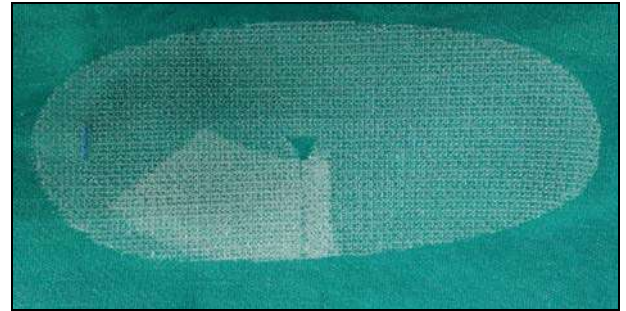


**Fig 1:** Image showing placing the mesh around the spermatic cord in Lichtenstein Tension Free Mesh Hernioplasty.

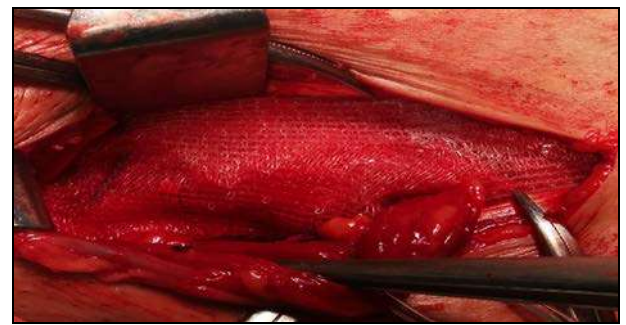
The self-fixating or gripping mesh (GM) is made of a low weight isoelastic large-pore monofilament polypropylene knitted fabric that incorporates resorbable polylactic acid micro hooks, which provide tissue-gripping properties at application of the mesh and during the following 12 months<sup>[1]</sup>. Proponents argue fewer incidence of infection, less early postoperative and chronic pain and less operative time while others have not confirmed this observation despite the high cost of self-fixating/self-gripping mesh.

In this surgical technique for the self-fixating mesh hernioplasty, after a 5 to 8 cm skin incision starting from the pubic tubercle and extending laterally, the external oblique aponeurosis was incised A wide dissection of the conjoint tendon and the rectus muscle aponeurosis was performed up to the linea alba as to create the space required to spread out the mesh. The pubic bone was dissected and bared about 2 cm. After having replaced the sac in its its course without opening it, the mesh was then opened and closed around the cord outside the operating area in order to avoid any untimely side by side placement. The mesh was then spread down carefully to its final position (color stitch orientated towards the pubic bone), its fixation started inferiorly to the high right muscle and to the adjacent inguinal ligament. Due to the micro hooks grip, the mesh fixation was immediate,

no additional fixation suture was required except when the mesh overlap was not sufficient. In this case, one stitch of absorbable suture on the pubic spine was used to prevent early migration of the mesh. The external oblique aponeurosis was closed retro-funicular by absorbable sutures in order to protect the fragile structures from direct contact with the mesh.



**Fig 2:** Self Gripping/ Self Fixating Mesh



**Fig 3:** Self-Fixating Mesh with flaps closed around the cord.

Otherwise, both the operative procedures were completed using standard operative techniques.

Note was made of time taken for each case in each group of operative techniques. Postoperative parameters like pain, length of hospital stay, chronic operative site pain at 3 months after surgery were recorded as per proforma. Patients were followed up to 6 months & any recurrence was noted.

### Observations

The age of the patients ranged from 18 to 79 years with a mean of 55.2 years in the self-fixating mesh group and from 18 to 80 years with a mean of 54.45 years in sutured mesh hernioplasty group. The youngest patient in both groups was 18 years of age, while the oldest patient in both the groups were of 79 and 80 years respectively. As the p value was more than .05, there was no significant difference in two age groups.

**Table 1:** Showing range of age distributions for both groups.

Age In Years	Self Fixating Mesh (N=20)	Sutured Mesh (N=20)
10-30	2(10%)	3(15%)
31-50	5(25%)	5(25%)
51-70	9(45%)	8(40%)
71-90	4(20%)	4(20%)

### Operation time

Duration of surgery that is, the total time from skin incision to skin closure ranged from 20 minutes to 35 minutes in self-fixating group whereas in sutured mesh group time varied between 37 to 52 minutes.

**Table 2:** Showing the duration of surgery in both groups

Duration of Surgery (in min.)	Self Fixating Mesh (n=20)	Sutured Mesh (n=20)
< 20	0 (0%)	0(0%)
20-30	14(70%)	0(0%)
31-40	6(30%)	6(30%)
>40	0(0%)	14(70%)

The mean operation time of self-fixating mesh repair was 27 minutes with S.D. of  $\pm 5.48$ . The mean operative time of sutured mesh repair was 44.7 minutes with S.D. of  $\pm 5.14$ .

### Pain

The P value for the mean VAS scores in immediate post-operative period that is average of VAS scores taken at 6, 12 and 24 hours was 0.240 which was not statistically significant. At 2 weeks it was 0.524 which was also not statistically significant so was the score at 3 months, p value being 1.

**Table 3:** Showing VAS scores in immediate post-operative period.

Vas Score	Self Fixating Mesh	Sutured Mesh
1	0	0
2	8	4
3	1	2
4	7	8
5	1	2
6	3	3
7	0	1

**Table 4:** Showing VAS scores at 3 months.

Vas Scores	Self Fixating Mesh	Sutured Mesh
0	9	10
1	6	4
2	5	6

Mean requirement of the rescue analgesic (inj. Lornoxicam 8mg ampule) in self-fixating group was 2.95 and in sutured mesh group was 3.3 with a p value of less than 0.487, which is statistically not significant.

**Table 5:** Showing analgesic requirement in self-fixating mesh and sutured mesh groups

	Self-Fixating Mesh (no. of injections)	Sutured Mesh (no. of injections)
MEAN	2.95	3.3
SD	1.05	1.97

### Post operative hospital stay

In the self-fixating mesh group, eight patients (40%) were discharged on first POD while eleven (55%) were discharged on second POD. The remaining one patient (5%) was discharged on third POD.

In the sutured mesh group three patients (15%) were discharged on first POD while fifteen patients (75%) went home on second POD. Two patients (10%) were discharged on third POD. As P value  $> 0.05$ , the difference between two groups was statistically insignificant.

**Table 6:** Showing post-operative duration of stay.

Hospital Stay In days	Self Fixating Mesh (no. of patients)	Sutured Mesh (no. of patients)
1	8(40%)	3(15%)
2	11(55%)	15(75%)
3	1(5%)	2(10%)

In the sutured mesh group three patients (15%) were discharged on first POD while fifteen patients (75%) went home on second POD. Two patients (10%) were discharged on third POD. As P value  $> 0.05$ , the difference between two groups was statistically insignificant.

### Recurrence

No recurrence was found in any of the groups during the 6 months follow up.

### Discussion

Despite important advances in the knowledge of anatomy and the introduction of anesthesia in 1846, surgery on hernias was revolutionized by Edoardo Bassini in 1884 by combining the principles of asepsis with reconstruction of inguinal floor & recreating the internal and external rings and had a 1% to 2% recurrence rate for initial hernia repairs [2]. Shouldice in 1940 proposed a technique based on Bassini's repair, effectuated under local anaesthesia and consisting of a four-layer muscular closure of the posterior wall using continuous sutures. Although recurrence rate was less than 1 percent with Shouldice repair, it was technically more difficult with longer operative time than the mesh hernioplasty. Lichtenstein coceptualised that by using mesh prosthesis to bridge the hernia defect rather than closing it with sutures, as with the Bassini repair and its modifications, tension is avoided ostensibly resulting in a less painful operation [3]. He also felt that the lack of tension reduced the incidence of suture pullout, which would result in a lower recurrence rate. Lichtenstein tension free hernia repair by using modern mesh properties since 1986, has now become the method of choice in the United States [4, 5, 6]. However, chronic groin pain has become one of the important complications and has a significant impact on the patient's quality of life [7]. The reason is still unclear, but the use of sutures during surgery which may injure minor or major nerves has been viewed as one of the potential pathogenic factors involved in chronic pain [8, 9].

The incidence of this pain varies among studies, ranging between 11% and 54%, with almost 30% of these patients reporting a significant impact on daily activities [10, 11]. Some patients complain of groin pain months or even years after surgery. For this reason, alternative fixation methods with a low degree of tissue trauma were developed and several fixation procedures have been investigated, such as absorbable sutures, tacks, and glue [12, 13].

The other ways of doing tensionless hernia repair is the concept of using a giant unsutured mesh as done by Stoppa and colleagues who used a large, unsutured Dacron prosthesis for repair of difficult groin hernias using a preperitoneal approach via a low midline incision in 1975 & plug & patch technique developed by Gilbert and later popularized by Rutkow and Robbins.

It was suggested that the use of high-density, microporous (or "heavyweight") polypropylene meshes stimulated inflammatory reactions, which may be responsible for adverse mesh shrinkage [14, 15] and low-weight polypropylene mesh might be more appropriate in this respect [16, 17]. There were concerns regarding chronic post hernia repair pain and the suture fixation of the meshes used in the Lichtenstein procedure [18]. Consequently, some authors recommended the use of lower weight [19-21] macroporous meshes and advocated limiting the extent of fixation and/or the use of non-compressive absorbable devices [22]. To address surgeons' concerns over postoperative pain and to incorporate the above recommendations, a new low-density, macroporous polypropylene mesh with self-gripping properties



was developed. A novel method for sutureless fixation of prosthetic mesh to the posterior inguinal wall was achieved by Chastan with a new mesh that provided Velcro like adherence to underlying tissues [23].

In 2007, the ProGrip® system was introduced (Covidien, Trévoux, France) and marketed in the United States since May 2008 and in Europe since July 2008. Parietex ProGrip™ is a lightweight, self-gripping mesh composed of monofilament polyester and polylactic acid (PLA) grips indicated for inguinal hernia repair [24].

In our study youngest patient in both groups was of eighteen years. Eldest patient in self-fixating group was 79 years and 80 years in sutured mesh group respectively. Percentage wise distribution revealed that maximum patients were above 60 years i.e. 40 % in each group while 2<sup>nd</sup> highest were in between 41 to 60 years i.e. 35 % in self-fixating mesh group and 30 % in sutured mesh group. Both the groups were comparable in terms of age, P value being more than 0.05.s.

The mean operative time of self-fixating mesh repair was 27 (range 20 -35) minutes which was significantly lower as compared to that of sutured mesh group which was 44.7 (range 37-52) minutes. The mean operative time for self-fixating mesh in our study was less than Kapischke *et al.* [25] (51 minutes), Kingsnorth [26] (32.4 minutes) and Pieredes [27] (36 minutes) but it was more than Bruna Esteban *et al.* [28] (17.8 minutes), however it was comparable to Jorgensen *et al.* [29] (29 minutes) and Anadol *et al.* [30] (23.7 minutes). The time for sutured mesh was comparable to Kingsnorth *et al.* [26] i.e., 39.4 minutes and Pierides *et al.* [27] which was 45 minutes. Thus, the results concur with the results of two metaanalysis i.e. Fang *et al.* [31] and Pandanaboyana *et al.* [32] that the operating time of self-fixating mesh was significantly shorter than that of suture fixation mesh hernioplasty.

Post-operative pain was recorded using Visual Analogue Scale (VAS) pain scoring system. The mean VAS scores taken at 6, 12 and 24 hours, then at 2 weeks and at 3 months revealed that there was no significant difference in both groups thus concurring with the findings of Anadol *et al.* Bruna Esteban *et al.* and Pierides *et al.* [27, 28, 30]

The median hospital stay was 1.55 and 2.2 days each in sutured mesh and self-fixating mesh groups. The p value was greater than 0.05 thus the difference was not statistically significant as found by Fang *et al* and Esteban *et al.* [28] had found no recurrence in both groups, Jorgensen *et al.* [29] found two recurrences in both groups at one year. Thus, the recurrence rates in both the groups were not significant as has been reported in meta-analysis by Fang *et al* and Pandanaboyana *et al* in 2014 though the follow up period in our study was shorter [31, 32].

Thus with self-fixating mesh even though the average pain scores at 6, 12, 24 hours and at 3 months and mean duration of hospital stay were shorter but the difference was not statistically significant. The only statistically significant difference was found in terms of total operating time, the p value being less than 0.001.No recurrence was observed in either groups during the 6 months follow up in our study.

## Conclusion

The only benefit of using self-fixating of using self-fixating/self-gripping mesh is decreased operative time. Since the first description of an inguinal hernia in 1555 BC, the treatment of inguinal hernia has travelled miles. Lichtenstien tension free hernioplasty still remains the gold standard for inguinal hernia repair in spite of advances in minimally invasive surgeries.

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