

Original Research Article

Comparison of self-fixating mesh with conventional polypropylene mesh in lichtenstein's tension free inguinal hernia repair

Avinash Jose, Sunil Sadanandan*

Department of General Surgery, Government Medical College, Kottayam, Kerala, India

Received: 06 November 2020

Accepted: 17 December 2020

*Correspondence:

Dr. Sunil Sadanandan,

E-mail: sunilsmanakat@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Post-operative pain is a disabling complication of inguinal hernia repair. Sutures that are used to anchor the mesh are blamed for tissue tension and nerve entrapment leading to postoperative pain. Self-fixating mesh, a bicomponent mesh with resorbable polylactic acid gripping system can produce a tension-free repair without sutures, reducing the potential of post-operative pain. The objectives of the study were to compare postoperative pain, the operating time and the efficacy in terms of recurrence among patients undergoing Lichtenstein's inguinal hernia repair with self-fixating mesh and conventional polypropylene mesh.

Methods: A prospective observational study was conducted among 120 patients. Half of them underwent Lichtenstein's inguinal hernia repair with self-fixating mesh which did not require sutures and the other half with conventional polypropylene mesh which were anchored with polypropylene sutures. Time taken to complete surgery was noted. Postoperative pain was charted using a visual analogue scale at 15 days, 3 months, 6 months and at 1 year during the follow up.

Results: Median postoperative pain score and operating time was significantly lower in patients who underwent repair with self-fixating mesh. None of the patients had recurrence at the end of 1 year follow up period.

Conclusions: Self-fixating mesh can reduce the postoperative pain and the operating time in patients undergoing Lichtenstein's inguinal hernia repair when compared with a conventional polypropylene mesh. The self-fixating mesh is as efficacious as conventional polypropylene mesh in preventing recurrences.

Keywords: Inguinal hernia, Lichtenstein's hernioplasty, Self-fixating mesh.

INTRODUCTION

Inguinal hernia is a very common disease.^{1,2} The inguinal hernias account for 75% of the abdominal hernias with a life time risk of 27% in males and 3% in the females.¹ There for groin hernia repair is a common operation performed by general surgeons.³

The word hernia is derived from the latin word for rupture.⁴ A hernia is defined as a protrusion of a viscus or a part of viscus through an abnormal opening in the wall of its containing cavity.⁵

The concept of avoiding tension by on lay mesh repair was introduced by Usher.⁶ He theorized that by using a mesh prosthesis to bridge the defect rather than closing it with sutures, avoided tension and results in a less painful operation.^{7,8} Lichtenstein popularized this method of hernia repair under local anesthesia and it came to be known as Lichtenstein's method. Now Lichtenstein tension free repair is considered gold standard of hernia surgery.⁹

Post-operative pain is one of the frequent and disabling complication of hernia repair.¹⁰ Pain depends on the method of anchoring the mesh prosthesis.^{11,12} Sutures used for anchoring the mesh prosthesis may cause ischemia, muscle contraction or nerve damage resulting in pain. Sutures that anchor the mesh are blamed for extensive tissue tension and nerve entrapment leading to prolonged post-operative pain.^{12,13}

Self-fixating mesh is a bicomponent mesh comprised of monofilament polyester and a resorbable polylactic acid (PLA) gripping system¹⁴. Tension-free repair, which may not require sutures is achieved through the resorbable PLA micro-grip, reducing the potential of chronic groin pain from sutures penetrating tissue and entrapping nerves.^{13,14}

The idea of this study is to compare usefulness self-fixating mesh with conventional polypropylene mesh in patients undergoing Lichtenstein's tension free hernia repair in reducing post-operative pain, operating time and to compare the efficacy of self-fixating mesh in terms of recurrence of hernia.

Objectives

Objectives were 1) to compare postoperative pain of patients undergoing Lichtenstein's tension free inguinal hernia repair with self-fixating mesh with conventional polypropylene mesh using a visual analogue scale 2) to compare efficacy of self-fixating mesh with that of conventional polypropylene mesh in terms of recurrence of hernia in patients undergoing Lichtenstein's tension free inguinal hernia repair 3) to compare the operating time of Lichtenstein's tension free inguinal hernia repair using a self-fixating mesh and conventional polypropylene mesh.

METHODS

Study design

Prospective observational study

Study setting

Government Medical College, Kottayam

Sample size

$$n = Z_{\alpha}^2 \times pq / d^2$$

Here $Z_{\alpha}=1.96$ for 5% level of significance, P =anticipated prevalence of post-operative pain=4%, $Q=[1-P]=96\%$, D =absolute prevalence taken as 5%

$$\text{Hence } n = 1.96 \times 1.96 \times 0.04 \times 0.96 / 0.05 \times 0.05 = 59$$

Roughly 120 patients divided into two groups of 60 each

Inclusion criteria

Inclusion criteria was patients undergoing elective Lichtenstein's tension free inguinal hernia repair in surgery department of government medical college Kottayam.

Exclusion criteria

Exclusion criteria were 1) patients not willing for study 2) complicated inguinal hernias 3) recurrent inguinal hernias 4) inguinoscrotal hernias 5) all post op infection cases.

Duration of study

One and half years from the date of approval by IRB

Procedure

A prospective observational study was conducted on patients who underwent Lichtenstein's tension free inguinal hernia repair in the Department of General Surgery, Government Medical College Kottayam for a period of one and half years from 21-12-2017.

Consecutive consenting 120 patients were included in the study, half of them underwent Lichtenstein's tension free inguinal hernia repair with self-fixating mesh and the other half underwent Lichtenstein's tension free inguinal hernia repair conventional polypropylene mesh.

Patients were recruited into the study in the first six months of study period and each patient will be followed up for 1 year. Patients who underwent repair with self-fixating mesh was be grouped as A and those who underwent repair with conventional mesh was grouped as B.

Written and Informed Consent was obtained for taking part in study and for operative procedure. Patient's history and examination was done in detail. Time period for surgery in each patient was noted for comparison.

Post-operative pain was noted according to pain score using a visual analogue scale at follow up. Patients was followed up after discharge on 15th day, after 3 months, after 6 months and at the end of 1year to reassess pain and to rule out recurrence.

Patient details was kept confidential throughout the study. The data collected was analyzed using SPSS software.

RESULTS

A total of 120 patients were recruited in to the study. Half of the patients underwent Lichtenstein's inguinal hernia repair using self-fixating mesh and other half using conventional polypropylene mesh which were anchored with 2-0 polypropylene sutures.

Among the patients participated in the study majority were males. Among the patients who underwent Lichtenstein's tension free hernioplasty using self-gripping mesh 93.3% were males and 6.7% were females. Among the patients who underwent repair with conventional polypropylene mesh 96.7% were males and 3.3% were females (Table 1).

Table 1: Distribution of study subjects based on type of procedure.

Group	Number	Percentage
Self-fixating mesh	60	50
Conventional mesh	60	50

Table 2: Distribution of study subjects based on sex.

Sex		Number	Percentage
Self-fixating mesh	Male	56	93.3
	Female	4	6.7
Conventional mesh	Male	58	96.7
	Female	2	3.3

Table 3: Number of patients in each age group.

Age group		Number	Percentage
Self-fixating mesh	10-20 years	1	1.7
	21-30 years	3	5
	31-40 years	3	5
	41-50 years	9	15
	51-60 years	21	35
	61-70 years	18	30
	71-80 years	5	8.3
Conventional mesh	10-20 years	1	1.7
	21-30 years	2	3.3
	31-40 years	9	15
	41-50 years	13	21.7
	51-60 years	20	33.3
	61-70 years	9	15
	71-80 years	5	8.3
	81-90 years	1	1.7

Majority of patients who participated in the study was in the age group between 50 and 60 years in limbs of the study (Table 2).

Mean operating time for patients undergoing repair with self-adhesive mesh was 31.17 minutes and that for the conventional mesh was 41.75 minutes. The mean reduction in operating time by using self-adhesive mesh was about 10 minutes. The p value was found to be 0.001 (Table 3).

Table 4: Distribution of study subjects based on operating time.

Operating Time	Number	Percentage	
Self-fixating mesh	25 minutes	13	21.7
	30 minutes	25	41.7
	35 minutes	17	28.3
	40 minutes	5	8.3
Conventional mesh	25 minutes	1	1.7
	30 minutes	4	6.7
	35 minutes	28	46.7
	40 minutes	27	45

Table 5: Operating time.

Variables	Mean	SD	t value	df	P value
Operating time for self-fixating mesh	31.17	4.450	-14.602	118	0.001.
Operating time for conventional mesh	41.75	3.423			

The median pain score of patients who underwent hernia repair with self-adhesive mesh was 2 and that for patients who underwent repair with conventional polypropylene mesh was 4 at post-operative day 15. The z score was -5.583 and p value was 0.001 which was statistically significant. (Table 4, 5)

The median pain score of patients who underwent hernia repair with self-adhesive mesh was 0 and that for patients who underwent repair with conventional polypropylene mesh was 2 at 3 months post-operative. The z score was -

6.536 and p value was 0.001 which was statistically significant (Table 6, 7).

Table 6: Pain score at 15 days.

Pain score at 15 days		Number	Percentage
Self-fixating mesh	0	7	11.7
	1	2	3.3
	2	25	41.7
	3	13	21.7
	4	13	21.7
Conventional mesh	2	11	18.3
	3	9	15
	4	27	45
	5	6	10
	6	7	11.7

Table 7: Pain score at 15 days Mann Whitney test.

Variable	Median	Quarties		-Z value	P value
		25 th	75 th		
Pain score at 15 days for self-fixating mesh	2	2	3	-5.583	0.001
Pain score at 15 days for Conventional mesh	4	3	4		

Table 8: Distribution of study subjects based on pain score at 3 months.

Pain score at 3 months		Number	Percentage
Self-fixating mesh	0	50	83.3
	1	3	5
	2	6	10
	3	1	1.7
Conventional mesh	0	14	23.3
	1	6	13.3
	2	26	43.3
	3	10	16.7
	4	2	3.3

Table 9: Pain score at 3 months Mann Whitney test.

Variable	Median	Quarties		-Z value	P value
		25 th	75 th		
Pain score at 3 months for self-fixating mesh	0	0	0	-6.536	0.001
Pain score at 3 months for conventional mesh	2	1	2		

Table 10: Distribution of study subjects based on pain score at 6 months.

Pain score at 6 months		Number	Percentage
Self-fixating mesh	0	53	88.3
	1	3	5
	2	3	5
	3	1	1.7
Conventional mesh	0	22	36.7
	1	12	20
	2	18	30
	3	7	11.7
	4	1	1.7

Table 11: Pain score at 6 months Mann Whitney test.

Variable	Median	Quarties		-Z value	P value
		25 th	75 th		
Pain score at 6 months for self-fixating mesh	0	0	0	-5.755	0.001
Pain score at 6 months for Conventional mesh	1	0	2		

The median pain score of patients who underwent hernia repair with self-fixating mesh was 0 and that for patients who underwent repair with conventional polypropylene mesh was 1 at 6 months post-operative. The z score was -5.755 and p value was 0.001 which was statistically significant. (Table 8, 9)

The median pain score of patients who underwent hernia repair with self-adhesive mesh was 0 and that for patients who underwent repair with conventional polypropylene mesh was 1 at 1-year post-operative. The z score was -5.755 and p value was 0.001 which was statistically significant (Table 10 and 11).

Table 12: Recurrence at 1 year.

Group	Number	Recurrence
Self-fixating mesh	60	Nil
Conventional mesh	60	Nil

No recurrence was noted in any patients in both limbs of study during the entire period of follow-up (Table 12).

DISCUSSION

A prospective observational study comparing post-operative pain among patients undergoing Lichtenstein's tension free inguinal hernia repair using self-fixating mesh and conventional polypropylene mesh was conducted in the department of general surgery government medical college Kottayam. 120 consecutive

consenting patients were enrolled in to the study and 60 of them underwent hernia repair with self-fixating mesh and 60 with conventional mesh. Majority of the patients who participated in the study were males in the age group 50 to 60 years (Table 2, 3).

The patients were followed for a period of 1 year and reassessed at 15 days, 3 months, 6 months and 1 year. The post-operative pain was significantly lower in patients who underwent hernia repair with self-fixating mesh during all the follow up visits compared to those patients who underwent repair with conventional polypropylene mesh. This result was similar to a multicenter study carried out in Istanbul Medipol university, Isthambul, Turkey.¹⁵ Similar results were also noted in Department of Surgery, Derriford Hospital, United Kingdom.¹⁶ However in a study conducted in China at Department of Hernia and Abdominal Wall Surgery, The First Affiliated Hospital of Chongqing Medical University, Chongqing did not show any statistical difference in the post-operative pain among both groups self-fixating.¹⁷ The HIPPO Trial, a randomized double-blind trial comparing self-gripping mesh and sutured mesh in lichtenstein hernioplasty showed no benefit in terms of reducing post-operative pain but a definite advantage in reducing operative time.¹⁸

The operating time of patients undergoing hernia repair with mesh was compared with that of conventional polypropylene mesh and the mean operating time for repair with self-fixating mesh was 31.17 minutes and for conventional mesh was 41.75 minutes (Table 5). The average reduction in the operating time was about 10 minutes which was statistically significant. This result was comparable with similar study conducted in Department of Surgery, Derriford Hospital, Derriford Road, GB-Plymouth, PL6, United Kingdom.¹⁴ The average reduction in operating time in the above-mentioned study was 9 minutes.¹⁴ Most of the meta-analysis have shown a definite advantage in operating time when a self-adhesive mesh was used for hernia repair.^{19,20}

None of the patients enrolled in the study did not have any recurrence during the period of study, which indicated that self-fixating mesh was as efficacious as conventional polypropylene mesh in preventing recurrence. Studies with long term follow up have shown efficacy of self-adhesive mesh in terms of hernia recurrence similar to that of suture fixed conventional polypropylene mesh, although few studies have shown the recurrence rate of hernia to be higher when using a self-adhesive mesh.^{21,22}

CONCLUSION

A prospective observational the study was conducted in the department of General Surgery Government Medical college Kottayam, comparing self-fixating mesh with conventional polypropylene mesh among 120 patients

who underwent Lichtenstein's tension free hernia repair. Self-fixating mesh was found to be effective in reducing the postoperative pain and reducing the operating time in patients undergoing Lichtenstein's tension free inguinal hernia repair when compared with a conventional polypropylene mesh. The self-adhesive mesh was found to be as efficacious as conventional polypropylene mesh in preventing recurrences of hernia in patients undergoing Lichtenstein's tension free inguinal hernia repair.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Jenkins JT, O' Dwyer PJ. Inguinal hernias. *Bio Med J.* 2008;336(7638):269–72.
2. Rahul BG, Ravindranath GG. Incidence of inguinal hernia and its type in a study in a semiurban area in Andhra Pradesh, India. *Int Surg J.* 2016;3(4):1946–9.
3. Bhasin SK, Roy R, Agrawal S, Sharma R. An Epidemiological Study of Major Surgical Procedures in an Urban Population of East Delhi. *Indian J Surg.* 2011;73(2):131–5.
4. Singh S, Prakash R, Singh V. A clinical study of inguinal hernia with special reference to laparoscopic trans-abdominal pre peritoneal repair. *Int Surg J.* 2016;4(1):282–90.
5. Conze J, Klinge U, Schumpelick V. Hernias [Internet]. *Surgical Treatment: Evidence-Based and Problem-Oriented. Zuckschwerdt*; 2001. Available at: <https://www.ncbi.nlm.nih.gov/books/NBK6888/> Accessed on 23 October 2020.
6. Read R. The contributions of Usher and others to the elimination of tension from groin herniorrhaphy. *Hernia J Hernias Abdom Wall Surg.* 2005;9:208–11.
7. Usher FC, Hill JR, Ochsner JL. Hernia repair with Marlex mesh. A comparison of techniques. *Surgery.* 1959;46:718–24.
8. Baylón K, Rodríguez-Camarillo P, Elías-Zúñiga A, Díaz-Elizondo JA, Gilkerson R, Lozano K. Past, present and future of surgical meshes: a review. *Membranes.* 2017;7(3):47.
9. Forte A, D'Urso A, Palumbo P, Storto G, Gallinaro L, Bezzi M, et al. Inguinal hernioplasty: The gold standard of hernia repair. *Hernia J Hernias Abdom Wall Surg.* 2003;7:35–8.
10. Campanelli G, Sfeclan C, Cavalli M, Biondi A. Reducing postoperative pain: the use of Tisseel for mesh fixation in inguinal hernia repair. *Surg Technol Int.* 2012;22:134–9.
11. Canonico S, Benevento R, Perna G, Guerniero R, Sciaudone G, Pellino G, et al. Sutureless fixation with fibrin glue of lightweight mesh in open inguinal hernia repair: effect on postoperative pain: a double-blind, randomized trial versus standard heavyweight mesh. *Surgery.* 2013;153(1):126–30.

12. Campanelli G, Sfeclan C, Cavalli M, Biondi A. Reducing postoperative pain: the use of Tisseel for mesh fixation in inguinal hernia repair. *Surg Technol Int.* 2012;22:134–9.
13. Mazin JB. FACS. Causes of Postoperative Pain Following Inguinal Hernia Repair: What the Literature Shows [Internet]. Practical Pain Management. Available at: <https://www.practicalpainmanagement.com/causes-postoperative-pain-following-inguinal-hernia-repair-what-literature-shows>. Accessed on 23 October 2020.
14. Kingsnorth A, Gingell-Littlejohn M, Nienhuijs S, Schüle S, Appel P, Ziprin P, et al. Randomized controlled multicenter international clinical trial of self-gripping ParietexTM ProGripTM polyester mesh versus lightweight polypropylene mesh in open inguinal hernia repair: interim results at 3 months. *Hernia J Hernias Abdom Wall Surg.* 2012;16(3):287–94.
15. Yilmaz A, Yener O, Kaynak B, Yiğitbaşı R, Demir M, Burcu B, et al. Self-gripping CovidienTM ProGripTM mesh versus polypropylene mesh in open inguinal hernia repair: multicenter short term results. *Prague Med Rep.* 2013;114(4):231–8.
16. Kingsnorth A, Gingell-Littlejohn M, Nienhuijs S, Schüle S, Appel P, Ziprin P, et al. Randomized controlled multicenter international clinical trial of self-gripping ParietexTM ProGripTM polyester mesh versus lightweight polypropylene mesh in open inguinal hernia repair: interim results at 3 months. *Hernia J Hernias Abdom Wall Surg.* 2012;16(3):287–94.
17. Zhang C, Li F, Zhang H, Zhong W, Shi D, Zhao Y. Self-gripping versus sutured mesh for inguinal hernia repair: a systematic review and meta-analysis of current literature. *J Surg Res.* 2013;185(2):653–60.
18. Molegraaf MJ, Grotenhuis B, Torensma B, de Ridder V, Lange JF, Swank DJ. The HIPPO Trial, a Randomized Double-blind Trial Comparing Self-gripping Parietex ProGrip Mesh and Sutured Parietex Mesh in Lichtenstein Hernioplasty: A Long-term Follow-up Study. *Ann Surg.* 2017;266(6):939–45.
19. Antoniou SA, Köhler G, Antoniou GA, Muysoms FE, Pointner R, Granderath FA. Meta-analysis of randomized trials comparing nonpenetrating vs mechanical mesh fixation in laparoscopic inguinal hernia repair. *Am J Surg.* 2016;211(1):239–49.
20. Pandanaboyana S, Mittapalli D, Rao A, Prasad R, Ahmad N. Meta-analysis of self-gripping mesh (ProGrip) versus sutured mesh in open inguinal hernia repair. *Surg J R Coll Surg Edinb Irel.* 2014;12(2):87–93.
21. Fan JKM, Yip J, Foo DCC, Lo OSH, Law WL. Randomized trial comparing self gripping semi re-absorbable mesh (PROGRIP) with polypropylene mesh in open inguinal hernioplasty: the 6 years result. *Hernia J Hernias Abdom Wall Surg.* 2017;21(1):9–16.
22. Zwaans WAR, Verhagen T, Wouters L, Loos MJA, Roumen RMH, Scheltinga MRM. Groin Pain Characteristics and Recurrence Rates: Three-year Results of a Randomized Controlled Trial Comparing Self-gripping ProGrip Mesh and Sutured Polypropylene Mesh for Open Inguinal Hernia Repair. *Ann Surg.* 2018;267(6):1028–33.

Cite this article as: Jose A, Sadanandan S. Comparison of self-fixating mesh with conventional polypropylene mesh in lichtenstein's tension free inguinal hernia repair. *Int Surg J* 2021;8:220-5.