International Journal of Science and Research (IJSR)
ISSN: 2319-7064
Impact Factor (2018): 7.426

A Prospective Comparative Study of Open Inguinal Hernia Repair: Self Gripping Mesh Vs Standard Polypropylene Mesh

Sharath Chandra B.J[1], Divakar S. R[2], Dandeboyina Sreenivas[3], Sumith .S Deep[4]

[1, 2, 3, 4]JSS Medical College and Hospital, JSS University, Mysore, India

Abstract: ***To compare the clinical outcome in the open inguinal hernia repair with Self gripping (SG) polyester mesh incorporating absorbable polylactic acid microhooks (Progrip) to Lichtenstein repair with Standard polypropylene (SP) mesh in terms of postoperative pain, operating time, hospital stay and return to normal activities. Methods It is a prospective study done in JSS Hospital, Mysore from October 2016 to September 2018 using SG mesh and SP mesh in 60 patients allocated into two equal groups. Results: SG mesh repair is superior to SP mesh. Conclusions: SG mesh has better outcome in terms of post-operative pain, operative time and hospital stay.***

Keywords: Progrip mesh, self gripping, polypropylene mesh, post-operative pain, open inguinal hernia repair

1. Introduction

Inguinal hernia repair is one of the most frequently performed surgical operations. The morbidity and recurrence rates have decreased in the last two decades because of the introduction of open tension-free hernia surgery with mesh. There has been a revolution in surgical procedures for groin hernia repairs after the introduction of prosthetic material. In 1980s Lichtenstein described a tension-free, simple, flat, polypropylene mesh repair for inguinal hernia where mesh was fixed with sutures[(1)]. However, it was associated with chronic pain due to mesh fixation with sutures[(2)].Hence self grippingmesh [(3)] .was developed to avoid suture fixation and to diminish the formation of excessive fibrosis during healing. This material is semi-resorbable mesh made of polyester, polylactic acid hooks and is lighter than standard polypropylene mesh. Weight of self gripping mesh before absorption: (82g/m^2); weight after absorption: (49g/m^2 – lightweight). Polylactic acid micro hooks adherent to the surrounding tissue are thought to dissolve over time, resulting in a completely sutureless repair.

2. Literature Survey

Currently open mesh techniques are common and has reduced hernia recurrence rates to acceptable levels less than 2 %, so the focus of scientific attention has shifted towards prevention of post-operative pain. The rate of chronic pain following hernia repair ranges from 11 to 40% [(4)]. According to current statistical data. Many studies which used light weight mesh documented in less chronic pain[(5)] and diminished foreign body sensation.

Fixation of mesh is done to prevent migration of mesh resulting in recurrence but many studies which used self gripping mesh (without fixation) is not associated with any increased risk of hernia recurrence and however fixing the mesh not only increases the duration of procedure but also can cause complications like post operative pain. Self gripping mesh was developed to avoid suture fixation and to diminish the formation of excessive fibrosis. The Polyester Self-gripping mesh is made of a low-weight polyester that has resorbable polylactic acid microhooks. These micro hooks in the Polyester structure provide tissue-gripping application of the mesh. The flap is made of the same fabric as the mesh, i.e. Polyester and polylactic acid micro hooks. After resorption of the polylactic acidmicrohooks, only the low-weight Polyester fabric (49g/m2) remains[(6)] .

T. Verhagen et al [(7)] conducted a study, a total of 363 patients were analysed .The study concluded self-gripping mesh for hernia repair may result in less pain in the early postoperative phase but chronic post-herniorrhaphy pain is not affected and duration of surgery is significantly less in self gripping mesh.(22).

In a study by Kingsnorth A, et al [(8)] recent multicentre study found that duration of surgery was 6·5 min (17 per cent) shorter with the ProGrip mesh. A double-blind randomized clinical trial (RCT) was initiated to compare medium-term postoperative groin pain after ProGrip or standard polypropylene mesh for hernia repair.

Chastan et al[(6)] concluded self-gripping mesh will reduce post-operative pain by creating less fibrosis reaction and reducing the extent of required suture fixation.

3. Methods

This study was a prospective comparative study conducted in the patients diagnosed with inguinal hernia admitted in the department of general surgery in JSS Hospital, Mysore during October 2016 to September 2018 .The study compared the self-gripping mesh (Progrip) and the standard polypropylene mesh. The study was accepted by the ethical committee of JSS medical college.

60 patients diagnosed with inguinal hernia were admitted anda detailed history including age , chief complaints ,past history , personal history were collected and underwent a detailed physical examination . Preoperatively the patients were given options of Open inguinal hernia repair either without fixation of mesh or with fixation of mesh and were explained about the advantages, disadvantages and the cost

of the procedure. After taking written informed consent for the procedure, the patients were investigated thoroughly for fitness and they were grouped into 2 equal groups of 30 each ,group A (SG-self gripping)without mesh fixation and group B (SP-standard polypropelene) with mesh fixation. This study includes the patients above 18years of age and excluded patients with strangulated hernia, incarcerated hernia, femoral hernia and chronic pain associated with previous locoregional surgeries (Appendicectomy in right sided inguinal hernia.)

Operative technique: A dose of prophylactic antibiotic was given 30 minutes before surgery. The incision is placed about 1.25 cm above and parallel to medial 2/3rdof the inguinal ligament, from the pubic tubercle and extending 5-6 cm laterally up to the midinguinal point. The Scarpa fascia isopened till external oblique aponeurosis, and the external inguinal ring and the lower border of the inguinal ligament are visualized . The external oblique aponeurosis is opened The self-gripping flap of the mesh is released and loosely closed around the cordaway from the deeper part of the wound. The mesh is placed to its final position with color stitch orientated towards and overlapping more than 1 cm the pubic bone .The fixation is achieved by applying pressure on the mesh, starting caudally on the pubic bone, then medially onto the internal oblique structures. No sutures are taken to fix the mesh. The superior part of the mesh is fixed under the external oblique aponeurosis carefully by digital manipulation, taking care that the mesh is not folded during its placement. Finally, the mesh is pushed down towards the inguinal ligament and the lateral part is then allowed to fold onto the deep aspect of the divided external oblique aponeurosis. In its final position, the mesh is anchored into the tissue both at the transversalis structures, as well as to the ligament.

Post operative care and follow up:
Post operatively the patients were kept nil per oraland were maintained on intravenous fluids. Patients were advised to get back to their daily activities as early as possible. Parenteral antibiotics were given for the first 48 hours and was switched over to oral antibiotics for a total duration of 5 to 8 days. Analgesics were given 12 hourly for a period of 3 to 5 days, shifted on to oral tablets as early as possible. Patients were discharged once they were physically fit and were advised for suture removal on 7th to 9th postoperative day

The postoperative pain scores were analysed by visual analogue scale at 24hours, 1week, 1month, 3 months in both the groups. Pain intensity was assessed by a Visual Analogue Scale – VAS [0 (no pain) to 10 (worst pain)].Operating time was noted starting from the skin incision till the final suture taken for skin closure, duration of hospital stay, time taken to return to daily activitieswere recorded. The recurrence rate was analysed and compared by follow up of patients after 6 months in both the groups. Post operative complications like wound infection, hematoma, seroma, testicular swelling, chronic groin pain etc, were assessed and documented.

4. Statistical Methods

Data analysis was performed using spss 21.0 software. Categorical variables were analyzed with chi-squared test and continuous variables were analyzed with 't' test, Friedman test, Two way repeated measure ANOVA, Mann Whitney test.

Descriptive statistics: frequency, percentages, mean, standard deviation to compare the proportion of side effects between the two groups were used.

5. Result

60 patients were allocated into two equal groups.

Group A: Without fixation of mesh (SG) and
Group B: With fixation of mesh (SP) in Open inguinal hernia repair.

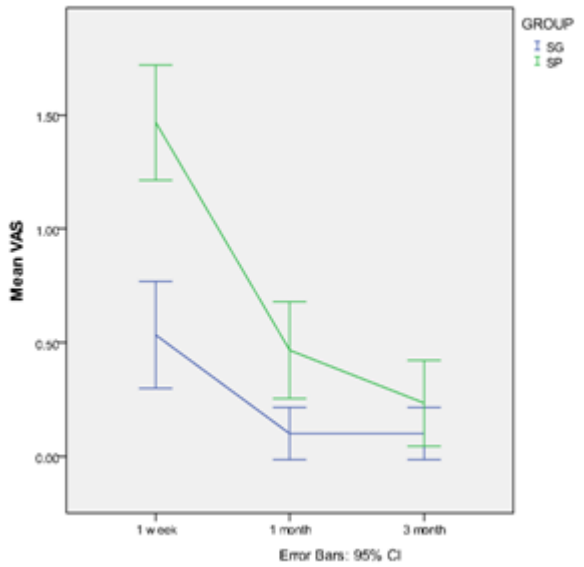
1) Post Operative pain in two groups at different point of time

The present study showed Lower pain scores among the patients who underwent open hernia repair with self gripping mesh. After 24 hours pain scores are 4.77±0.77 in SP group and 3.77±0.68 in SG group and at the end of 1 week the pain scores are 1.47±0.68 in SP group and 0.63±.00 in SG group with p value <0.0001 which is statistically significant.

Table1: Comparison of Post Operative pain in two groups at different point of time

VAS Post opearative pain	Group						
	Without Mesh fixation			With Mesh Fixation			
	Mean	SD	Median	Mean	SD	Median	P*
Pain after 24hrs	3.77	0.68	4.00	4.77	0.77	5.00	<0.0001
After 1 week	0.53	0.63	.00	1.47	0.68	1.00	<0.0001
After 1 month	0.10	0.31	.00	0.47	0.57	.00	0.004
After 3 months	0.10	0.31	.00	0.23	0.50	.00	0.26

p** = <0.0001; p*** = 0.8
**Friedman test; ***Two way repeated measure ANOVA;
*Mann Whitney test



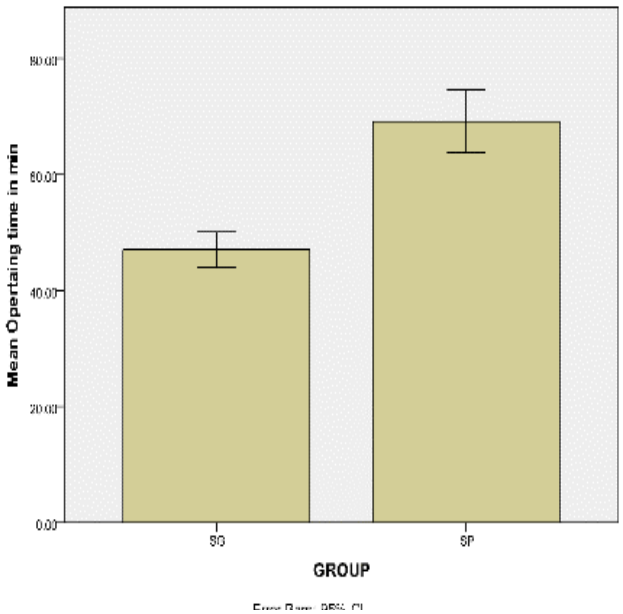
Graph 1: Post -operative pain in two groups at different point of time.

2. Comparison of operative time in both groups

In the present study, total operative time taken was 69.17±14.5 minutes for SP group and 47.03±8.26 minutes for SG group with P value <0.0001 which is statistically significant. The mean difference between the two groups with respect to operative time in the current study is 22 minutes. The duration of surgery was shorter in the SG group.

Table 2: Comparison of operating time in both groups

	Group				
	Without Mesh fixation		With Mesh Fixation		
	Mean	SD	Mean	SD	P
Operative Time	47.03	8.26	69.17	14.45	<0.0001



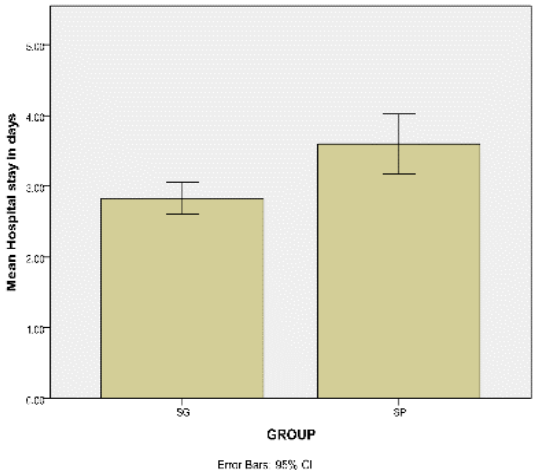
Graph 2: Operating time in both groups

3. Comparison of hospital stay

In Present study the mean duration of postoperative hospital stay in SP group was 3.60±1.13 days while that in SG Group was 2.83±0.59 days with 0.7 days(20 hours) shorter hospital stay in SG group with significant P value of <0.004.

Table 3: Hospital stay in both the groups

	Group				
	Without Mesh fixation		With Mesh Fixation		
	Mean	SD	Mean	SD	
Hospital Stay	2.83	0.59	3.60	1.13	0.004



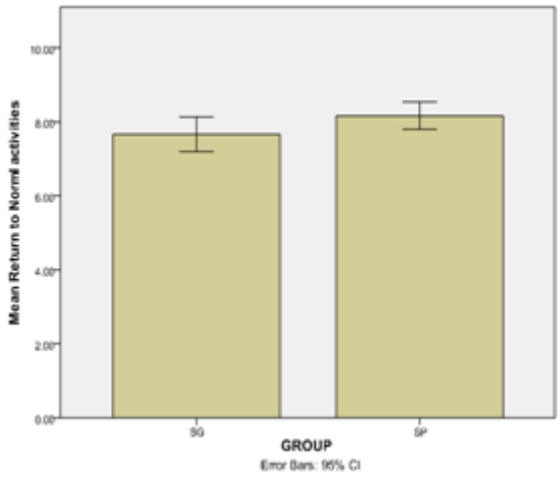
Graph 3: Hospital stay in both the groups

4. Comparison of return to normal activities in both the groups

Table 4: Comparison of return to normal activities in both the groups

	GROUP				
	SG		SP		
	Mean	SD	Mean	SD	
Return to Normal Activities	7.67	1.24	8.17	.99	0.1

The time taken to resume to the daily activities like getting dressed, walking, bathing and returning to work and doing light sedentary work like sitting, desk bound work is shortened in SG group. In the present study the time taken to resume to the daily activities is 8.17±0.99 days in SP group and 7.67±1.24 days in SG group. This difference was not statistically significant (P value <0.1),suggesting patients operated in both groups more or less get ambulated at the same time.



Graph 4: Mean return to normal activities in both the groups

5. Comparison of the complications in both the groups

In the present study none of the study groups had recurrence. Seroma formation was seen in both groups with incidence of one patient in each group.

Table 5: Comparison of the complications in both the groups

		Group			
		SG		SP	
		Count	Column N %	Count	Column N %
Complications	Nil	29	96.7%	29	96.7%
	Seroma	1	3.3%	1	3.3%

6. Discussion

The use of mesh has now become the standard of care in Tension free repair of inguinal hernia because mesh implantation is known to reduce recurrence. It has been observed that choice of the prosthesis in hernia repair is also an important determinant of outcome. It is described that polypropylene meshes, as a hydrophobic material, cause some degree of contraction and scar formation in the long-term follow-up. Polypropylene meshes have risk of recurrence, owing to overall decrease in the size of mesh, as well as an increased subjective foreign body feeling from contracture and scarring. Polyester seems not to suffer from these limitations because it is described as hydrophilic. Other advantages are the softness of polyester without loss of memory, making placement easier and its lack of tendency to stick to fat.

The present study was carried out at JSS Hospital and Medical College, Mysuru by comparing the two meshes in various clinical scenarios in terms of the outcome in immediate post-operative period and by follow up of the patients for 1 week,1 month,3 and 6 months. The results were analyzed and compared to various other studies done in this field.

1. In the present study, total operative time taken was 69.17±14.5 minutes for Polypropylene and 47.03±8.26 1minutes for Self Gripping mesh repair with P value <0.0001 which is statistically significant. The mean difference between the two groups with respect to operative time in the current study is 22 minutes. The duration of surgery was shorter in the SG group. However, it is variable and individual surgeon dependent.

Table 6: Comparison of operative time (mean ± 2SD /median in range) with other studies

Studies	SP	SG	p-value
DL Sanders et al [10]	43	35.4	<0.0001
Yilmaz A et al[9]	58.3 ± 15.2	24.9± 4.2	<0.001
Present study	69.17± 14.4	47.03±8.26	<0.001

In Yilmaz A et al [9] study Operative time in SP Group was 58.3±15.2 minutes and in Self Gripping mesh group it was 24.9±4.2 minutes. With P value in Yilmaz <0.0001.

In DL Sanders et al [10] study Operative time in SP Group was 43 minutes and in SG group it was 35.4 minutes.8 LN Jorgensen et al and Yilmaz A et al in their study found statistically significant difference between the two group.

2. The present study has a mean postoperative pain score of 4.77±0.77 in SP group and 3.77±0.68 in SG group at 24 hours. Lower pain scores are reported among patients in SG group in present study. Self-gripping mesh has less tissue dissection requirement. Polypropylene mesh repair requires more dissection, tissue handling. This may contribute to significant less post-operative pain after the Self Gripping mesh, compared to Polypropylene mesh. Present findings are consistent with the literature.

Comparison of post-operative pain (mean ± 2SD /median in range) with other studies

Chastan P et al [6] found post-operative pain score in self gripping mesh group it was 1.1±1.2.11.

In Sanders DL[10] et al study post-operative pain score in polypropylene Group was 8.6 and in self-gripping mesh Group it was 1.3 with P value 0.0001 which is statistically significant.

3. In Present study the mean duration of postoperative hospital stay in SP group was 3.60±1.13 days while that in SG Group was 2.83±0.59 days, with shorter stay of 0.7 days (20 hours) with a P value of 0.004 which is significant.
Jorgensen LN et al [11] , Yilmaz A et al [9] , Sanders DL et al[10] found duration of hospital stay in polypropylene Group and in self gripping mesh group was not statistically significant.

Table 7: Comparison of duration of hospital stay with other studies

Studies	SP	SG	p-value
Jorgensen N et al [11]	4	4	0.681
Yilmaz A et al[9]	1.2	1	0.492
Present study	3.60±1.13	2.83±0.59	0.004

4. The time taken to resume to the daily activities like getting dressed, walking, bathing and returning to job work and doing light sedentary work like sitting, desk bound work.

In the present study the time taken to resume to the daily activities is 8.17±0.99 days in SP group and 7.67±1.24 days in SG group. This difference was not statistically significant, with p value of 0.1 suggesting patients operated in both the groups get ambulated more or less at the same time.

Chastan P et al[6] found the time taken to resume to the daily activities in Self Gripping mesh group it was 5.5±3.6 days. Present findings are consistent with the literature. The cause of this early return to basic activities may be less postoperative pain due to less tissue handling and dissections.

5. In the present study none of the study groups had recurrence similar to the study conducted by Taylor C et al[12] in which without fixation of mesh in hernia repair was not associated with an increased risk of hernia recurrence and also in the study done by Beatti G C et al [13] and Koch C A et al [14] where there is no recurrence in any of the groups.

7. Conclusion

It is described that polypropylene meshes, as a hydrophobic material, cause some degree of contraction and scar formation in the long-term follow-up. Fixation of the mesh also leads to entrapment of neurovascular structures nearby Polypropylene meshes have risk of recurrence, owing to overall decrease in the size of mesh, as well as an increased subjective foreign body feeling from contracture and scarring. Polyester seems not to suffer from these limitations because it is described as hydrophilic and has better outcome in terms of operative time, post-operative pain and hospital stay. Hence our study favours open inguinal hernia repair with self gripping mesh over mesh fixation.

8. Future Scope

Self gripping mesh in open inguinal hernia repair is feasible, leading to a durable repair with less operating time, less post operative complications and being more pocket friendly to the patient.

References

[1] Bailey and love's Short practice of Surgery 27th edition:1032.
[2] Bisgaard T, Bay-Nielsen M, Christensen IJ, Kehlet H - Risk of recurrence 5 years or more after primary Lichtenstein mesh and sutured inguinal hernia repair - Br J Surg. 2007 Aug;94(8):1038-40
[3] Kapischke, M et al. Self-fixating mesh for the Lichtenstein procedure – a prestudy. Langenbeck's Archives of Surgery 2010; 395: 317-322.
[4] Nienhuijs SW[1], van Oort I, Keemers-Gels ME, Strobbe LJ, Rosman C. Randomized trial comparing the Prolene Hernia System, mesh plug repair and Lichtenstein method for open inguinal hernia repair -Br J Surg. 2005 Jan;92(1):33-8.
[5] O'Dwyer PJ, Kingsnorth AN, Molloy RG, Small PK, Lammers B, Horeyseck G. Randomized clinical trial assessing impact of a lightweight or heavyweight mesh on chronic pain after inguinal hernia repair. Br J Surg 2005; 92: 166–170
[6] Chastan P. Tension-free open hernia repair using an innovative self-gripping semi-resorbable mesh. Hernia 2009; 13: 137–142.
[7] T. Verhagen,W. A. R. Zwaans,M. J. A. Loos,J. A. Charbon,M. R. M. Scheltinga,R. M. H. Roumen.Randomized clinical trial comparing selfgripping mesh with a standard polypropylene mesh for open inguinal hernia repair. Br. J. Surg 2016; 103: 812-818
[8] Kingsnorth A, Gingell-Littlejohn M, Nienhuijs S, Schüle S, Appel P, Ziprin P et al. Randomized controlled multicenter international clinical trial of selfgrippingParietex™ ProGrip™ polyester mesh versus lightweightpolypropylene mesh in open inguinal hernia repair: interim results at 3 months. Hernia 2012; 16: 287–294.
[9] Yilmaz A, Yener O, Kaynak B, Yiğitbaşı R, Demir M, Burcu B, et al. SelfgrippingCovidienTMProGripTM Mesh versus polypropylene mesh in open inguinal hernia repair: multicenter short term results. Prague Med Rep. 2013;114(4):231-8.
[10] Smeds S, Nienhuijs S, Kullman E, Sanders DL, Lehnert T, Ziprin P, GingellLittlejohn M, Miserez M, KingsnorthA.Hernia. 2016 Feb;20(1):33-41.
[11] Jorgensen LN, Sommer T, Assaadzadeh S, Strand L, Dorfelt A, Hensler M et al.; Danish Multicentre DANGRIP Study Group. Randomized clinical trial of self-gripping mesh versus sutured mesh for Lichtenstein hernia repair. Br J Surg 2013; 100: 474–481.
[12] Taylor C, Layani L, Liew V, Ghusn M, Crampton N, White S : Laparoscopic inguinal hernia repair without mesh fixation, early results of a large randomised clinical trial. - SurgEndosc. 2008 Mar;22(3):757-62. Epub 2007 Sep 21.
[13] G.C. Beattie, S. Kumar, S.J. NixonLaparoscopic total extraperitoneal hernia repair: mesh fixation is unnecessary. J LaparoendoscAdvSurg Tech A, 10 (2000), pp. 71-73
[14] Koch CA, Greenlee SM, Larson DR, Harrington JR. Randomized prospective study of totally extraperitoneal inguinal hernia repair: fixation versus no fixation of mesh. JSLS. 2006;10:457–460.