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RESEARCH ARTICLE
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A COMPARATIVE STUDY OF INGUINAL HERNIA USING MONOFILAMENT NON-ABSORBABLE SUTURE VERSUS MONOFILAMENT DELAYED ABSORBABLE SUTURE FOR MESH FIXATION IN LICHTENSTEIN TENSION FREE HERNIA: REPAIR RANDOMIZED CONTROLLED STUDY (SINGLE BLINDED)

Dr Bhuvaneshwari Gachinmath[1*], Dr Mahantesh Math[2], Dr Bailappa A Kolhar[3], Dr B V Goudar[4], Dr Rajendra Benkatti[5]

[1*]Postgraduate, S. Nijalingappa Medical College and HSK Research Centre, Bagalkote, Karnataka
[2]MBBS MS Mch, Assistant Professor in General Surgery, S. Nijalingappa Medical College and HSK Research Centre, Bagalkote, Karnataka
[3]Professor and Head of the Unit General Surgery, S. Nijalingappa Medical College and HSK Research Center, Bagalkote, Karnataka
[4]Professor and Head of unit General Surgery Department, S. Nijalingappa Medical College and HSK Research Center, Bagalkote, Karnataka
[5]MBBS MS, Professor in General Surgery, S. Nijalingappa Medical College and HSK Research Centre, Bagalkote, Karnataka

***Corresponding Author:** Dr Bhuvaneshwari Gachinmath
*Postgraduate, S. Nijalingappa Medical College and HSK Research Centre, Bagalkote, Karnataka

ABSTRACT

Introduction: A hernia occurs when tissue or an organ, like the bowel, protrudes through the normal cavity wall. Various techniques for mesh implantation involving sutures are used to secure the mesh in place and prevent migration, wrinkling, and curling. **Aim**: To enhance the quality of life for patients and decrease complications of inguinal hernia repair, specifically chronic groin pain, without impacting the recurrence rate.

Methodology: Seventy patients admitted to our institute with proven diagnosis of inguinal hernia and admitted from 1st August 2022 to 31st January 2024 were included in the study, and were subjected to delayed absorbable or non- absorbable monofilament suture for mesh fixation in lichtenstein tension free hernioplasty, with follow up. Chronic groin pain in post op assessed by VAS score, seroma formation, and wound infection was compared in both groups.

Results: Among the participants subjected to Prolene suture, 7/35 (20%), 8/35 (22.9%) and 1/35 (2.9%) showed wound infection on day 4, 5, and 15, respectively. Among the participants subjected to PDS material, 5/35 (14.3%), 6/35 (17.1%) and 1/35 (2.9%) showed wound infection on days 4,8 and 15, respectively. The p value was found to be > 0.05.

Among the participants subjected to Prolene, 7/35 (20%) showed seroma formation on day 8, as compared to this complication noted in only 1 case (2.9%) among PDS group. Prolene group accounts to major occurrence of scrotal edema as compared to PDS group. The two cases who

underwent repair using Prolene material showed recurrence on post-operative days 30 and 90 (1/35;2.9% each).

Conclusion: This study concludes that the use of absorbable suture such as PDS has superior benefit over non-absorbable suture Prolene, in preventing the post-operative complications after Lichtenstein Tension-Free Hernia repair.

MANUSCRIPT

Introduction: A hernia occurs when tissue or an organ, like the bowel, protrudes through the normal cavity wall. Several different forms of hernias can develop, with the abdomen and groin being the most frequently affected areas. In inguinal hernia, the most frequently seen type is groin hernia.An inguinal hernia occurs when a viscous material bulges into the inguinal canal via the deep ring or Hesselbachs triangle. [1]

Surgery is the preferred treatment for all cases of inguinal hernia. Inguinal hernia surgery has a long history in the field of surgery.[2] Before the use of mesh, patients often experienced prolonged pain from sutures and had higher rates of recurrence compared to lichtenstein hernia repair. Modern techniques like lichtenstein hernia repair with mesh fixation have reduced the recurrence rate to 1-5%.[3,4]

Ever since Bassini first mentioned it, the goal of an optimal hernia repair has been to be free of tension, based on tissue, with no lasting pain or complications, and no chance of recurrence. The most frequent complication is chronic inguinal pain, affecting sixteen to sixty percent of patients after surgery.[1,2,5] Chronic groin pain is defined by IASP as any VAS score above zero lasting over 3 months post-inguinal hernia surgery.[4] Increased focus is on the risk of chronic pain after hernioplasty, likely neuropathic in origin. Nerve compression by sutures used for mesh fixation often leads to chronic inguinal region pain and discomfort. [6]Lichtenstein tension-free hernioplasty is commonly preferred by surgeons.[7]

Finding a balance between ensuring secure fixation is the main challenge in avoiding these complications. Both sutures and tissue adhesives were determined to be equally safe in terms of recurrence and wound infection. Repairing inguinal hernias with an open mesh technique is comparatively simpler, more cost-effective, and can be performed using local anesthesia. Many studies have been carried out using modified mesh fixation techniques, which involve altering the type or quantity of sutures, or changing the knotting method. Various techniques for mesh implantation involving sutures are used to secure the mesh in place and prevent migration, wrinkling, and curling. The primary aim of these studies is to enhance the quality of life for patients and decrease complications of inguinal hernia repair, specifically chronic groin pain, without impacting the recurrence rate.[7,8,9]

An inguinal hernia occurs when soft tissue protrudes through a weak spot in the abdominal muscles. It is a commonly seen diagnosis that is often encountered in everyday practice. Groin hernias account for 75 - 85% of abdominal wall hernias, with the most common being inguinal hernia. Indirect inguinal hernia is most frequently seen in men and women who are in the younger age group. Common factors that can cause inguinal hernia include smoking, obesity, prior surgery, constipation, straining, and multiple pregnancies. The most frequent symptoms reported to doctors are swelling and a dragging pain in the groin. The preferred surgery for hernia treatment is the lichtenstein tension free hernioplasty. The most frequent method for attaching mesh during hernia repair is with non-absorbable suture material. One of the most frequent postoperative issues is persistent groin pain caused by the non-absorbable suture utilized in mesh fixation. [8,9] Therefore, we aim to assess the benefits of delayed absorbable suture compared to non-absorbable suture.

Materials and Methods

All the patients admitted to our institute S. Nijalingappa medical college and HSK hospital and research center with proven diagnosis of inguinal hernia and admitted from 1st August 2022 to 31st January 2024 were taken in the study, With the consent of patients, all were subjected to delayed absorbable or non- absorbable monofilament suture for mesh fixation in lichtenstein tension free hernioplasty. Chronic groin pain in post op assessed by VAS score, seroma formation, and wound infection was compared in both groups.

This is a single blinded , randomized controlled study conducted for a period of 1.5 year at our institute, on an estimated sample size of 35 in each group, i.e. 35 in monofilament absorbable Polydioxanone Suture (PDS) & 35 in monofilament non absorbable Prolene group. The follow up was done for four months in each case.

Patients of age group more than 18 years with Uncomplicated inguinal hernia were included in the study.

Patients not willing for the study, Uncontrolled Hyperglycemia and Immunocompromised patients were excluded from the study.

Results: The group of participants subjected to Prolene material included majority of the patients belonging to age group 61-70 years (9/35;25.7%). The group of participants subjected to PDS material included majority of the patients belonging to age group of 61-70 years (8/35; 22.9%). The present study included patients of various occupations including participants belonging to different lifestyles ranging from strenuous work such as farmers, to sedentary lifestyle such as students and teachers. Majority of the patients with hernia belonged to the farmers group (17/70; 24.3%) explaining the risk factor of lifting heavy weights or strenuous exercise to be the contributing to the cause of hernia.

In the present study, among 70 participants majority of the participants complained of inguinal swelling. The laterality was localized to right in majority of them (32/70; 45.7%), followed by left sided swelling in 25/70 (35.7%) of the participants. Bilateral inguinal swelling was noted in 13/70 cases (18.6%). The distribution of complaints among the two groups were compared and the results were statistically significant (p value < 0.05). (Table 1)

Table 1: Age distribution of study participants

Age (in years)	Suture		Total	Chi-square, P-value
	PROLENE	PDS		
21-30	4 (11.4%)	6 (17.1%)	10 (14.3%)	.813a, 0.976
31-40	7 (20.0%)	6 (17.1%)	13 (18.6%)	
41-50	6 (17.1%)	6 (17.1%)	12 (17.1%)	
51-60	7 (20.0%)	6 (17.1%)	13 (18.6%)	
61-70	9 (25.7%)	8 (22.9%)	17 (24.3%)	
>70	2 (5.7%)	3 (8.6%)	5 (7.1%)	
Total	35 (100.0%)	35 (100.0%)	70 (100.0%)	

The incidence of wound infection was compared among the two groups. A total of 28 cases (40%) of study participants showed wound infection during the follow up period. Among the participants subjected to Prolene suture, 7/35 (20%), 8/35 (22.9%) and 1/35 (2.9%) showed wound infection on day 4, 5, and 15, respectively. Among the participants subjected to PDS material, 5/35 (14.3%), 6/35 (17.1%) and 1/35 (2.9%) showed wound infection on days 4,8 and 15, respectively. The p value was found to be > 0.05 on each day of wound infection and was not statistically significant .This suggests that the occurrence of wound infection was comparable among both the groups, irrespective of the material used for surgery. (Figure 1)

Seroma is a common post-operative complication which is defined as an abnormal localized accumulation of serous fluid with an empty space. Among 70 patients, 8/ 70 (11.42%) showed seroma formation. Among the participants subjected to Prolene, 7/35 (20%) showed seroma formation on day 8, as compared to this complication noted in only 1 case (2.9%) among participants subjected to PDS material. The results among the two groups were compared and showed p value less than 0.05 (FIG 2). This suggests that the occurrence of seroma formation was significantly higher among the Prolene group compared to PDS group of hernial repair.

Among the 70 participants, 9/70 (12.85%) showed collection of extracellular fluid within the scrotal sac leading to scrotal edema. This complication was noted in 2/35 (5.7%), 4/35 (11.4%) and 1/35 (2.9%) on days 3, 4 and 8, respectively. This group accounts to major occurrence of this complication as compared to PDS group. Among the 35 participants in the PDS group, only two cases (1/35; 2.9% each on day 4 and day 8) showed scrotal edema. The p value for comparison of scrotal edema among the two groups was less than 0.05, which suggests that the incidence of this complication was higher among the participants on Prolene compared to PDS showing statistically significant difference. (FIG 3)

The post-operative recurrence of hernia after the mesh fixation using Lichtenstein tension free hernioplasty technique was found to in two cases post-operatively. Both the cases belonged to Prolene group and none of the patients subjected to PDS had post-operative recurrence. The two cases who underwent repair using Prolene material showed recurrence on post-operative days 30 and 90 (1/35;2.9% each). The results were compared and showed p value of less than 0.05 which was statistically significant. This suggests that the recurrence was significantly higher among the Prolene group compared to PDS group. (Figure 4)

The post-operative groin pain was assessed among the study participants and was pain was noted to be present among all the study participants. All the participants with repair using Prolene material showed groin pain up to 4^{th} post operative day (35/35;100%). Only one patient recovered on 5^{th} postoperative day (34/100;97.1%). There was a gradual reduction in number of patients complaining of pain on each follow up visits (25/35; 71.4%, 17/35; 48.6%, 13/35; 37.1% and 6/35; 17.1% on days 30, 60 and 90, respectively). (Figure 5)

Among the patients who underwent repair using PDS, only 17/35 (48.6%) complained of groin pain on day 1. Whereas 20/35 (57.1 %) showed pain on 2^{nd} post-operative day. Then the number of patients with pain gradually reduced on each postoperative day (45.7%, 31.4% and 34.3%, on days 3,4 and 5, respectively). The groin pain was noted in only 6/35 cases (17.1%) with PDS material by the end of 90^{th} post-operative day. The study results for groin pain among the two groups were compared and the p value was less than 0.001 up to day 15 and less than 0.05 up to day 60. This suggests that the incidence and duration of groin pain is much higher among participants who were subjected to lichtenstein tension free hernioplasty using Prolene, as compared to PDS. (Fig 6)

Discussion: Inguinal hernia is a routinely encountered condition that is often seen in regular clinical practice. The Lichtenstein technique, also known as tension free mesh repair, is the current preferred method for open inguinal hernia repair. The Lichtenstein repair has decreased the occurrence of repeated inguinal hernia. At present, Inguinodynia, or chronic groin pain, is a frequent issue following hernia repair surgery and can impact one's quality of life. Between sixteen to sixty two percentage of patients have reported experiencing persistent groin pain. It needs to be distinguished from early postoperative pain. As per the International Association for the Study of Pain (IASP), chronic groin pain is described as any VAS score above zero lasting over 3 months after inguinal hernia repair. The main agreement is to distinguish between postoperative pain and chronic groin pain at the 3-month mark. The pain can either be constant, as patients describe it as a constant sensation, or it can be triggered by certain activities such as cycling, running, kneeling, walking upstairs, gardening, or lifting at work. Long-term groin pain can result from nerve damage from dissection or retraction, nerve compression from post-surgery scarring, fibrosis from mesh, or

sutures securing the mesh. The mesh can be fastened with either non-absorbable sutures or absorbable sutures.[10,11]

Lichtenstein hernioplasty is a method for fixing inguinal hernias without tension, using a polypropylene mesh to reinforce the inguinal muscle layer. Between ten to thirty per cent of procedures can result in chronic pain. The discomfort could result from irritation or injury to the inguinal nerves by sutures or mesh, an inflammatory response to the mesh, or scar tissue. Neuropathic pain is frequently described as being related to youth and occurring during physical activity, with a higher likelihood of being linked to repeated hernia surgery. Regular utilization of mesh techniques decreases the chance of hernia returning when compared to methods that do not use mesh. Recognizing and protecting inguinal nerves during surgery may also lower the chances of developing chronic pain. However, pain is connected to both the patient and surgical elements. Patients who have a high preoperative physical activity score and high pain response to a standard heat stimulus might experience less pain following hernia repair surgery. Also, using a lightweight mesh may be connected with much lower levels of pain during physical activity and decreased feeling of an external object when compared to standard mesh. The classic method for securing mesh in Lichtenstein hernioplasty involved using permanent sutures positioned close to the pubic periosteum and mesh upper corner, as well as continuous sutures along the inguinal ligament. Afterwards, some have reported using absorbable stitches, different tissue adhesives or innovative self-attaching mesh. The goal of these techniques is to decrease chronic neuropathic pain and expedite surgical procedures.[10,11]

The present study showed mean age of occurrence of 51+/- 16.29 for study group on whom non-absorbable suture was used and 49.29 +/- 16.11 on the group with absorbable suture. The study results were in concordance with the study done by Patel KR et al[1], Kharadi et al [7], Igor et al [2], Jenew et al [10], Paajanen et al [11], Lionetti et al [12], Meena et al [4], Pierides et al [13], and Kim-Fuchs et al [14] who also showed similar mean age incidence of approximately 50 years.

The study results of laterality of occurrence were comparable with the studies done by Patel KR et al[1], Rahul B G et al [15], Charles et al [16] and Saeed et al [17], who also showed predominance of unilateral hernias compared to bilateral. Among the unilateral hernias, right sided occurrence was more common compared to left sided hernia.

The present study showed mean post-operative complication of pain among both the study groups. This finding was higher among the group on whom non-absorbable suture was used (mean of 1.08+/-0.37) as compared to group with absorbable suture (mean- 036+/- 0.39). The p value was less than 0.001 which was statistically significant. Our study results were comparable with the study done by other researchers who also showed statistically significant results (p value < 0.05). (Table 2)

The complication of wound infection was common among the participants of group A. Similar results were obtained by study done by Jenaw et al [10], who also showed significantly higher number of cases with wound infection among the group A participants compared to group B.

The present study showed formation of seroma as a complication of hernia repair among 7/35 patients of Group A and among only 1/35 cases among group B. This was in comparison with the studies done by Jenaw et al [10] and Igor et al [2] who also showed higher incidence of Seroma formation among patients on whom non-absorbable suture was used, compared to absorbable suture group.

The present study shows that the occurrence of scrotal edema was higher among the group with non-absorbable suture (7/35) compared to absorbable suture (2/35). This was in concordance with studies done by Patel KR et al [1], Paajanen et al [11], and Kharadi et al [7] who also showed higher incidence of scrotal edema among the group A participants compared to Group B participants.

Recurrence is a complication of any surgical procedure. This was exclusively noted among group A participants in our study. Similarly, the group A showed higher incidence among group A compared

to group B in study done by Jenaw et al [10]. Other studies showed higher incidence among group B. This recurrence may be due to persistence of risk factors among the study participants, which increases the pressure within abdomen and predisposes to hernial protrusion. Thus, prevention of the causative factors plays an important role in avoiding the chances of recurrence among the patients undergoing surgical repair.

Limitations of the study

This is a single institution study that was conducted on smaller group of study population. The surgeries were performed by different surgical teams on different patients, which may cause difference in fine surgical skills. The follow up was only done up to 3-4 months, late complications beyond the follow up period could not be recorded.

Conclusion: The present study noted that the occurrence of Inguinal hernia is common among the individuals during their 5^{th} to 6^{th} decade of life. The common presentation is of unilateral right sided occurrence.

This study highlights that the incidence of postoperative complications such as post-operative pain, wound infection, seroma formation, scrotal edema and late complication such as recurrence are commonly noted in both non-absorbable and absorbable sutures used in hernia repair, but the incidence is higher among the non-absorbable prolene group compared to absorbable suture group. This study concludes that the use of absorbable suture such as PDS has superior benefit over non-absorbable suture Prolene, in preventing the post-operative complications after Lichtenstein Tension-Free Hernia repair.

References

1. Patel KR, Jain AP, Shah SC, Rathwa R, Gosai K. A comparative study of inguinal hernia using monofilament non-absorbable suture versus monofilament absorbable suture in Lichtenstein tension free hernia repair at tertiary care government hospital. Int Surg J 2019;6:4364-9.
2. Igor j, Wiser I, Karasic E, Nesterenko V, Poluksht N, Lavy R, et al. Reduced pain after tension free inguinal repair using absorbable sutures: a single blind randomised clinical trial. J Am Coll Surg. 2014;218:102-7.
3. Matikainen M, Vironen J, Kossi J, Hulmi T, Hertsi M, Rantanen T, Paajanen H. Impact of mesh and fixation on chronic inguinal pain in lichtenstein hernia repair: 5-Year outcomes from the finn mesh study. World J Surg2021;45:459–64.
4. Meena LN, Bansal S, Verma P, Rai R. A comparative study of postoperative chronic pain after tension free inguinal hernia repair using absorbable versus non absorbable sutures for mesh fixation. Int Surg J 2018;5(4):1378-81.
5. Mui WL, Ng CS, Fung TM, Chenug FK, Wong CM, Ma TH. Prophylactic ilioinguinal neurectomy in open inguinal hernia repair: a double blinded randomised controlled trial. Ann Surg. 2006:244:27-33.
6. Bay-Nielsen M, Nilsson E, Nordin P et al (2004) Chronic pain after open mesh and sutured repair of indirect hernia in young males. Br J Surg 91:1372–76.
7. Kharadi A, Shah V. Comparative study of mesh fixation with non-absorbable v/s delayed absorbale suture in open inguinal hernia. Int Surg J. 2016;3(3);1180-3.
8. Redha AGM, Jaber AA, Nasser AM. The difference in outcome of patients with open inguinal hernia repair by using delayed absorbable sutures instead of non-absorbable sutures for mesh fixation. Int Surg J 2021;8:24-7.
9. Patchayappan M, Narayanasamy SN, Duraisamy N. Three stitch hernioplasty: A novel technique for beginners. Avicenna J Med. 2015;5:106-9.
10. Aasvang E, Kehlet H. Surgical management of chronic pain after inguinal hernia repair. Br J Surg. 2005;92:795-801.

11. Paajanen H, Kossi J, Silvasti S, Hulmi T, Hakala T. Randomized clinical trial of tissue glue versus absorbable sutures for mesh fixation in local anaesthetic Lichtenstein hernia repair. Br J Surg. 2011;98:1245-51.
12. Lionetti R, Neola B, Dilillo S, Bruzzese D, Ferulano GP. Sutureless hernioplasty with light-weight mesh and fibrin glue versus Lichtenstein procedure: a comparison of outcomes focusing on chronic postoperative pain. Hernia. 2012;16:127-31.
13. Kim-Fuchs C, Angst E, Vorburger S, Helbling C, Candinas D, Schlumpf R. Prospective randomized trial comparing sutured with sutureless mesh fixation for Lichtenstein hernia repair: long-term results. Hernia. 2012;16:21-7.
14. Pierides G, Scheinin T, Remes V, Hermunen K, Vironen J. Randomized comparison of self-fixating and sutured mesh in open inguinal hernia repair. Br J Surg. 2012;99:630-6.
15. 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;3:1946-9.
16. Charles, M. R., Christian, L. B., Sen, T., Mahapatra, S., & Joshi, B. R. (2013). A Two year Retrospective Study of Congenital Inguinal Hernia at Western Regional Hospital. *Journal of Nepal Medical Association*, *39*(133), 172–175. https://doi.org/10.31729/jnma.687
17. Saeed AB, Rabee B, Aram FO, Abdulla A. Inguinal hernia repair by Darning. Yemeni.j.Med.Sci 2009;3(1):1-5

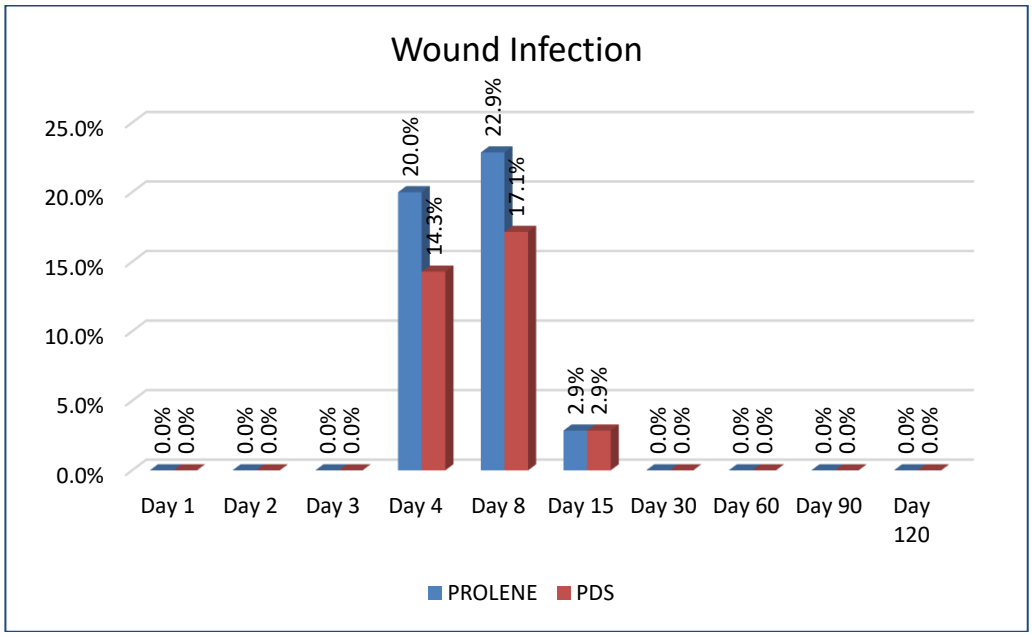

Figure 1: WOUND INFECTION

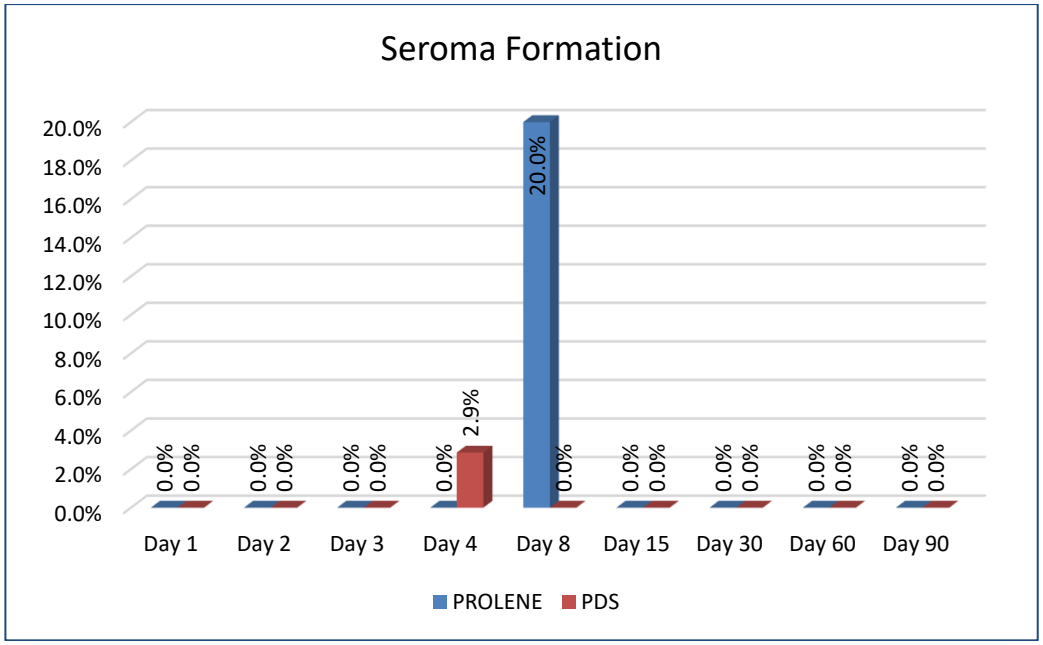

Figure 2 : SEROMA FORMATION

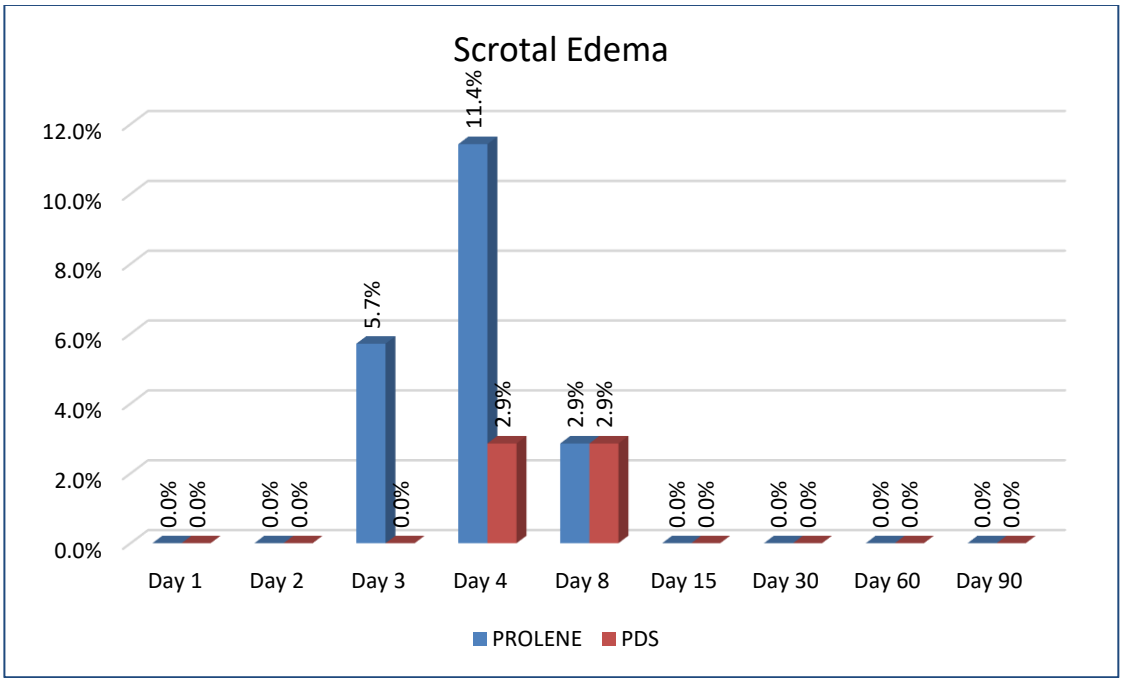

Figure 3 : SCROTAL EDEMA.

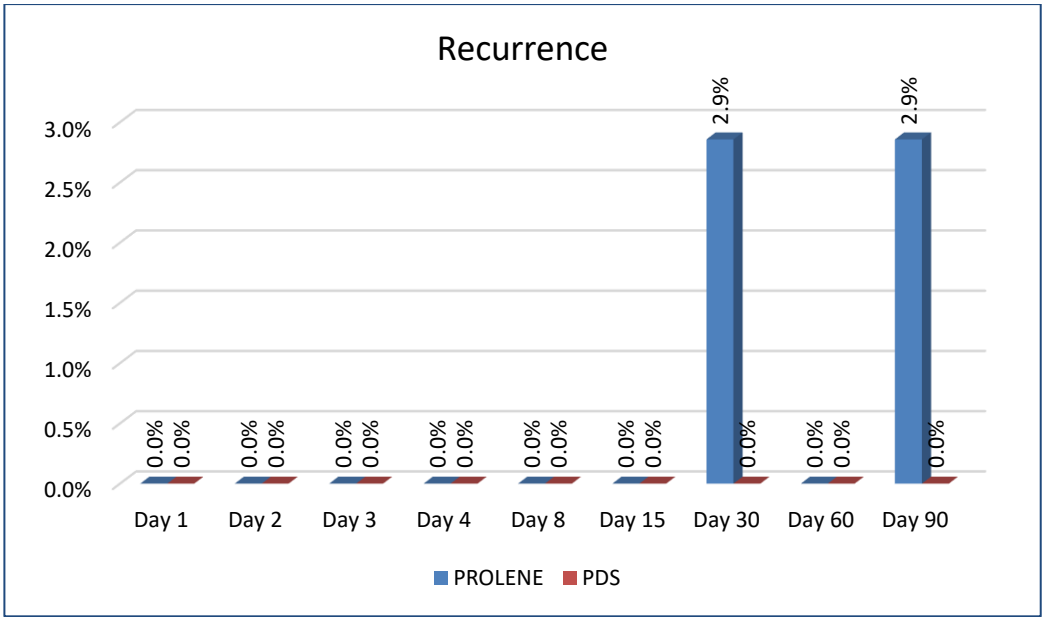

Figure 4: Comparison of Recurrence among the two groups

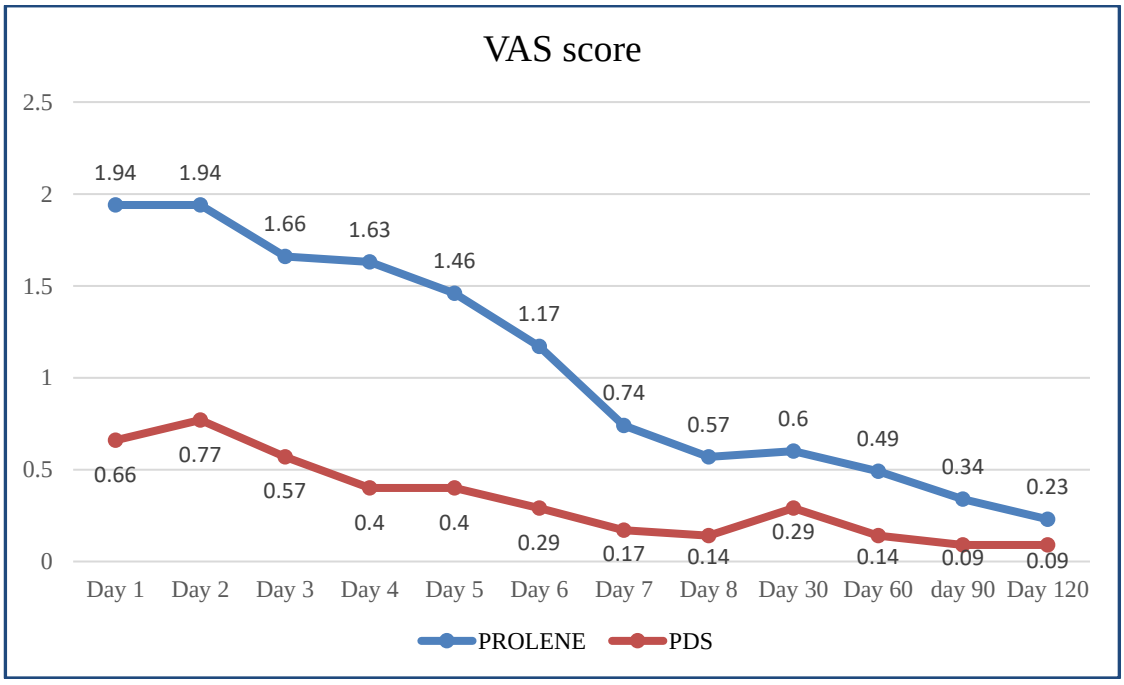

Figure 5 : Pain score (VAS) comparison between groups

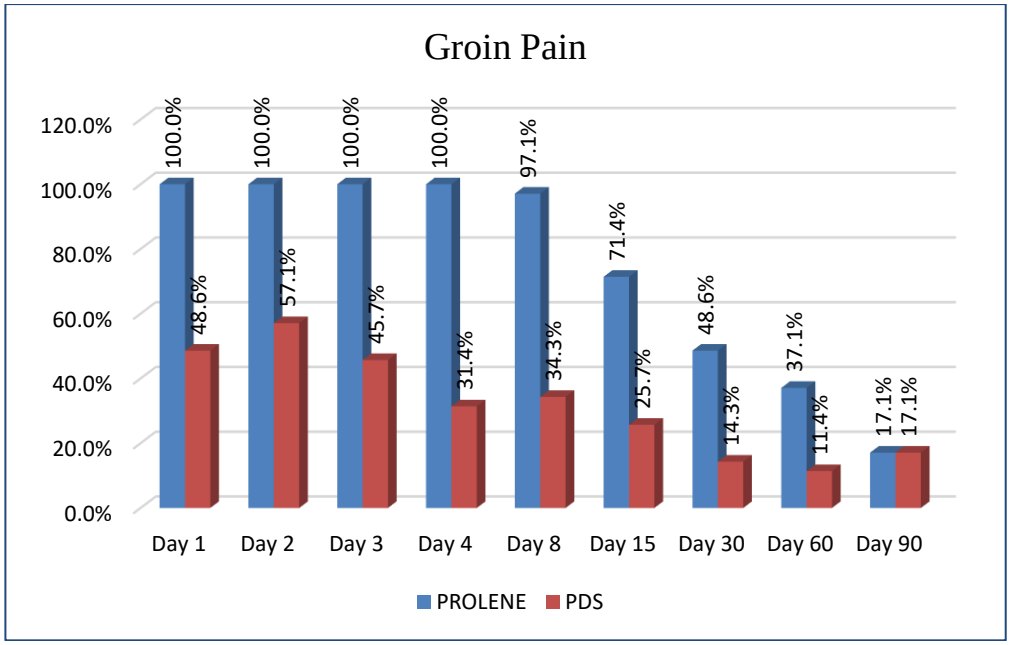

Figure 6: Comparison of Groin Pain among the two groups

Table 1: Distribution by Laterality of Inguinal hernia

Laterality	Suture		Total	Chi-square, P-value
	PROLENE	PDS		
Left inguinal swelling	16 (45.7%)	9 (25.7%)	25 (35.7%)	3.152a, 0.207
Right inguinal swelling	14 (40.0%)	18 (51.4%)	32 (45.7%)	
b/l inguinal swelling	5 (14.3%)	8 (22.9%)	13 (18.6%)	
Total	35 (100.0%)	35 (100.0%)	70 (100.0%)	

Table 2 showing comparison of mean VAS score with previous studies

Previous studies	Mean VAS score		P value
	Group A (Non-absorbable suture)	Group B (Absorbable suture)	
Patel KR et al[1]	10	3	0.048
Kharadi et al [7]	4	2	0.40
Igor et al [2]	29	26	0.071
Jenaw et al [80]	8	2	0.043
Paajanen et al [81]	30	22	0.3
Lionetti et al [82]	6	0	<0.001
Meena et al [4]	15	5	0.02
Present study	**1.08 +/- 0.37**	**0.36 +/- 0.39**	**< 0.001**