

## **Sutures used in ventral and inguinal hernia mesh fixation - a comparative outcome of polypropylene 2-0 versus polyglactin 2-0**

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### **Abstract**

**Background:** Polyglactin 2-0 is more convenient suture than polypropylene 1-0 in repair of inguinal and ventral hernia with mesh fixation.. As more data is required before clinical application, we compared both polyglactin 2-0 and polypropylene 1-0 in ventral and inguinal hernia repair with mesh fixation.

**Methods:** We analyzed the data of 46 patients who presented to the department of General Surgery, NKPSIMS & LMH, Nagpur, Maharashtra with inguinal and ventral hernia between Feb2018 to Feb 2021. The comparison was carried out considering the post-operative complications like seroma formation, post-operative pain, foreign body sensation and recurrence.and chi square test was used for the comparison of these variables.

**Results:** Group A revealed 4 (17.39%) cases of post-operative pain rate as compared to group B which was 3 (13.04%). Rate of seroma formation in group A was 4

(17.39%) patients while it was 3(13.04%) in group B. Post-operative foreign body sensation occurred in 14 (60.86%) patients in Group A and 1 (4.34%) in group B ( $p = 0.018$ ). Recurrence occurred in 1 (4.34%) patient in group A and 1 (4.34%) recurrence was reported in group B. Group A had patients for whom mesh was fixed with polypropylene and Group B had patients for whom mesh was fixed with polyglactin suture..

**Conclusion:** Polyglactin 2-0 was far superior to polypropylene 1-0 in inguinal and ventral hernia repair mostly in terms of foreign body sensation.

**Keywords:** Inguinal hernia, ventral hernia, seroma, foreign body sensation, recurrence, polyglactin 2-0, polypropylene 1-0.

### **Introduction**

#### **Inguinal Hernia**

Worldwide, more than 20 million patients undergo groin hernia repair annually [1]. Inguinal hernia, the most frequently occurring type of hernia globally, with

an approximate of 75% of all hernias of abdominal wall. Inguinal hernia repair accounts for 10 to 15% of all surgeries. Hernias can be defined as a “protrusion of a viscus or part of the viscus through an abnormal opening in the walls of its containing cavity”.<sup>6</sup> Inguinal hernias can be congenital or acquired, and the latter is common<sup>[2]</sup>. It is seen that clinically the most common type of hernia is inguinal hernia with approx 27% to 43% rate of occurrence in males and it is 3-6% in females<sup>[3]</sup>. It is seen that inguinal hernia is one of the most common surgical procedure carried out worldwide, more than 20 million people undergo inguinal hernial repair annually<sup>2[4]</sup>. The Lichtenstein repair is a widely accepted and durable treatment option for a tension-free repair of inguinal hernias. However, acute and chronic postoperative pain remains a significant issue<sup>[5]</sup>. Inguinal hernias present with a lump in the groin that goes away with minimal pressure or when the patient is lying down. Most cause mild to moderate discomfort that increases with activity.

Inguinal hernias are at risk of irreducibility or incarceration, which may result in strangulation and obstruction; however, unlike with femoral hernias, strangulation is rare. . A recent larger study estimated the lifetime risk of strangulation at 0.27% for an 18 year old man and 0.03% for a 72 year old man<sup>[6]</sup>. A hernia is reducible if it occurs intermittently (such as on straining or standing) and can be pushed back into the abdominal cavity, and irreducible if it remains permanently outside the abdominal cavity. A reducible hernia is usually a longstanding condition, and diagnosis is made clinically, on the basis of typical symptoms and signs. The condition may be unilateral or bilateral and may recur after treatment (recurrent hernia).

Inguinal hernias are often classified as direct or indirect, depending on whether the hernia sac bulges directly through the posterior wall of the inguinal canal (direct hernia) or passes through the internal inguinal ring alongside the spermatic cord, following the coursing of the inguinal canal (indirect hernia). However, there is no clinical merit in trying to differentiate between direct or indirect hernias<sup>[6]</sup>.

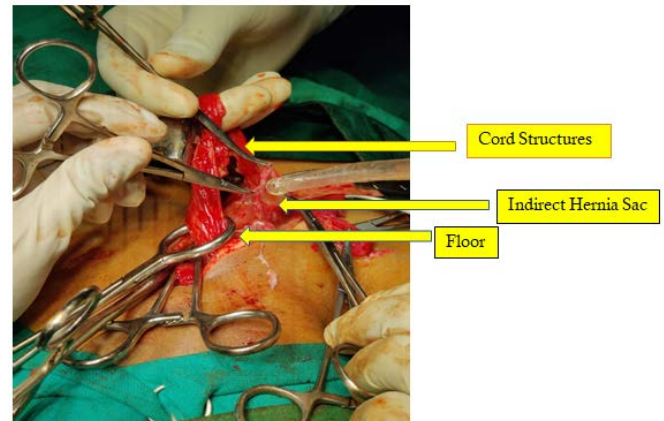


Figure 1: Anatomy of Inguinal Hernia

### Ventral Hernia

Ventral hernia is a common complication of abdominal surgery. The incidence ranges from 2% to 20% and varies greatly from one series to another<sup>[7]</sup>. Ventral hernias of the abdomen are non-inguinal, non-hiatal defects in the fascia of the abdominal wall. They are commonly seen in clinical practice. The repair of these abdominal wall defects is a common surgery performed by general surgeons. Ventral hernias of the abdomen are defined as a non-inguinal, non-hiatal defect in the fascia of the abdominal wall. The repair of these abdominal wall defects is a common surgery performed by general surgeons. Surgery is typically recommended for individuals with acceptable operative risk, symptomatic hernias, or those at elevated risk of developing complications from a hernia. Etiologies of a ventral hernia can be broken down into 2 main categories; acquired or congenital. The vast majority of

hernias that general surgeons see and treat are acquired; however, some individuals live with their ventral hernias from birth for prolonged periods of time before having them surgically repaired. Common causes of acquired ventral hernias include previous surgery causing an incisional hernia, trauma, and repetitive stress on naturally weak points of the abdominal wall. These naturally occurring weak points in the abdominal wall include the umbilicus, semilunar line, ostomy sites, bilateral inguinal regions, and esophageal hiatus. Obesity is a large component of hernias as well because it stretches the fascia of the abdomen causing it to weaken. Specifically, the action of repetitive weight gain and loss leads to weakening.[4]

The anterior abdominal wall is made of many layers including skin, fat, fascia, muscle, and peritoneum. The order of the layers change depending on the location you enter the abdomen perpendicularly. A point approximately midway between the umbilicus and pubic symphysis is an imaginary line called the arcuate line. At this point, the layers of the abdomen, with respect to the rectus, change in orientation. Above the arcuate line, the fascia of the internal oblique aponeurosis envelops the rectus muscle. The external oblique aponeurosis always lays anterior to the internal oblique aponeurosis and the transversus abdominis aponeurosis always posterior to it. However, below the arcuate, line all 3 layers of aponeurosis become anterior to the rectus muscle, and it is no longer enveloped. Instead, the only fascial layer below the rectus is the transversalis fascia which is separate from the transversus abdominis aponeurosis [14].

Repetitive stresses on the abdominal wall from increased intra-abdominal pressure lead to microscopic tears of tissue. Over time this can decrease the strength of tissue, predisposing individuals to hernia formation.

Tissue strength following surgery can only achieve an 80% tensile strength of the previous maximum. This effect is additive as well, so after a second midline laparotomy, the maximum tissue strength would be 80% of 80%, which is 64% [14].

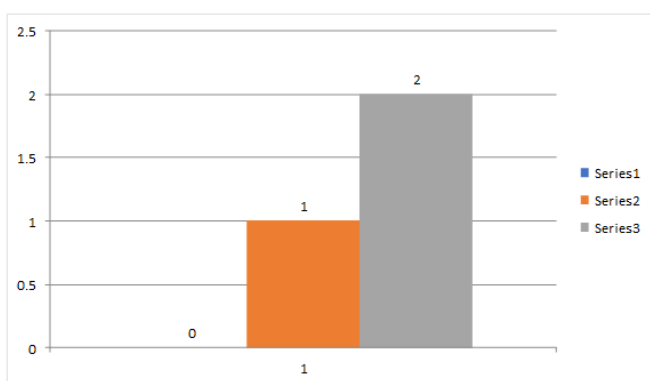
### **Mesh Fixation in Inguinal and Ventral Hernia**

In the surgical repair of groin hernia, prosthetic meshes and their fixation have been subject to debate. In the last decades, synthetic meshes have become crucial in surgical treatment of inguinal hernia. Once positioned, meshes are designed to be integrated in local tissue by a fibrotic reaction that gradually incorporates them. Therefore, a good fixation is essential to secure the mesh in its correct position. The primary function of a fixation device is to keep the mesh in place until tissue ingrowth is completed. The interaction between mesh and tissue depends on the type of mesh; however, complete integration is usually achieved within 2–3 weeks after surgery. It is important to underline that shear strength is reached for 74% during the first 2 weeks. Until then, therefore, proper fixation is essential. At present, various fixation techniques and materials have been developed [2].

Tissue adhesive have been introduced in medical practice during 1960. since then they have been used in numerous procedures. Tack fixation has been introduced since the introduction of laparoscopic hernia repair between late 1980s and early 1990s. In current practice three types of tacks are commonly used, divided into two categories : absorbable and non absorbable. Sutures commonly used in hernia repair are divided into two: absorbable and non absorbable, each characterized by a different degree of tension generated and a different time of strength lost due to degradation. Strength of different sutures are as follows.

**Table 1: Characteristics of different sutures**

Type of suture used	Security in days	Wound tensile strength	Tissue reactivity
Polyglactin	30	Good	Low
Polyglycolic	30	Good	Low
Polyglyconate	60	Excellent	Least
Polydioxone	60	Excellent	Least
Chromic gut	14	Average	High



Graph 1: Security of different sutures in days

**Methods**

**Study design:** We did a hospital based prospective study to compare polyglactin sutures with polypropylene sutures to fix the mesh in patients undergoing open inguinal hernia and ventral hernia repair. Our study was conducted in the Department of General Surgery, NKPSIMS & LMH, Nagpur, Maharashtra over three years period from February 2018 to February 2021. Following departmental research committee and institutional ethical board approval, each patient signed an informed consent form.

**Study population:** A total of 46 patients divided into two groups of 23 each were studied.

**Inclusion criteria**

- Age group above 18 years

- Unilateral or bilateral inguinal hernias posted for elective repair
- All ventral hernia posted for elective repair
- Recurrent hernias

**Exclusion criteria**

- Agegroup less than 18 years
- Emergency surgery
- patients on anticoagulant treatment,
- pregnancy
- Irreducible, obstructed or strangulated hernia
- patients with bleeding disorders

**Intervention**

We stratified the patients into two groups of 23 each. The mesh fixation done with polyglactin 2-0 sutures were in group A and the patients where mesh fixation was done with polypropylene 2-0 sutures were in group B. Mesh used for surgery is polypropylene mesh. The surgery was performed under spinal anesthesia. The skin and subcutaneous tissue was incised. The external oblique aponeurosis was opened along the fibres. The cord was identified. The ilioinguinal nerve was identified and secured. The direct inguinal hernial sac was reduced back without opening it. The indirect ones were divided, transfixed and excised. A polypropylene mesh was placed over the posterior wall. The mesh was fixed in an interrupted fashion to the conjoint tendon and inguinal ligament with the first stitch being taken from lacunar ligament. Mesh was fixed using polyglactin 2-0 for one set of patients (group A) and polypropylene 2 - 0 for another set of patients (group B). The external oblique aponeurosis and subcutaneous tissues were approximated. Skin closure was done by non-absorbable sutures.

All patients received prophylactic 3 doses of intravenous ceftriaxone sodium 1gm intravenous at the

time of induction in the post operative period 1. Dressing protocol and techniques for all patients remained same. Post operatively patients of both the groups were given the same analgesics that is, Injection diclofenac sodium were used intramuscular for 2 days. Then Patient is shifted to oral on POD2, Later oral aceclofenac + paracetamol were given as per requirement. All the surgeries were performed by same surgical team and patients were followed.

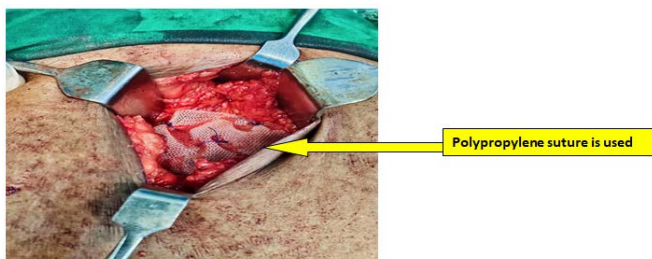


Figure 2

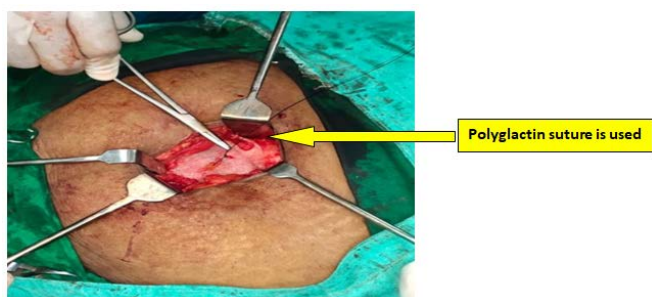


Figure 3

### Outcomes

All the patients were assessed in the post operative period on post operative day 10, day 30 and also after 3 months. To grade the pain we used visual analogue score ranging from 0 to 10 considering 0 as no pain and 10 as severe pain. Chronic pain was defined as a pain persisting beyond the normal tissue-healing time (assumed to be 3 months) according to the International Association for the Study of Pain [9]. Patients experiencing serous discharge from wound were considered positive for seroma formation and were managed conservatively till discharge settled. Post discharge on follow up visit in the out patient

department few patients complained of foreign body sensation. Few patients reported to outpatient department with complained of reducible swelling over the operated site.

Sample size calculation:

$$2S^2(Z\alpha + Z\beta)^2$$

$$N = \frac{\quad}{d^2}$$

The mean d1 and standard deviation S2 for group 1 was 3.80 and 3.163. The mean d2 and standard deviation S2 for the second group was 6.23 and 4.031.  $Z\alpha=1.96$  at 5% alpha error,  $Z\beta=0.842$  at 20% beta error, S is average of S1 and S2; d is the difference between d1 and d2. N is 24.23 participants in each group, rounded off to 23. Substituting these values in the formula,  $N=23$  and enrolment ratio is 1:1 hence, the sample size estimated were a minimum of 46 patients. Accordingly 23 patients each were included in polyglactin repair and 23 in polypropylene repair.

### Statistical analysis

Data were presented as frequencies and percentages. Chi square test was used to analyze the association between the variables. p value less than 0.05 was considered significant

### Results

A total of 46 patients who underwent inguinal hernia mesh repair were included and were randomly divided into two equal groups of 23 each. Group A had patients for whom mesh was fixed with polypropylene and Group B had patients for whom mesh was fixed with polyglactin. Minimum age was 18 years (n=1). Group A revealed 4 (17.39%) post-operative pain rate as compared to group B which was 3 (13.04%). Rate of seroma formation in group A was 4 (17.39%) while it was 3(13.04%) in group B. Post-operative foreign body sensation occurred in 14 (60.86%) in Group A



and 1 (4.34%) in group B. Recurrence occurred in 1 (4.34%) in group A and 1 (4.34%) recurrence was reported in group B.

Table 2: Seroma in total patients

Seroma	Study Group		Total
	A	B	
Yes	4	3	7
No	19	20	38
Total	23	23	46

Table 3: Post operative pain in total patients at 10 days, 1 month and 3 months

Post operative Period	Post operative pain	
	Group A	Group B
After 10 days	2	3
After 1 month	1	0
After 3 months	1	0

Table 4: Post operative pain in total patients

Post-operative Pain	Study Group		Total
	A	B	
Yes	4	3	7
No	19	20	39
Total	23	23	46

Table 5: Foreign body sensation in total patients

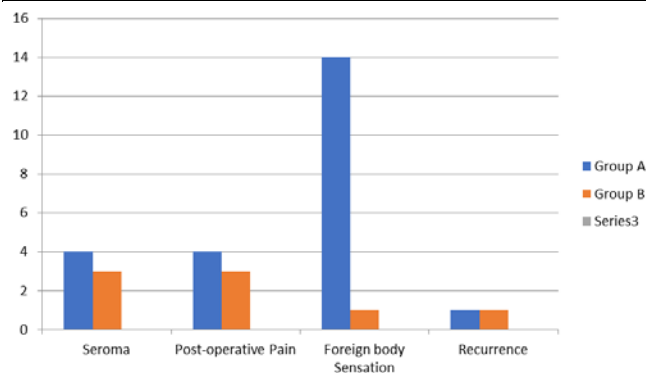
Foreign Body Sensation	Study Group		Total
	A	B	
Yes	14	1	15
No	9	22	31
Total	23	23	46

Table 6: Recurrence in total patients

Recurrence	Study Group		Total
	A	B	
Yes	1	1	2
No	22	22	44
Total	23	23	46

Table 7: Different complications with their p-value

Complications	Group A	Group B	P value	Significance
Seroma	4	3	0.242	—
Post-Operative Pain	4	3	0.242	—
Foreign body sensation	14	1	0.018	++
Recurrence	1	1	0.418	—



Graph 2: Different complications in Group A and Group B

### Discussion

In general surgery inguinal hernia repair is one of the most common procedures in world Wide. In USA every year more than 800,000 Inguinal Hernia Repairs are performed[10-15]. Inguinal hernia is a surgical condition which is commonly found in surgical outpatient department and they usually needs surgical procedures [10] those patients who are asymptomatic or minimally symptomatic hernia patients can be managed by watchful Waiting[16] Despite various advances in hernia repair, the Lichtenstein repair continues to enjoy the status of most popular repair technique all over the world owing to the ease of operation, low rates of local recurrence and high levels of patient safety and comfort.[17-18] Ventral hernia repair is also one of the common procedures performed. Chronic pain after this type of operation is observed in 1 to 27 % of patients. Potential source of it can by the formation of tension

between gradually shrinking mesh and non-absorbable points of its attachment [19 -21]

In this study the results obtained as seen in tabulation compares the outcome of mesh fixation using absorbable versus non absorbable suture material in Lichtenstein's hernioplasty and ventral hernia repair. The two groups in the study with 23 patients each were followed up on postoperative day 10 , 1 month and 3 months. In group A pain was seen in 4 patients, seroma formation in 4 while recurrence in 1 and foreign body sensation in 14 patients were seen. In group B pain was seen in 3 patients, seroma formation in 3 while recurrence in 1 and foreign body sensation in 1 patients were seen. Foreign body sensation was the most common complaint. The non absorbable sutures has been associated with significant inflammatory and infiltrating process depicted in the form of seroma formation and foreign body sensation .

Post hernioplasty mesh is anchored and fixed within 3 months and polyglactin sutures hydrolysed in less than 3 months but polypropylene sutures remain intact for longer periods. Mesh generally do not requires suture support after 3 months as it is already anchored and using polyglactin sutures serves this purpose as it gets hydrolysed prior to 3 months thus avoiding unnecessary foreign body sensation which is significantly seen with polypropylene sutures.

### Conclusion

Based on the findings of the present study it concluded that, using polyglactin suture material to fix mesh is a safe, simple as well as an effective alternative to the conventional usage of polypropylene sutures for fixing the mesh in hernia repair. The postoperative pain after 10 days, 1 month and 3 months is more with prolene sutures but after 1 months it is less in vicryl. Seroma formation in 4 in group A and 3 in Group B. Foreign

Body Sensation observed in 14 in group A and 1 in group B with p value of 0.018 which is significant and 1 recurrence in both groups, Hence our study helps us to understand the benefits of using polyglactin sutures and also enables us to recommend its application to fix the mesh in hernioplasty. So, routine usage of polyglactin (vicryl) sutures for mesh fixation in a hernioplasty is safe and simple with significance and thus a reasonable option.

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

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