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Postoperative Pain after Laparoscopic Ventral Hernia Repair: A Prospective Comparison of Sutures versus Tackers

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Abstract: ***Aim and Objectives: After the first report of laparoscopic incisional and ventral hernia repair (LIVHR) in 1993, several studies have proven its efficacy over open method. Among the technical issues, the technique of mesh fixation to the abdominal wall is still an area of debate. This prospective randomized study was done to compare two techniques of mesh fixation, i.e., tacker only versus trans-fascial sutures alone with respect to pain scores. Materials and Methods: 40 patients admitted for LIVHR repair (defect size less than 25cm2) were randomized in two groups: group T, tacker fixation (20 patients) and group S, suture fixation (20 patients). Patients in the two groups were well matched in terms of age, sex and hernia characteristics. Follow up was performed in the outpatient clinic with questioning and clinical evaluation after discharge on day 7, day 10 and 3 months for VAS scores. Results: Patients in group T were found to have significantly lower pain scores at day 1, day 3, at 1 week and 3 months as compared to group S resulting in shorter hospital stay and early recovery. During long-term follow-up, patients in group T were satisfied cosmetically. There was no recurrence in either of the group studied. Conclusions: Laparoscopic ventral hernia repair with tacker only mesh fixation is safe and convenient way for treatment of abdominal wall hernia and its results in respect of surgical outcomes and recurrences are comparable to any other method of ventral hernias surgery.***

Keywords: LVHR; tackers; sutures; IPOM; mesh fixation

1. Introduction

"No disease of the human body belonging to the province of the Surgeon requires in its treatment a better combination of accurate anatomical knowledge with surgical skill than Hernia in all its varieties"

-Sir Astely Paston Copper (1804)

HERNIA is a word derived from a Greek word heron, meaning a branch or protrusion. A hernia is a protrusion of a viscus or part of a viscus through an abnormal opening in the walls of its containing cavity.

The traditional primary repair entails a laparotomy with suture approximation of strong fascial tissue on each side of the defect. However, this requires extensive tissue dissection & recurrence rates after this procedure range from 12% to 24% during long-term follow-up.[1-3]

Laparoscopic ventral hernia repair (LVHR) with intra-peritoneal mesh placement to cover the defect was first described by LeBlanc and Booth in 1993 .In a meta-analysis on 8 randomized clinical trials, LVHR was found to be as effective, if not superior to the open repair. LVHR showed shorter hospital stay, less wound infection, with the same or even lower recurrence rates. So, LVHR is gaining more acceptances worldwide. [4-5]

Fixation of mesh is most significant step of surgery in laparoscopic ventral hernia repair. Since the inception of laparoscopic ventral hernia repair, techniques of mesh fixation over the abdominal wall defects have been the topic of huge debate.

Tacks are applied to fix the mesh over the abdominal wall via a mechanical device called the tacker. Tacks are found to cause potential damage to mesh at site of fixation.

Since the beginning, trans fascial suturing of the mesh to fix it on abdominal wall is considered important and an unavoidable step. Lot of studies reported in its favor, that this is the only way to secure adequate fixation strength and durability which is the basis to prevent recurrence. They claimed that, fixation with only tackers was relatively weaker as the tackers did not fix the mesh to muscles and fascia as they penetrated through few millimeters of the abdominal wall and this may lead to partial or complete mesh displacement leading to recurrence.[6-7]

On the other hand, other surgeons prefer to fix the mesh with only tackers without any trans-fascial sutures. These surgeons found that tackers-only fixation significantly reduced the operative time, avoided parietal vascular injuries, decreased post-operative pain and maintained a similar recurrence rate. [8-9]

2. Aims and Objective

The aim of my study is to compare the post operative pain between the two mesh fixation techniques: repair by trans-fascial sutures alone vs tackers alone.

Study Design

The study was conducted at KIMS (Kempegowda Institute of Medical Sciences) Bangalore. A Prospective time bound randomized study was planned. A total of 40 patients undergoing laparoscopic ventral hernia repair by all the surgeons at the KIMS hospital, Bengaluru were enrolled in the study. The patients were randomized into two groups depending upon the mesh fixation technique:

- Group S: hernia repairs with trans-fascial sutures alone

- Group T: hernia repairs with only tackers

The participating surgeons all had extensive experience with LVHR. The study protocol was fully approved by the local ethical committee. The surgical technique was discussed with each patient and informed written consent was taken. Patients' demographics and clinical data were prospectively recorded.

Follow up was performed in the outpatient clinic with questioning and clinical evaluation after discharge on day 7, day 10 and 3 months. Patients were considered free from recurrence if at clinical examination, no hernia was felt in upright position during Valsalva manoeuvre at 3 months.

Surgical Technique

All the patients received prophylactic antibiotics in the form of 1 gm Cefotaxime Sodium with the induction of anesthesia and it was continued 12 hourly post-operatively for 24 hours. Surgery was performed with the patient placed in supine position. The surgeon and the assistant are on the side of the patient which is opposite to the ventral hernia. The trocars were inserted as lateral as possible from the hernial defect.

Open technique was used to introduce 10 mm trocar at the level of the umbilicus to create artificial pneumoperitoneum with insertion of 30 degrees scope.

Then, two 5 mm trocars were inserted under vision cephalic and caudal to the first trocar. Adhesiolysis was performed by taking down the omentum and bowel adhesions using the scissors trying to avoid the use of diathermy as much as possible to minimize the risk of thermal injury.

Adhesiolysis was continued till the edges of the defect were completely and clearly exposed to a distance of at least 5 cm. Then, the pneumoperitoneum was reduced to 8 mmHg. Sterile ruler was introduced to measure the maximum diameter of the defect to fashion the proper mesh size that provides 5 cm overlap of the edges of the defect in all directions.

We used Composite mesh which is polyester knit mesh from one side and the other side is covered by absorbable collagen barrier to prevent visceral adhesions. The mesh has 4 prolene stitches that help in mesh orientation and fixation.

The mesh was rolled up and introduced through the 10 mm trocar. Then, it was oriented to make the non-adherent face toward the bowel and to overlap the defect edges by 5 cm in different directions.

Two small incisions (each is about 1 mm) were made in the abdominal wall at 6 and 12 o'clock. The endo-close was passed through these incisions to take the prolene sutures fixed to the mesh and pull them out through the abdominal wall. These 2 sutures help to keep the mesh hanged up on the abdominal wall and centered on the defect while fixing it.

In the suture group, transabdominal sutures were placed 2 to 3cm apart circumferentially around the mesh. In the tackers group, the 1st crowns of tackers are placed circumferentially around the mesh 2 to 3 cm apart. The second crown was applied around the edge of the defect.

Post-operatively, the patients were kept on paracetamol 1gm every 8 hours and started oral intake once the bowel sounds became audible. The patients were discharged once they tolerated full oral intake.

3. Results

Fifty patients were enrolled in this study. Twenty were in the Sutures Group and twenty in the Tacks Group.

Table 1: Sex distribution between the two groups

Gender	Group S	Group T	Total
Female	12 (60%)	8 (40%)	20 (50%)
Male	8 (40%)	12 (60%)	20 (50%)
Total	20 (100%)	20 (100%)	40 (100%)

Table 2: Age distribution between the two groups

Age (in years)	Group S	Group T	Total
21-30	3 (15%)	3 (15%)	6 (15%)
31-40	6 (30%)	4 (20%)	10 (25%)
41-50	3 (15%)	3 (15%)	6 (15%)
51-60	8 (40%)	10 (50%)	18 (45%)
Total	20 (100%)	20 (100%)	40 (100%)
Mean ± SD	44.85±12.42	45.05±11.28	44.95±11.71

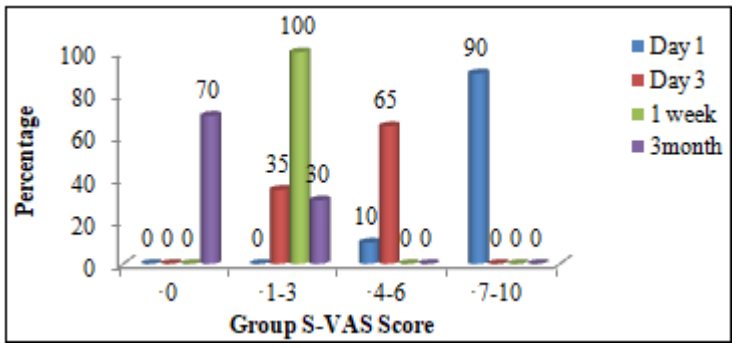
Demographics and clinical characteristics of the 2 groups are outlined in Table 1- 3. Both groups were of similar age and body mass index (BMI). More females were in the Sutures Group and more males in tackers group. No significant difference was found between the groups in terms of proportion of patients with type of hernias, multiple hernia defects, and total defect size.

Table 3: BMI distribution between the two groups

BMI (kg/m^2)	Group S	Group T	Total
<18.5	0 (0%)	0 (0%)	0 (0%)
18.5-25	1 (5%)	1 (5%)	2 (5%)
25-30	11 (55%)	9 (45%)	20 (50%)
>30	8 (40%)	10 (50%)	18 (45%)
Total	20 (100%)	20 (100%)	40 (100%)
Mean ± SD	29.59±3.30	29.49±2.84	29.54±3.04

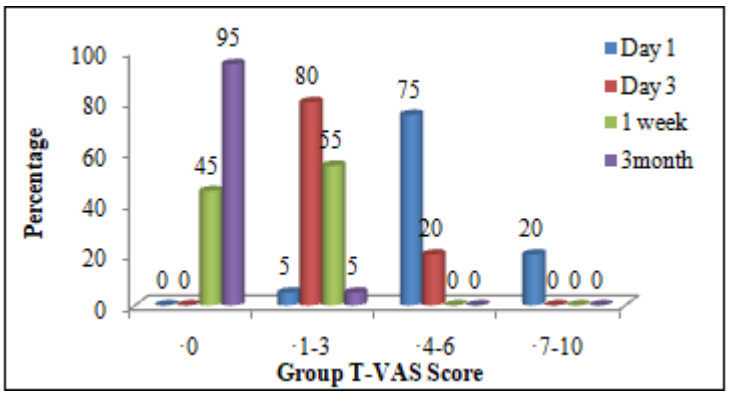
Pain Scores in Group S

This graph shows the pain score of various patients of GROUP S on day 1, day 3, day 7, and 3 months. We can see that around 90% of patients had pain of 7 and above on day 1, around 65% of patients had pain between 4-6 on day 3 and at the end of 3 months 70% had no pain while around 3 patients had mild discomfort and 3 patients (15%) had chronic pain having VAS score 2 or above.



Pain Scores in Group T

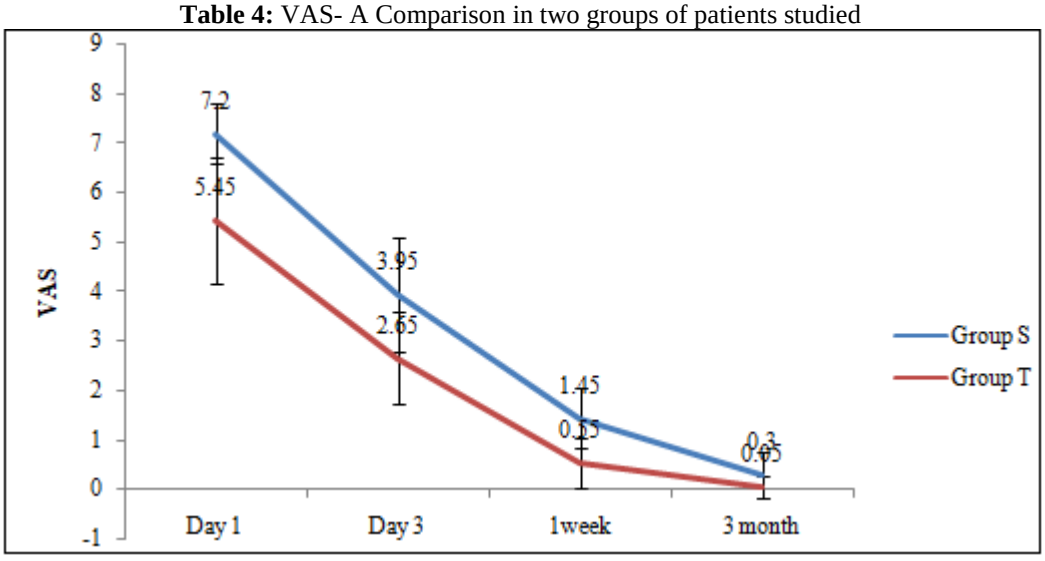
This graph shows the pain score of various patients of GROUP T on day 1, day 3, day 7, and 3 months. We can see that on Day 1 around 20% of cases had pain scores above 7 while 75% of cases had pain scores between 4-6. This decreased to 1-3 for 80% of cases and 20% had pain scores of 4-6 on day 3. On day 7, 45% of patients had no pain or discomfort at all in GROUP T. At the end of 3 months 95% of patients of GROUP T had no pain at all



Comparison of Pain Scales

VAS	Group S	Group T	P value
Day 1	7.20±0.62	5.45±1.28	<0.001**
Day 3	3.95±1.15	2.65±0.93	<0.001**
1week	1.45±0.60	0.55±0.51	<0.001**
3 month	0.30±0.47	0.05±0.22	0.038*

Table 4: VAS- A Comparison in two groups of patients studied



As we can see from the above tables and the charts the average pain score between the two groups were statistically significant on day 1, day 3, day 7 and on 3 months follow up. At every point the patients of group S had a more pain score as compared to patients in group T.

4. Discussion

The preferred method of mesh fixation during laparoscopic ventral hernia is controversial. Many proponents of the use of transabdominal sutures cite lower recurrence rates due to

higher tensile holding strengths of sutures in comparison to tacks. Other authors argue that the use of tacks reduces surgical time considerably while maintaining similar recurrence rates. These authors also argue that the use of tacks significantly reduces postoperative pain. To date, most studies of mesh fixation during laparoscopic ventral hernia repair focus on the risk of recurrence. However, in this study we compare postoperative pain after hernia repair with sutures versus tacks.

The post-operative pain is of great concern in LVHR as it increases consumption of pain killers, increases the incidence of post-operative ileus and subsequently prolongs the length of hospital stay [10]. Sutures penetrate through the full thickness of abdominal wall musculature and fascia. This has been theorized to cause local muscle ischemia resulting in severe pain postoperatively. In addition, numerous sutures are typically needed around the perimeter of the hernia defect. Because mesh overlap on normal muscular fascia is usually aimed for around 3 cm to 5 cm, the circumference around which sutures must be secured becomes quite large.

Mesh fixation with only tackers was found to reduce post-operative pain and length of hospital stay if compared to transfacial stitches. The mean VAS in our study for group T was 5.45, 2.65, 0.55 and 0.05 at 24 hours, 3 days, 1 week, and 3 months post-operatively respectively. In group S the VAS score was 7.20, 3.95, 1.45 and 0.30 at 24 hours, 3 days, 1 week, and 3 months post-operatively respectively.

From the above we can see that the difference in pain scores in the two group were statistically significant. These results are more or less similar to studies conducted by muysoms et al and Beldi et al. Muysoms *et al.* [11] reported a VAS score of 3.1 at rest at 24 hours and 3.9 at 4 weeks post-operatively. At 3 months, they reported a VAS of 0.05 at rest. They have concluded that with tackers there is less acute pain at 4hrs post operatively and also less chronic pain at 3 months follow up. Beldi *et al.* [12] had a mean VAS of 2.5 at 6 weeks after surgery. They also have concluded that there is a higher pain score for suture fixation in comparison to tacks fixation.

Bansal *et al.* [10] reported a mean VAS of 1.3 at 6 weeks post-operatively in cases of tackers only mesh fixation. They have concluded that tackers are more painful at all measurement points. Wassner et al[13] had concluded that the two methods of mesh fixation were associated with similar post operative pain. However both of the studies have looked into the mean pain score to compare between the groups. It is possible that the early pain caused by multiple tacks is equivalent to pain caused by trans fascial sutures but over the long term. But in our study it is seen that the tackers group had significantly lesser pain then the sutures group at all points in time.

The limitations of this study center on the sample size. Forty patients were followed, and comparisons were made between the 2 groups. Small differences in pain scale between the groups may be difficult to assess. And as pain is a subjective feeling there might be variations between patients as regards to their sensitivity to pain.

5. Conclusion

Hernia surgery affects about 20 million patients per year worldwide. Due to this huge number of patients, the quality of performances in diagnostics and treatment has an impact not only on the individual patient but also on the cost for the health care systems of the respective countries. Therefore, it is of paramount importance to find the best treatment options.

Laparoscopic ventral hernia repair with tackers was quicker provides lesser post-operative pain, lesser complications, shorter hospital stay and lesser economic impact as they returned to returned to work early. Thus patients have less morbidity and improved quality of life.

Though the initial cost of surgery with sutures was less but as most of our patients involved in the study were working class involving moderate to heavy work, laparoscopic repair with tackers meant lesser economic impact and decreased loss of man-power hours.

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