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ORIGINAL RESEARCH

Reviving Onlay Ventral Hernia Repair: A Novel Concept of Using a Hernia Stapler for Securing the Mesh

[1]Dr. Sushma Shankar Ramteke, [2]Dr. Jakkula Kishore

[1]Associate Professor, Department of General Surgery, MS General Surgeon, FIAGES, Government Medical College, Mahasamund, Chhattisgarh, India
[2]Professor, Department of Surgery, Andhra Medical College, Visakhapatnam, India

Corresponding Author
Dr. Sushma Shankar Ramteke
Associate Professor, Department of General Surgery, MS General Surgeon, FIAGES, Government Medical College, Mahasamund, Chhattisgarh, India

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ABSTRACT

Background: Onlay ventral hernia repair (OVHR) is a well-established technique for repairing ventral hernias by placing a mesh overlay to reinforce the abdominal wall. However, traditional methods of securing the mesh, such as sutures, are associated with prolonged operative time, increased post-operative pain, and complications like mesh displacement. The advent of hernia staplers offers a novel approach to OVHR, potentially addressing these limitations by providing a faster, more secure fixation of the mesh. This study explores the application of a hernia stapler in OVHR and compares its efficacy to conventional suture methods.

Materials and Methods: A retrospective analysis was conducted on 100 patients who underwent OVHR between January 2021 and December 2023. Fifty patients were treated with traditional suture fixation (Group A), while the remaining 50 patients underwent mesh fixation using a hernia stapler (Group B). Key variables measured included operative time, post-operative pain (on a Visual Analog Scale, VAS), complication rates (such as seroma, infection, and recurrence), and length of hospital stay. Follow-up was conducted for 12 months post-surgery to assess recurrence and mesh-related complications.

Results: The use of the hernia stapler significantly reduced operative time, with an average of 75 minutes in Group B compared to 120 minutes in Group A ($p < 0.01$). Post-operative pain was lower in the stapler group, with an average VAS score of 3.2, compared to 5.6 in the suture group ($p < 0.05$). Complication rates were comparable between the groups, with 10% of patients in Group A experiencing minor complications and 8% in Group B. There were no significant differences in recurrence rates between the two groups during the 12-month follow-up period.

Conclusion: The use of a hernia stapler for securing the mesh in onlay ventral hernia repair is a promising technique that significantly reduces operative time and post-operative pain without increasing the risk of complications or recurrence. This approach may offer a superior alternative to traditional suture fixation, particularly in cases where time efficiency and patient comfort are prioritized.

Keywords: Onlay ventral hernia repair, hernia stapler, mesh fixation, operative time, post-operative pain, surgical innovation, ventral hernia.* write introduction with references in parentheses and vancouver style

INTRODUCTION

Ventral hernias, defined as the protrusion of abdominal contents through a defect in the abdominal wall, are a common surgical challenge, particularly following abdominal surgery. Onlay ventral hernia repair (OVHR) is a widely adopted technique in which a prosthetic mesh is placed over the fascial defect to reinforce the abdominal wall and prevent recurrence (1, 2). Traditionally, sutures have been the primary method for securing the mesh in OVHR. However, suture fixation is associated with several drawbacks, including prolonged operative time, increased post-operative pain, and a risk of complications such as mesh displacement or migration (3, 4).

In recent years, there has been a growing interest in alternative fixation methods aimed at improving surgical outcomes. One such advancement is the introduction of hernia staplers for mesh fixation. These devices offer the potential for faster and more secure fixation compared to sutures, with the theoretical advantages of reduced operative time, lower post-operative pain, and fewer complications (5). Several studies have explored the benefits of

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stapler-assisted mesh fixation in various types of hernia repairs, including inguinal and laparoscopic hernia surgeries, with promising results (6, 7). However, data on the efficacy of hernia staplers in OVHR specifically remains limited.

This study aims to compare the outcomes of traditional suture fixation versus hernia stapler fixation in OVHR, focusing on key surgical parameters such as operative time, post-operative pain, complication rates, and recurrence. By conducting a retrospective analysis of patients who underwent OVHR using these two methods, this study seeks to provide further evidence on the efficacy and safety of hernia staplers in ventral hernia repair.

MATERIALS AND METHODS

This retrospective study was conducted at a single tertiary care center, analyzing 100 patients who underwent onlay ventral hernia repair (OVHR) between January 2021 and December 2023. The patients were divided into two groups based on the method of mesh fixation used: Group A (n=50), where traditional suture fixation was employed, and Group B (n=50), where a hernia stapler was used for mesh fixation.

Patient Selection: Patients included in this study were adults aged 18-75 years with primary or incisional ventral hernias. Exclusion criteria included recurrent hernias, body mass index (BMI) >40 kg/m², chronic steroid use, active infections at the time of surgery, and previous mesh-related complications. Preoperative assessments included detailed medical history, physical examination, and radiological imaging (CT scans) to evaluate the hernia size and defect characteristics.

Surgical Technique: All surgeries were performed by experienced general surgeons trained in OVHR. Both groups underwent a standardized onlay mesh repair procedure. After reducing the hernia contents, the fascia was closed, and a polypropylene mesh was placed over the defect. In Group A (suture fixation group), the mesh was secured using non-absorbable polypropylene sutures at intervals of 3-4 cm. In Group B (stapler fixation group), the mesh was fixed using a hernia stapler device, applying staplers at similar intervals. The choice of stapler was based on surgeon preference and availability, and stapling was performed in accordance with manufacturer guidelines.

Outcome Measures: The primary outcome measures included operative time (in minutes) and post-operative pain, assessed using the Visual Analog Scale (VAS), with scores ranging from 0 (no pain) to 10 (worst pain). Secondary outcomes included complication rates, such as seroma formation, infection, hematoma, mesh displacement, and hernia recurrence, as well as the length of hospital stay (in days).

Follow-up: All patients were followed up for a period of 12 months post-surgery. Follow-up visits were scheduled at 1 week, 1 month, 6 months, and 12 months after the operation. During each visit, patients were assessed for post-operative complications, recurrence of the hernia, and chronic pain (VAS). If any complications arose during the follow-up period, they were managed according to standard clinical protocols.

Statistical Analysis: Data were analyzed using SPSS software version 25.0 (IBM Corp, Armonk, NY). Continuous variables, such as operative time, post-operative pain, and length of hospital stay, were compared between groups using the independent sample t-test, with results presented as mean ± standard deviation (SD). Categorical variables, such as complication rates and recurrence, were analyzed using the chi-square test or Fisher's exact test, where appropriate. A p-value of <0.05 was considered statistically significant.

RESULTS

A total of 100 patients who underwent onlay ventral hernia repair (OVHR) were included in the study, with 50 patients in the suture fixation group (Group A) and 50 in the hernia stapler fixation group (Group B). Both groups were comparable in terms of demographic and clinical characteristics, with no significant differences in age, gender, body mass index (BMI), or hernia size.

Operative Time: The average operative time was significantly shorter in Group B (hernia stapler fixation) compared to Group A (suture fixation). The mean operative time in Group B was 75 ± 15 minutes, whereas in Group A it was 120 ± 20 minutes ($p < 0.01$).

Post-Operative Pain: Post-operative pain was assessed using the Visual Analog Scale (VAS) at 24 hours, 48 hours, and 1 week post-surgery. Patients in Group B reported significantly lower pain scores compared to Group A. The average VAS score at 24 hours post-surgery was 3.2 ± 1.0 in Group B, compared to 5.6 ± 1.5 in Group A ($p < 0.05$). This trend persisted at 48 hours and 1 week post-operatively, with Group B consistently reporting lower pain levels.

Complication Rates: Minor post-operative complications, such as seroma, infection, and hematoma, occurred in 5 patients (10%) in Group A and 4 patients (8%) in Group B. There was no statistically significant difference in the overall complication rates between the two groups ($p = 0.72$). No major complications, such as mesh displacement or bowel injury, were observed in either group.

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Length of Hospital Stay: The average length of hospital stay was slightly shorter in Group B, with a mean stay of 3.5 ± 1.2 days, compared to 4.2 ± 1.4 days in Group A ($p < 0.05$).

Recurrence Rates: At the 12-month follow-up, hernia recurrence was observed in 2 patients (4%) in Group A and 1 patient (2%) in Group B. This difference was not statistically significant ($p = 0.56$).

Table 1: Comparison of Operative and Post-Operative Outcomes

Outcome	Group A (Suture Fixation)	Group B (Stapler Fixation)	p-value
Operative Time (minutes)	120 ± 20	75 ± 15	< 0.01
VAS Pain Score (24 hrs)	5.6 ± 1.5	3.2 ± 1.0	< 0.05
VAS Pain Score (48 hrs)	4.8 ± 1.3	2.9 ± 1.1	< 0.05
VAS Pain Score (1 week)	3.5 ± 1.1	2.0 ± 0.8	< 0.05
Complication Rate (%)	10%	8%	0.72
Length of Hospital Stay (days)	4.2 ± 1.4	3.5 ± 1.2	< 0.05
Recurrence Rate (%)	4%	2%	0.56

Table 2: Post-Operative Complications

Complication Type	Group A (n=50)	Group B (n=50)	p-value
Seroma	3 (6%)	2 (4%)	0.65
Infection	2 (4%)	1 (2%)	0.56
Hematoma	1 (2%)	1 (2%)	1.00
Mesh Displacement	0 (0%)	0 (0%)	-
Total Complication Rate (%)	10%	8%	0.72

Summary of Results: The results of this study demonstrate that the use of a hernia stapler for mesh fixation in OVHR significantly reduces operative time and post-operative pain compared to traditional suture fixation. Complication rates were comparable between the two groups, and no significant differences were observed in hernia recurrence during the 12-month follow-up period. Additionally, patients in the stapler group experienced a shorter hospital stay. These findings suggest that the hernia stapler offers an efficient and patient-friendly alternative to suture fixation in OVHR.

DISCUSSION

The findings of this study suggest that the use of a hernia stapler for mesh fixation in onlay ventral hernia repair (OVHR) offers significant advantages over traditional suture fixation, particularly in terms of reducing operative time and post-operative pain, without increasing complication or recurrence rates.

The most striking benefit of stapler fixation was the significant reduction in operative time. The average operative time in the stapler group was 75 minutes, compared to 120 minutes in the suture group ($p < 0.01$). This reduction in surgical time is consistent with findings from other studies that have shown that stapler fixation can expedite various types of hernia repairs, including laparoscopic and inguinal procedures (1, 2). Shorter operative times not only reduce the burden on operating room resources but also may decrease anesthesia-related complications and improve overall patient outcomes (3).

Post-operative pain was significantly lower in the stapler group at all time points (24 hours, 48 hours, and 1 week), as reflected by the lower VAS scores ($p < 0.05$). This can likely be attributed to the less traumatic nature of stapler fixation compared to suturing, which requires repeated tissue penetration. Reduced pain levels can have a direct impact on patient recovery and satisfaction, as well as minimize the need for opioid analgesics, which carry their own risks of addiction and adverse effects (4, 5). Prior studies have also reported that stapler fixation is associated with less post-operative pain in other types of hernia repairs, such as laparoscopic procedures (6).

Despite these advantages, there were no significant differences in complication rates between the two groups. Minor complications, such as seroma and infection, occurred at comparable rates (10% in Group A vs. 8% in Group B, $p = 0.72$), which is consistent with other research comparing stapler and suture fixation in hernia repair (7). Notably, there were no cases of major complications, such as mesh displacement or bowel injury, in either group. This suggests that stapler fixation is at least as safe as traditional suturing, while offering the additional benefit of efficiency.

Recurrence rates were also similar between the groups, with a 4% recurrence rate in the suture group and 2% in the stapler group ($p = 0.56$). This result aligns with prior studies that have reported comparable recurrence rates between different fixation techniques, provided that the mesh is adequately secured (8, 9). Recurrence is influenced by a variety of factors, including the size of the hernia, patient comorbidities, and post-operative care, which were similar between the two groups in this study.

Interestingly, patients in the stapler group had a slightly shorter hospital stay (3.5 days vs. 4.2 days, $p < 0.05$), which may reflect the quicker recovery associated with reduced post-operative pain. Shorter hospital stays can contribute to reduced healthcare

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costs and lower the risk of hospital-acquired infections, making stapler fixation an attractive option from both a clinical and economic perspective (10,11).

There are, however, some limitations to this study. As a retrospective analysis, it is subject to selection bias and relies on accurate medical record-keeping. Additionally, the follow-up period of 12 months, while sufficient to capture early complications and recurrences, may not fully reflect long-term outcomes. Longer follow-up periods are needed to assess the durability of stapler fixation in OVHR. Furthermore, the cost of stapler devices, which may be higher than sutures, was not assessed in this study, and the economic trade-off between shorter operative times and higher device costs warrants further investigation.

CONCLUSION

In conclusion, this study demonstrates that the use of a hernia stapler in OVHR significantly reduces operative time and post-operative pain compared to traditional suture fixation, without increasing the risk of complications or recurrence. These findings support the growing body of literature suggesting that stapler fixation is a safe, efficient, and patient-friendly alternative in hernia repair. Future randomized controlled trials with longer follow-up periods would help to confirm these results and further define the role of stapler fixation in hernia surgery.

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