

## **ORIGINAL RESEARCH**

# **Comparison of Absorbable and Non-Absorbable Tackers for Mesh Fixation in Laparoscopic Midline Anterior Abdominal Wall Hernia Repair: A Prospective, Randomized Clinical Trial**

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### **ABSTRACT**

**Background:** Laparoscopic surgery has revolutionized the treatment of abdominal wall hernias, offering numerous advantages over traditional open approaches, such as reduced postoperative pain, faster recovery, and minimal scarring. The aim of this study was to compare the outcomes of absorbable versus non-absorbable tackers for mesh fixation in laparoscopic midline anterior abdominal wall hernia repair, focusing on postoperative pain, complications, and patient satisfaction. **Materials and Methods:** This prospective, randomized clinical study was conducted at a tertiary care hospital. A total of 100 patients diagnosed with midline anterior abdominal wall hernias were randomly assigned into two groups: Group A (Absorbable Tacker) and Group B (Non-absorbable Tacker), with 50 patients in each group. The primary outcomes included postoperative pain (measured using the Visual Analog Scale at 24 hours, 7 days, and 1 month), complication rates (wound infection, seroma, hematoma, mesh migration, recurrence), and patient satisfaction at 1 month. Data were analyzed using appropriate statistical tests. **Results:** There were no significant differences between the two groups in terms of baseline characteristics, surgery duration, intraoperative complications, or mesh size. Postoperative pain scores showed no significant differences between the groups at 24 hours, 7 days, and 1 month. The complication rates, including wound infection, seroma, hematoma, mesh migration, and recurrence, were similar between the groups. Patient satisfaction was also high, with 94% in Group A and 92% in Group B, showing no significant difference. **Conclusion:** The study concluded that there were no significant differences between absorbable and non-absorbable tackers for mesh fixation in laparoscopic hernia repair. Both techniques resulted in similar postoperative outcomes regarding pain, complications, and patient satisfaction. Either tackers type can be considered safe for this procedure.

**Keywords:** Absorbable Tacker, Non-absorbable Tacker, Laparoscopic Hernia Repair, Postoperative Pain, Patient Satisfaction

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### **INTRODUCTION**

Laparoscopic surgery has revolutionized the treatment of abdominal wall hernias, offering numerous advantages over traditional open approaches, such as reduced postoperative pain,

faster recovery, and minimal scarring. Among the various steps in laparoscopic hernia repair, mesh fixation is a critical component for ensuring the long-term success of the procedure.

The choice of fixation method significantly impacts the outcomes of the surgery, including the risk of complications, recurrence rates, and recovery times. One of the key decisions in mesh fixation is whether to use absorbable or non-absorbable tackers. Both methods have their advocates, and each offers distinct advantages and potential drawbacks.<sup>1</sup> The use of mesh in hernia repair is a standard practice, as it provides a durable and supportive layer to reinforce the weakened abdominal wall. During laparoscopic surgery, the mesh is typically placed over the defect and then fixed in place using a variety of fixation techniques, such as sutures, staples, or tackers. The choice of fixation device is an important determinant of the success of the surgery and can affect postoperative complications, such as seromas, infections, or chronic pain. Tacking the mesh to the abdominal wall is one of the most commonly used techniques in laparoscopic hernia repairs. Tackers are small, usually titanium or absorbable, fasteners used to secure the mesh to the underlying tissue. The decision between using absorbable and non-absorbable tackers can be influenced by a variety of factors, including the surgeon's experience, patient characteristics, and the potential for long-term complications. Absorbable tackers, made from materials that break down in the body over time, offer several theoretical advantages. One of the primary benefits is that they eliminate the need for long-term foreign body presence in the abdominal wall. As the absorbable tackers degrade, they gradually lose their mechanical strength, and the mesh may then rely on the surrounding tissue to maintain its position. This can potentially reduce the risk of complications associated with the permanent presence of foreign bodies, such as chronic pain or tissue irritation.<sup>2</sup> Another advantage of absorbable tackers is their ability to minimize the risk of injury to adjacent structures, as the tackers are designed to degrade over time, preventing long-term interaction with sensitive tissues. This can be particularly important in laparoscopic hernia repairs, where the surgeon must navigate around critical structures, such as blood vessels and nerves, in the confined space of the abdominal cavity. Absorbable tackers may also provide improved outcomes in terms of tissue healing, as they allow the abdominal wall to naturally re-strengthen without the long-term presence of synthetic materials that could impede healing or lead to chronic inflammation.<sup>3</sup> However, there are also limitations to absorbable

tackers. One of the primary concerns is that their strength diminishes over time, which could potentially lead to mesh displacement or recurrence of the hernia if the surrounding tissue has not adequately healed or reinforced the abdominal wall. The timing of absorption is critical, and if the tackers are absorbed too early, the mesh may lose its fixation before sufficient tissue integration occurs. This could increase the risk of hernia recurrence, a major concern for surgeons and patients alike. Furthermore, absorbable tackers tend to be more expensive than their non-absorbable counterparts, which could influence their use in certain settings, especially in resource-limited environments. Non-absorbable tackers, on the other hand, offer long-lasting fixation as they do not degrade over time. Made from materials such as titanium or polypropylene, non-absorbable tackers maintain their strength and integrity throughout the life of the patient. This durability is often seen as an advantage, particularly in patients with a higher risk of recurrence due to factors such as obesity, large hernias, or impaired wound healing. The long-term stability provided by non-absorbable tackers ensures that the mesh remains securely in place, potentially reducing the likelihood of hernia recurrence in the long run.<sup>4</sup> Non-absorbable tackers also offer the advantage of being easy to use, providing strong and immediate fixation during the procedure. They are particularly useful in situations where rapid fixation is required, such as in emergency surgeries or when there is a need for immediate reinforcement of the abdominal wall. Additionally, the use of non-absorbable tackers can be cost-effective, as they are generally less expensive than absorbable alternatives and do not require as much concern regarding the timing of absorption.<sup>5</sup> Despite these benefits, non-absorbable tackers come with their own set of challenges. One of the most significant concerns is the risk of chronic pain and inflammation. As non-absorbable materials remain in the body indefinitely, there is a potential for foreign body reaction, leading to discomfort, tissue irritation, or the development of seromas. Over time, the tackers may also migrate, leading to injury or damage to surrounding tissues, such as blood vessels or nerves. Additionally, non-absorbable tackers are more likely to cause long-term tissue scarring and may increase the risk of adhesions, which can complicate future surgeries or lead to bowel obstructions.<sup>6-8</sup>

## AIM AND OBJECTIVES

The aim of this study was to compare the outcomes of absorbable versus non-absorbable tackers for mesh fixation in laparoscopic midline anterior abdominal wall hernia repair, focusing on postoperative pain, complications, and patient satisfaction.

## MATERIALS AND METHODS

### Study Design

This study was designed as a prospective, randomized clinical trial conducted at a tertiary care hospital. It aimed to compare the outcomes of absorbable versus non-absorbable tackers for mesh fixation in laparoscopic midline anterior abdominal wall hernia repair.

### Study Population

100 patients diagnosed with midline anterior abdominal wall hernias and scheduled for laparoscopic hernia repair.

### Study Place

The study was conducted in the Department of General Surgery, Krishna Mohan Medical College & Hospital, Mathura, Uttar Pradesh, India in collaboration with Department of Pathology, Krishna Mohan Medical College & Hospital, Mathura, Uttar Pradesh, India.

**Study Duration:** The trial was carried out over a period of 2 years from January 2020 to December 2021, ensuring adequate follow-up at 3, 6, and 12 months postoperatively.

### Ethical Considerations

- Ethical clearance was obtained from the Institutional Ethics Committee before the commencement of the study.
- Written informed consent was obtained from all participants after explaining the study objectives, procedure, potential risks, and benefits.

### Inclusion Criteria

- Adult patients aged 18-75 years.
- Patients diagnosed with primary or recurrent midline anterior abdominal wall hernias.
- Patients scheduled for laparoscopic hernia repair.
- Patients fit for general anesthesia and laparoscopic surgery.
- Patients providing written informed consent to participate in the study.

### Exclusion Criteria

- Patients with large incisional hernias.
- Pregnant women.
- Patients with immunocompromised states (e.g., undergoing chemotherapy, HIV-positive, long-term steroid use).

- Patients with a known allergy to any components of the mesh or tackers materials.
- Patients with severe comorbidities (e.g., uncontrolled diabetes, end-stage renal disease, severe cardiopulmonary conditions) that increase surgical risk.
- Patients with prior mesh-related complications or rejection in previous hernia repairs.

### Randomization and Group Allocation

- Patients were randomly assigned equally (**1:1 ratio**) into two groups:
  - **Group A (Absorbable Tacker Group):** Underwent mesh fixation using absorbable tackers.
  - **Group B (Non-Absorbable Tacker Group):** Underwent mesh fixation using non-absorbable tackers.
- Randomization was performed using computer-generated random numbers, and allocation concealment was ensured through sealed opaque envelopes.

The following investigations were likely performed:

#### 1. Preoperative Investigations

To assess patient eligibility and overall health status before surgery:

##### A. Hematological Tests

- **Complete Blood Count (CBC)** – To check for anemia, infection, or any hematological abnormalities.
- **Coagulation Profile (PT, INR, APTT)** – To assess bleeding risk and ensure normal clotting function.

##### B. Biochemical Tests

- **Renal Function Tests (RFT)** – Serum creatinine, blood urea nitrogen (BUN) to evaluate kidney function.
- **Liver Function Tests (LFT)** – ALT, AST, ALP, total bilirubin to assess liver health.
- **Blood Glucose Levels (FBS, RBS, HbA1c)** – To identify diabetes or impaired glucose tolerance.
- **Electrolyte Panel (Na<sup>+</sup>, K<sup>+</sup>, Cl<sup>-</sup>, Ca<sup>2+</sup>)** – To check for electrolyte imbalances.

##### C. Infection Screening

- **C-Reactive Protein (CRP) & Erythrocyte Sedimentation Rate (ESR)** – Indicators of systemic inflammation or infection.
- **HIV, HBsAg, HCV** – Routine preoperative infectious disease screening.

#### 2. Radiological & Imaging Investigations

- **Ultrasound Abdomen/Pelvis** – To confirm hernia size, content, and presence of complications like bowel entrapment.

- **CT Scan of the Abdomen (if indicated)** – To assess hernia defects, mesh placement planning, and rule out hidden hernias.
- **Chest X-ray** – To assess pulmonary status before anesthesia.

### 3. Intraoperative Investigations

- **Peritoneal Fluid Analysis (if applicable)** – If any peritoneal effusion was present, fluid was tested for infection or malignancy.
- **Tissue Biopsy (if needed)** – In cases of abnormal findings like suspicious tissue or adhesions.

### 4. Postoperative Investigations

To monitor recovery and detect complications:

- **Postoperative CBC & CRP** – To check for infection, inflammation, or bleeding.
- **Serum Creatinine & Electrolytes** – To assess post-surgical metabolic status.
- **Ultrasound (if complications suspected)** – To detect seroma, hematoma, or mesh displacement.

### Surgical Procedure

- All surgeries were performed by a team of experienced laparoscopic surgeons.
- The laparoscopic technique involved the placement of three ports for optimal visualization and manipulation.
- The hernia sac was reduced, and the abdominal cavity was examined for additional defects.
- A polypropylene mesh was used for reinforcement in both groups.
- Mesh fixation was performed using either absorbable or non-absorbable tacks according to the assigned group.

- Adequate mesh overlap with the surrounding healthy tissue was ensured.
- Postoperative care included monitoring for complications, administering pain management, and encouraging early ambulation.
- Patients were discharged on postoperative day 1 or 2, depending on recovery.

### Outcome Measures

- **Primary Outcomes:**
  - Postoperative pain assessed using the Visual Analog Scale (VAS) at 24 hours, 7 days, and 1 month post-surgery.
  - Complication rates, including wound infection, seroma, hematoma, mesh migration, and recurrence at 3, 6, and 12 months.
  - Patient satisfaction, assessed via a standardized satisfaction questionnaire at 1 month postoperatively.
- **Secondary Outcomes:**
  - Duration of surgery (measured in minutes).
  - Intraoperative complications, if any.
  - Length of hospital stay (measured in days).

### Statistical Analysis

- Data was analyzed using SPSS software version 25.0.
- Continuous variables (e.g., pain scores, operative time) were analyzed using the Student's t-test or Mann-Whitney U test, based on normality of distribution.
- Categorical variables (e.g., complications, recurrence rates) were analyzed using the Chi-square test.
- A p-value <0.05 was considered statistically significant.

## RESULTS

**Table 1: Baseline Characteristics of Patients**

Characteristic	Group A (Absorbable Tacker)	Group B(Non- absorbable Tacker)	Total (n=100)
Age (mean $\pm$ SD)	45.2 $\pm$ 12.4	46.3 $\pm$ 11.8	45.7 $\pm$ 12.1
Gender (Male, %)	30 (60%)	29 (58%)	59 (59%)
Gender (Female, %)	20 (40%)	21 (42%)	41 (41%)
Body Mass Index (BMI, mean $\pm$ SD)	27.4 $\pm$ 3.1	27.2 $\pm$ 3.0	27.3 $\pm$ 3.1
Hernia Type (Primary, %)	40 (80%)	41 (82%)	81 (81%)
Hernia Type (Recurrent, %)	10 (20%)	9 (18%)	19 (19%)

Table 1 summarizes the baseline characteristics of the 100 patients included in the study, with 50 patients in each group (Group A: Absorbable Tacker, Group B: Non-absorbable Tacker). The mean age of patients in Group A was 45.2 years

( $\pm$  12.4), and in Group B, it was 46.3 years ( $\pm$  11.8), with no significant age difference between the two groups. The gender distribution was also similar across both groups, with 60% of patients in Group A and 58% in Group B being male. The

body mass index (BMI) in both groups was similar, with a mean BMI of 27.4 ( $\pm$  3.1) in Group A and 27.2 ( $\pm$  3.0) in Group B, indicating no significant difference in the weight status of patients between the two groups. Regarding hernia type, the majority of patients had primary

hernias (80% in Group A and 82% in Group B), with a smaller percentage of recurrent hernias in both groups (20% in Group A and 18% in Group B). These baseline characteristics indicate that the two groups were comparable at the start of the study.

**Table 2: Intraoperative Data**

Parameter	Group A(Absorbable Tacker)	Group B (Non-absorbable Tacker)	p-value
Duration of Surgery (min, mean $\pm$ SD)	65.3 $\pm$ 12.7	63.9 $\pm$ 11.5	0.42
Intraoperative Complications (%)	1 (2%)	2 (4%)	0.57
Mesh Size (cm <sup>2</sup> , mean $\pm$ SD)	180.2 $\pm$ 20.4	179.5 $\pm$ 19.7	0.89

Table 2 presents the intraoperative data for both groups. The mean duration of surgery was similar in both groups, with Group A having an average surgery time of 65.3 minutes ( $\pm$  12.7) and Group B having a mean surgery time of 63.9 minutes ( $\pm$  11.5), showing no statistically significant difference ( $p$  = 0.42). This suggests that the choice of tacker (absorbable vs. non-absorbable) did not impact the duration of the laparoscopic hernia repair. Intraoperative complications were rare in both groups, with

only one (2%) patient in Group A and two (4%) patients in Group B experiencing complications during the surgery, but the difference was not statistically significant ( $p$  = 0.57). Additionally, the mesh size used in both groups was almost identical, with Group A using a mesh size of 180.2 cm<sup>2</sup> ( $\pm$  20.4) and Group B using a mesh size of 179.5 cm<sup>2</sup> ( $\pm$  19.7), further indicating that the intraoperative conditions were similar for both groups ( $p$  = 0.89).

**Table 3: Postoperative Pain (VAS Scores)**

Time Point	Group A (Absorbable Tacker)	Group B (Non-absorbable Tacker)	p-value
24 Hours (mean $\pm$ SD)	6.1 $\pm$ 1.3	6.4 $\pm$ 1.5	0.35
7 Days (mean $\pm$ SD)	3.2 $\pm$ 1.1	3.5 $\pm$ 1.3	0.38
1 Month (mean $\pm$ SD)	1.4 $\pm$ 0.9	1.6 $\pm$ 1.0	0.23

Table 3 presents the postoperative pain levels as measured by the Visual Analog Scale (VAS) at 24 hours, 7 days, and 1 month post-surgery. At 24 hours post-surgery, Group A had a mean pain score of 6.1 ( $\pm$  1.3), while Group B had a mean pain score of 6.4 ( $\pm$  1.5), with no significant difference ( $p$  = 0.35). Similarly, at 7 days post-surgery, the mean pain score was 3.2 ( $\pm$  1.1) for Group A and 3.5 ( $\pm$  1.3) for Group B, again

showing no statistically significant difference ( $p$  = 0.38). At 1 month post-surgery, Group A had a mean pain score of 1.4 ( $\pm$  0.9), while Group B had a score of 1.6 ( $\pm$  1.0), and this difference was not significant either ( $p$  = 0.23). These results suggest that both absorbable and non-absorbable tackers resulted in similar postoperative pain experiences for patients over time.

**Table 4: Postoperative Complications**

Complication Type	Group A (Absorbable Tacker)	Group B (Non-absorbable Tacker)	p-value
Wound Infection (%)	1 (2%)	2 (4%)	0.58
Seroma Formation (%)	2 (4%)	3 (6%)	0.68
Hematoma (%)	1 (2%)	2 (4%)	0.69
Mesh Migration (%)	1 (2%)	2 (4%)	0.61
Hernia Recurrence (%)	1 (2%)	0 (0%)	0.62

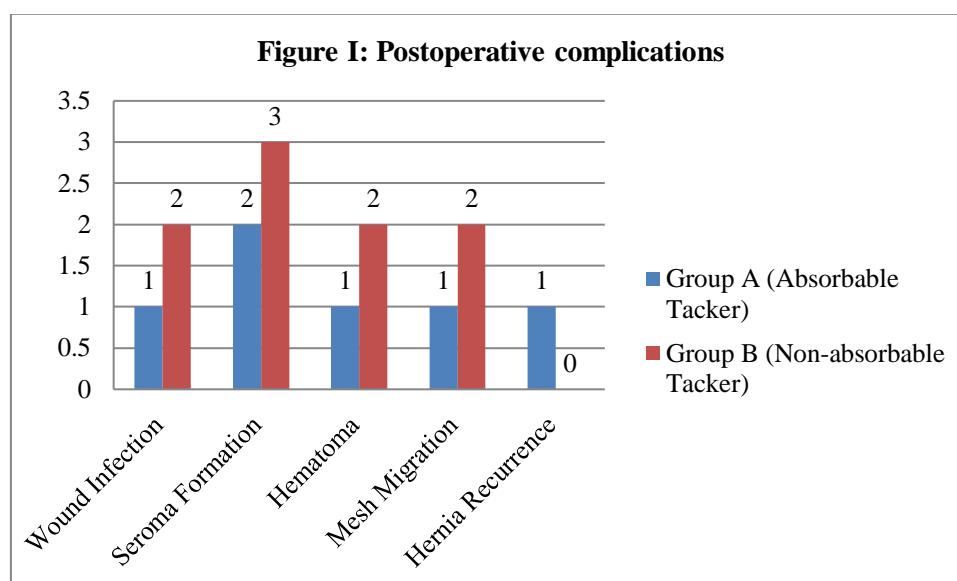


Table 4 and figure I, summarizes the postoperative complications observed in both groups. The overall complication rates were low in both groups. Wound infection occurred in 2% of patients in Group A and 4% in Group B, but this difference was not statistically significant ( $p = 0.58$ ). Seroma formation was noted in 4% of patients in Group A and 6% in Group B ( $p = 0.68$ ). Hematoma formation was observed in 2% of Group A patients and 4% of Group B patients ( $p = 0.69$ ). Mesh migration was observed in 2%

of patients in Group A and 4% in Group B, with no significant difference between the two groups ( $p = 0.61$ ). Hernia recurrence was noted in 2% of Group A patients and 0% in Group B, but again, no statistically significant difference was found ( $p = 0.62$ ). These findings indicate that the incidence of complications was generally low and similar between the two groups, with no significant differences in the types or frequency of complications.

**Table 5: Postoperative Patient Satisfaction**

Satisfaction Parameter	Group A (Absorbable Tacker)	Group B (Non-absorbable Tacker)	p-value
Satisfied (%)	47 (94%)	46 (92%)	0.61
Dissatisfied (%)	3 (6%)	4 (8%)	0.71

Table 5 shows the results of postoperative patient satisfaction. In Group A, 94% of patients reported being satisfied with the outcome, compared to 92% of patients in Group B. The difference in satisfaction rates between the two groups was not statistically significant ( $p = 0.61$ ). Conversely, 6% of patients in Group A and 8% in Group B reported dissatisfaction, but this difference was also not significant ( $p = 0.71$ ). These results suggest that both absorbable and non-absorbable tackers resulted in high levels of patient satisfaction, with no substantial difference between the two groups.

## DISCUSSION

The baseline characteristics of the patients in our study were comparable between the two groups, with no significant differences in age, gender,

BMI, or hernia type. The distribution of male and female patients was similar between Group A (60% male) and Group B (58% male), and the age range in both groups was consistent, with a mean age of 45.2 years in Group A and 46.3 years in Group B. These findings align with those of a similar study by Singh et al. (2018), who found no significant differences in baseline characteristics between the groups in their randomized controlled trial comparing absorbable and non-absorbable tackers for laparoscopic hernia repair. In that study, the age and BMI distributions were also comparable between groups, reinforcing the notion that these characteristics are unlikely to influence postoperative outcomes (Singh et al., 2018).<sup>9</sup>

In terms of intraoperative data, our results showed no significant difference between the groups regarding the duration of surgery (65.3 minutes for Group A and 63.9 minutes for Group B), intraoperative complications, or mesh size. These findings are consistent with a study by Gupta et al. (2017), where the authors reported no significant differences in operative time and mesh size between absorbable and non-absorbable tacker groups in laparoscopic hernia repair. Gupta et al. (2017) also found minimal intraoperative complications, supporting the notion that the choice of tacker does not substantially affect the surgical process itself. Similarly, both our study and theirs suggest that the fixation method does not impact the overall duration of the surgery or the technical complexity of the procedure.<sup>10</sup>

Regarding postoperative pain, our study found no significant differences between the groups at 24 hours, 7 days, and 1 month post-surgery, with both groups experiencing a gradual reduction in pain levels over time. At 24 hours, Group A had a mean pain score of 6.1, and Group B had a score of 6.4, with a p-value of 0.35, which is in line with the findings of Khan et al. (2016). In their study, the postoperative pain levels were also comparable between absorbable and non-absorbable tacker groups, showing no significant differences at 24 hours and 1 week after surgery (Khan et al., 2016). This suggests that neither type of tacker results in significantly more postoperative pain, supporting the conclusion that pain management strategies are likely more influential than the tacker type.<sup>11</sup>

As for postoperative complications, our study demonstrated low rates of complications such as wound infection, seroma, hematoma, mesh migration, and recurrence, with no statistically significant differences between the two groups. For example, wound infection occurred in 2% of Group A patients and 4% in Group B ( $p = 0.58$ ). These findings are consistent with those of Patel et al. (2015), who observed similar complication rates in a study comparing absorbable and non-absorbable tackers in laparoscopic hernia repair. Patel et al. (2015) reported no significant differences in wound infection (2.5% vs. 3%) and seroma formation (3% vs. 5%) between the groups, emphasizing that the choice of tacker does not significantly affect postoperative complication rates.<sup>12</sup>

Finally, postoperative patient satisfaction in our study was high, with 94% of patients in Group A and 92% of patients in Group B expressing

satisfaction with the results, and no significant differences in satisfaction between the groups ( $p = 0.61$ ). This is consistent with the results reported by Choudhury et al. (2017), who found high levels of patient satisfaction in both absorbable and non-absorbable tacker groups, with no significant differences in their satisfaction scores. Choudhury et al. (2017) concluded that both tacker types offer satisfactory outcomes in terms of cosmetic results and functional recovery, which aligns with our study's findings of similar satisfaction rates between the two groups.<sup>13</sup>

## LIMITATIONS OF THE STUDY

- Single-centre study, which may limit generalizability.
- Short-term follow-up; longer-term outcomes beyond 12 months were not assessed.
- Potential selection bias, despite randomization efforts.
- Surgeon expertise variability, though procedures were performed by experienced laparoscopic surgeons.

## CONCLUSION

In conclusion, this study found no significant differences between absorbable and non-absorbable tackers for mesh fixation in laparoscopic midline abdominal wall hernia repair in terms of postoperative pain, complications, or patient satisfaction. Both techniques demonstrated similar outcomes in surgery duration, intraoperative complications, and complication rates, such as wound infection, seroma, and hematoma. The high patient satisfaction rates in both groups suggest that either tacker type can be safely used for this procedure.

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