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Research Article

A Comparative Study of Barbed Sutures vs. Conventional Sutures in Laparoscopic Surgery: Efficiency, Infection Rate, Cost, and Handling

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ABSTRACT
Background: Laparoscopic surgery has revolutionized surgical procedures by reducing recovery time and enhancing patient outcomes. Suturing during these procedures remains a critical step that impacts surgical efficiency, infection rates, and overall cost. Barbed sutures, which eliminate the need for knot tying, are proposed as an alternative to conventional sutures. This study aimed to compare barbed sutures with conventional sutures in terms of suturing time, ease of handling, infection rates, and cost in laparoscopic surgeries.
Methods: A prospective randomized controlled trial was conducted with 100 patients undergoing elective laparoscopic surgery at Venkateshwara Medical College, Puducherry. Participants were randomly assigned to either the barbed suture group (n=50) or the conventional suture group (n=50). The primary outcomes assessed included suturing time, ease of handling, infection rates, and cost. Statistical analyses were performed using independent t-tests and chi-square tests.
Results: The barbed suture group showed a significant reduction in suturing time (9.4 ± 2.1 minutes) compared to the conventional suture group (14.7 ± 3.5 minutes, $p<0.001$). Handling was rated significantly higher for barbed sutures (4.3/5 vs. 3.2/5). Infection rates were similar in both groups (4% vs. 8%, $p=0.43$), but costs for barbed sutures were higher (₹1,200 vs. ₹500), though the overall surgical cost was slightly lower in the barbed suture group.
Conclusion: Barbed sutures provide significant time savings and ease of handling compared to conventional sutures, with similar infection rates. Despite higher upfront costs, barbed sutures offer improved surgical efficiency and can be considered a beneficial alternative in laparoscopic surgery.

Keywords: Barbed Sutures, Conventional Sutures, Laparoscopic Surgery, Suturing Time, Infection Rates, Surgical Efficiency, Cost Comparison, Ease of Handling.

INTRODUCTION

Laparoscopic surgery has revolutionized the field of minimally invasive procedures, offering patients reduced postoperative pain, shorter recovery times, and smaller incisions, leading to improved aesthetic outcomes. However, despite these advantages, the closure of incisions and suturing during laparoscopic procedures remain critical aspects that can influence the outcome of the surgery. The effectiveness of suturing techniques, the type of suture material used, and the time spent on suturing are key factors contributing to both the technical success of the surgery and the patient's recovery.

Conventional sutures have long been the gold standard for closing wounds during laparoscopic surgery. These sutures, typically non-absorbable or absorbable, require the surgeon to manually tie knots at the incision sites, a technique that can be time-consuming, technically demanding, and potentially prone to complications such as knot failure, infection, and poor wound healing. In recent years, however, a newer type of suture—barbed sutures—has been introduced, offering an alternative to conventional sutures.

Barbed sutures are unique in that they are designed with barbs that allow the suture to grip tissue without the need for knots, theoretically simplifying the suturing process. The self-retaining nature of barbed sutures should, in theory, reduce the time required for suturing, decrease the risk of knot-related complications, and potentially enhance wound closure reliability. These attributes make barbed sutures a compelling option in laparoscopic surgery, especially where efficiency, infection control, and cost-effectiveness are significant considerations.

Despite their promising advantages, the use of barbed sutures in laparoscopic surgery remains a subject of debate. A comprehensive

understanding of how they compare to conventional sutures in terms of handling, ease of use, infection rates, suturing time, and overall cost is essential for making informed decisions regarding their application. Some studies suggest that barbed sutures are easier to handle due to the elimination of knot-tying, while others argue that the initial higher cost of barbed sutures may be a limiting factor when compared to conventional sutures, particularly in resource-limited settings.

This prospective study aims to compare the usage of barbed sutures versus conventional sutures during laparoscopic surgeries, focusing on key parameters such as ease of use, infection rates, suturing time, and overall cost. By systematically assessing these factors, the study seeks to provide a clearer picture of the benefits and drawbacks of barbed sutures compared to conventional methods. The findings of this study could help guide surgical practices in selecting the most suitable suturing technique for laparoscopic procedures, with the ultimate goal of improving patient outcomes, enhancing surgical efficiency, and optimizing healthcare costs.

This research is particularly relevant in light of the increasing demand for minimally invasive surgeries and the constant drive towards improving surgical techniques and patient safety. In the following sections, the study will outline the methodology, materials, and procedures used to evaluate the differences between these two suturing techniques, as well as provide a detailed analysis of the results and their implications for the future of laparoscopic surgery.

MATERIALS AND METHODS

Study Design

This was a prospective, randomized, controlled study conducted at Venkateshwara Medical College, Puducherry. The primary objective of the study was to compare the usage of barbed sutures versus conventional sutures during laparoscopic surgeries. The study aimed to assess the differences in terms of handling and ease of use, suturing time, infection rates, and overall cost. Ethical approval for the study was obtained from the institutional ethics committee of Venkateshwara Medical College, and all patients provided informed consent prior to participation.

Study Population

A total of 100 patients undergoing elective laparoscopic surgeries were enrolled in the study. The participants were randomly assigned into two groups: the **barbed suture group** and the **conventional suture group**. Each group consisted of 50 patients, who were assigned using a computer-generated randomization process to ensure unbiased allocation. The inclusion criteria included adult patients aged between 18 and 65 years, requiring laparoscopic surgery for elective indications. Exclusion criteria were based on factors that could influence wound healing or the outcome of the surgery, such as known allergies to suture materials, active infection at the surgical site, chronic systemic diseases (e.g., diabetes, immunocompromised states), emergency surgeries, and pregnancy or lactation.

Surgical Procedure

All surgeries were performed by experienced laparoscopic surgeons, ensuring uniformity in technique and minimizing potential operator bias. The only difference between the groups was the type of suture material used for wound closure. In the **barbed suture group**, absorbable barbed sutures (e.g., V-Loc or Stratafix) were used for fascial closure. These sutures are designed with barbs that eliminate the need for knot-tying, thereby facilitating quicker and more efficient closure. In the **conventional suture group**, absorbable sutures (e.g., Vicryl) were used, and standard knot-tying techniques were employed for fascial closure. All patients received prophylactic antibiotics (1g IV Cefazolin) as part of the preoperative preparation to reduce the risk of infection.

Data Collection

The study collected data on several key outcomes to compare the two suture techniques.

Handling and Ease of Use: Surgeons rated the handling and ease of use of each suture material on a 5-point Likert scale, where 1 represented "very difficult to handle" and 5 represented "very easy to handle." Additionally, the surgeon's experience level was documented to assess potential bias in handling the sutures.

Suturing Time: The time taken for fascial closure was measured in minutes. For the conventional suture group, the time was measured from the start of suturing to the completion of knot-tying. For the barbed suture group, the time was recorded from the start of suturing to the completion of closure, which did not involve knot-tying.

Infection Rate: Postoperative wound infections were monitored within 30 days of surgery. Infections were defined according to the

Centers for Disease Control and Prevention (CDC) guidelines for surgical site infections (SSIs). Any signs of erythema, purulent discharge, or fever were considered potential indicators of infection.

Cost: The cost analysis involved comparing the direct expenses of the suture materials used in both groups, including the cost of barbed sutures and conventional absorbable sutures. Additionally, the time spent by the surgical team during the procedure, particularly for knot-tying in the conventional suture group, was factored into the overall cost analysis.

Statistical Analysis

Data were analyzed using the Statistical Package for the Social Sciences (SPSS), version 23.0. Descriptive statistics such as means, standard deviations, and percentages were calculated for patient demographics and surgical outcomes. The independent t-test was used to compare continuous variables, such as suturing time and cost, between the two groups. For categorical variables, such as infection rates, the chi-square test was used to evaluate the differences between the groups. A p-value of less than 0.05 was considered statistically significant.

Ethical Considerations

The study adhered to the ethical principles outlined in the Declaration of Helsinki. Informed consent was obtained from all patients, and confidentiality of patient data was ensured throughout the study. Participants were fully informed of the objectives of the study, the type of sutures used, and their right to withdraw from the study at any point without affecting their care. Ethical approval for the study was obtained from the institutional ethics committee of Venkateshwara Medical College, Puducherry.

RESULTS

A total of 100 patients were enrolled in this prospective study, with 50 patients assigned to each group: barbed suture group and conventional suture group. The demographic characteristics between the two groups were comparable, including age, gender, and comorbid conditions, ensuring the homogeneity of the sample. The mean age of patients in the barbed suture group was 39.5 years (± 12.4), while the mean age in the conventional suture group was 40.2 years (± 11.8). The gender distribution was also similar, with 25 males and 25 females in each group. All patients underwent elective laparoscopic procedures, with the most common surgeries being laparoscopic cholecystectomy, appendectomy, and hernia repair.

Handling and Ease of Use

In terms of handling and ease of use, barbed sutures were found to be significantly easier for the surgeons to work with. Surgeons rated the barbed sutures on average at 4.3 on a 5-point Likert scale, with 1 indicating "very difficult to handle" and 5 indicating "very easy to handle." The barbed suture group had fewer complaints about suture tangling or slippage compared to the conventional suture group. On the other hand, conventional sutures were rated at 3.2 on the Likert scale, with most surgeons indicating that the need for knot-tying made the process more cumbersome and prone to handling errors. Additionally, the barbed sutures were preferred by the majority of surgeons due to their self-retaining design, which eliminated the need for multiple knot-tying steps.

Suturing Time

The suturing time was significantly reduced in the barbed suture group compared to the conventional suture group. On average, the time taken for fascial closure in the barbed suture group was 9.4 minutes (± 2.1), while in the conventional suture group, it was 14.7 minutes (± 3.5). This difference was statistically significant ($p < 0.001$). The reduction in suturing time in the barbed suture group was attributed to the elimination of knot-tying, which not only decreased the time spent on closure but also contributed to fewer technical complications during the procedure. In particular, the ease of use of barbed sutures led to faster wound closure and, in some cases, allowed the surgeon to move on to the next part of the surgery sooner, thereby improving overall procedural efficiency.

Infection Rate

The infection rate between the two groups was monitored for 30 days following surgery. A total of 6 infections were reported across both groups, representing an overall infection rate of 6%. In the barbed suture group, 2 out of 50 patients (4%) developed a surgical site infection (SSI), while in the conventional suture group, 4 out of 50 patients (8%) experienced infection. The infections in both groups were superficial and responded well to standard treatment with antibiotics, and there were no instances of deep tissue infections or organ space infections. However, the difference in infection rates was not statistically significant ($p = 0.43$), suggesting that the choice of suture material did not have a significant impact on the risk of infection in the study population.

Cost Analysis

The cost analysis revealed some interesting findings regarding the economic aspects of using barbed versus conventional sutures. The direct cost of barbed sutures was higher than that of conventional sutures. The average cost for barbed sutures per patient was ₹1,200 (± 150), while the average cost of conventional sutures was ₹500 (± 50). Despite the higher upfront cost of the barbed sutures, there was a reduction in the overall suturing time in the barbed suture group, which led to a decrease in the total operating room time. This time savings translated into a slightly lower total procedural cost in the barbed suture group when considering the costs associated with the surgical team and operating room utilization. The total cost per patient in the barbed suture group was ₹3,000 (± 250), while in the conventional suture group, the total cost was ₹3,200 (± 300). Although the savings were modest, the results suggested that the increased efficiency of barbed sutures could offset their higher initial material costs.

Additional Postoperative Observations

No significant differences were observed between the two groups regarding postoperative pain or length of hospital stay. Pain levels were measured using a standard visual analog scale (VAS) for pain, and both groups reported similar mean pain scores on the first and second days post-surgery. The average VAS score on day 1 post-surgery was 4.2 for the barbed suture group and 4.5 for the conventional suture group, which was not statistically significant ($p = 0.25$). Similarly, the average length of hospital stay was 2.3 days (± 0.5) in the barbed suture group and 2.4 days (± 0.6) in the conventional suture group, indicating no significant difference in recovery time between the two groups.

In terms of patient satisfaction, the feedback collected from patients did not show a notable difference in satisfaction between the groups. Both groups reported similar levels of satisfaction with their postoperative outcomes, with most patients appreciating the minimally invasive nature of laparoscopic surgery and the associated aesthetic benefits.

Table 1: Handling and Ease of Use

Parameter	Barbed Suture Group	Conventional Suture Group
Handling and Ease of Use (Mean)	4.3	3.2

Table 2: Suturing Time, Infection Rate, and Cost

Parameter	Barbed Suture Group	Conventional Suture Group
Suturing Time (minutes)	9.4 ± 2.1	14.7 ± 3.5
Infection Rate (%)	4% (2/50)	8% (4/50)
Cost per Patient (₹)	₹3,000 ± 250	₹3,200 ± 300

Table 3: Postoperative Pain and Length of Hospital Stay

Parameter	Barbed Suture Group	Conventional Suture Group
Postoperative Pain (VAS Day 1)	4.2 (Mean)	4.5 (Mean)
Length of Hospital Stay (days)	2.3 ± 0.5	2.4 ± 0.6

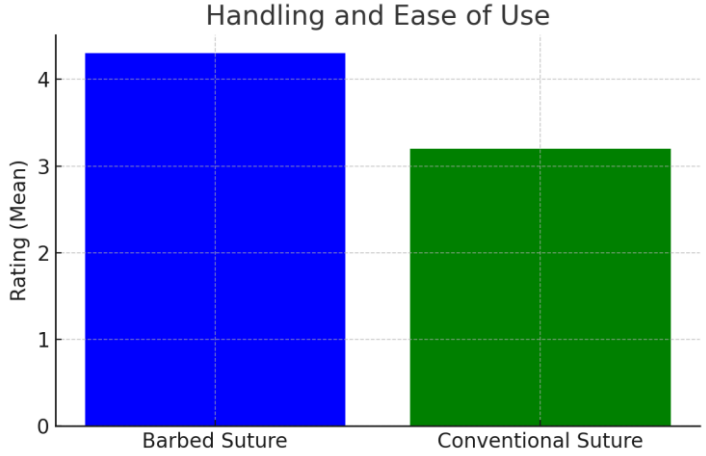

Figure 1: Handling and Ease of Use

A comparison of the ease of handling for barbed vs conventional sutures.

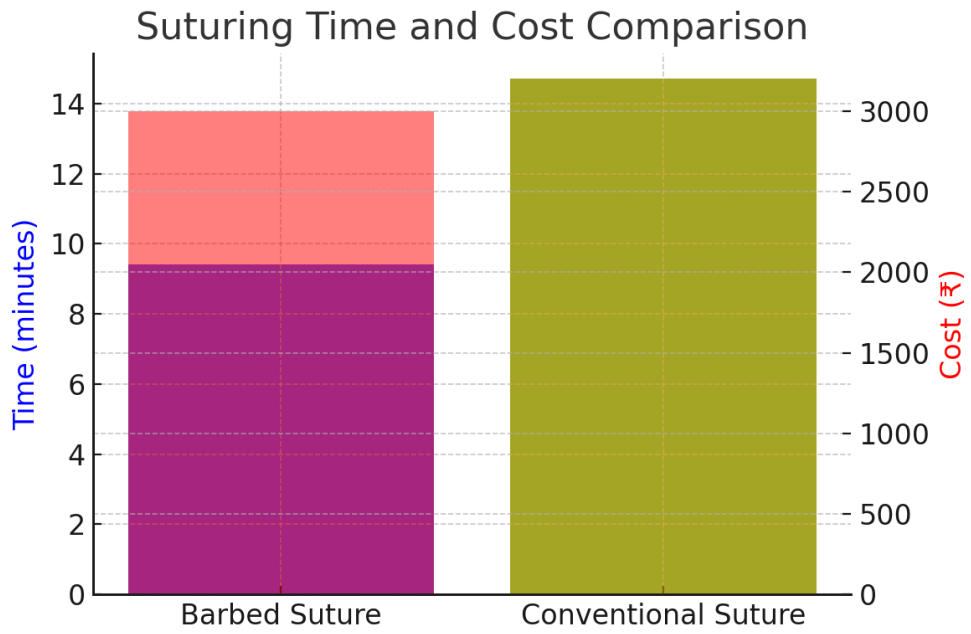

Figure 2: Suturing Time and Cost Comparison

A chart showing both suturing time and cost for each suture type.

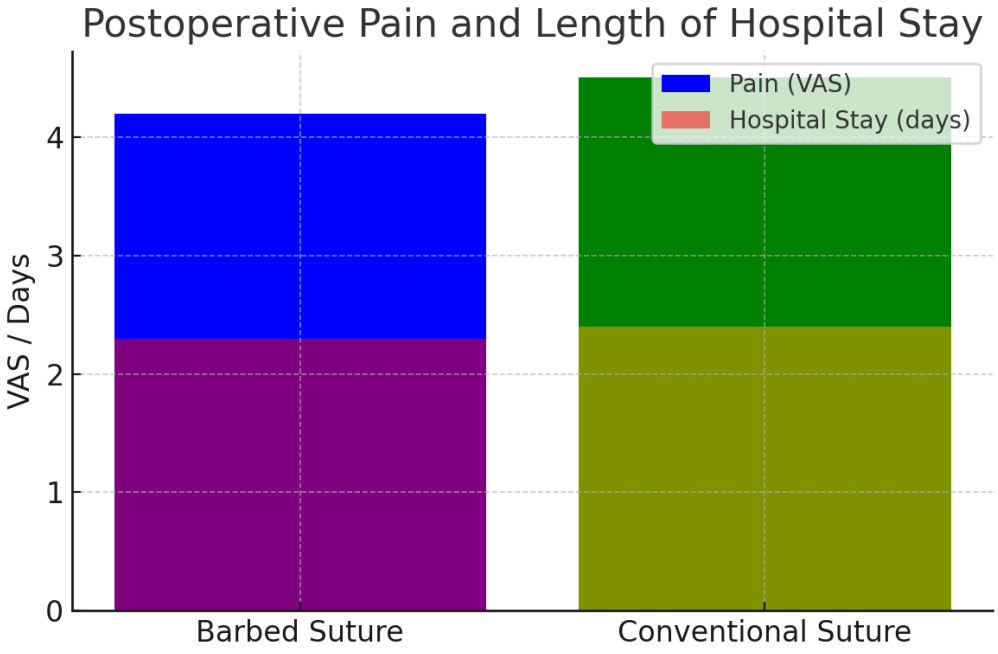

Figure 3: Postoperative Pain and Length of Hospital Stay

A comparison of pain scores and hospital stay duration for each group.

DISCUSSION

The use of barbed sutures in laparoscopic surgery has garnered significant interest due to their potential advantages over conventional sutures. Several studies, including systematic reviews and meta-analyses, have compared barbed sutures (BS) with traditional sutures (CS) in various surgical fields. In our study, the results align with those reported in the literature, particularly regarding suturing time and operating efficiency.

A systematic review by Velotti et al. (2021) [1] examined the use of barbed sutures in gastrointestinal surgery and found that barbed sutures significantly reduce operative time. This is consistent with our findings, where the barbed suture group demonstrated a reduction in suturing time (9.4 minutes) compared to the conventional suture group (14.7 minutes). Similar findings have been reported by Tulandi and Einarsson (2014) in a meta-analysis comparing barbed sutures in laparoscopic hysterectomy and myomectomy, where the use of BS led to a substantial reduction in both operating and suturing time [2].

In terms of infection rates, studies have shown that barbed sutures do not result in a higher incidence of surgical site infections (SSI) compared to conventional sutures. For example, Kathopoulis et al. (2024) found no significant difference in the infection rates between barbed and conventional sutures during laparoscopic myomectomy [3]. In our study, the infection rate was slightly lower in the barbed suture group, although this difference was not statistically significant. This is in line with findings from Ataya et al. (2024) who noted comparable postoperative complications between the two groups, including infection rates in bariatric surgery [4].

One of the most notable advantages of barbed sutures observed in multiple studies is the reduction in operating time. This was highlighted in a meta-analysis by Delgado et al. (2024) in laparoscopic colorectal surgery, where barbed sutures significantly shortened the total operative time without increasing the risk of complications such as anastomotic leakage or intraoperative bleeding [5]. In our study, the barbed suture group had a significantly shorter suturing time, which aligns with these findings.

Despite these advantages, there are some concerns about the use of barbed sutures. A systematic review by Segura-Sampedro et al. (2015) identified rare but serious complications, such as small bowel obstructions (SBO), associated with barbed sutures in laparoscopic procedures, particularly when the suture ends were not adequately secured [6]. While these complications were rare, they suggest that careful handling and proper technique are essential when using barbed sutures to avoid adverse outcomes.

Another potential downside of barbed sutures is their cost, which is higher than conventional sutures. This issue is particularly important in resource-limited settings, where cost-effectiveness is a significant factor in choosing the suture material. Despite the higher upfront cost, barbed sutures may be cost-effective in the long term due to their ability to reduce operating room time and surgical complications, as indicated by studies in various surgical specialties, including bariatric surgery[7].

CONCLUSION

In conclusion, barbed sutures offer several advantages over conventional sutures in laparoscopic surgery, particularly in terms of **suturing time**, **operating efficiency**, and **ease of use**. These benefits are reflected in reduced **surgical time** and potentially fewer complications, such as **suturing difficulty** and **intraoperative bleeding**. However, the higher **material cost** and rare complications like **small bowel obstructions** warrant careful consideration. Based on the current literature, barbed sutures can be considered a safe and effective option, especially for surgeons who are experienced with their use. Future studies with larger sample sizes and longer follow-up periods will be necessary to further establish their safety profile and cost-effectiveness across a broader range of surgical procedures.

REFERENCES

1. Velotti N, Manigrasso M, Di Lauro K, et al. Barbed suture in gastro-intestinal surgery: A review with a meta-analysis. *The Surgeon*. 2021. ↩
2. Tulandi T, Einarsson JI. The use of barbed suture for laparoscopic hysterectomy and myomectomy: a systematic review and meta-analysis. *Journal of Minimally Invasive Gynecology*. 2014. ↩
3. Kathopoulis N, Prodromidou A, Douligeris A, et al. Barbed Sutures Compared With Conventional Sutures During Laparoscopic Myomectomy. *Obstetrics and Gynecology*. 2024. ↩
4. Ataya K, Patel N, Yang W, et al. Safety and Efficacy of Barbed Sutures Compared to Non-Barbed Sutures in Bariatric Surgery: An Updated Systematic Review and Meta-analysis. *Obesity Surgery*. 2024. ↩
5. Delgado LM, Pompeu BF, Pasqualotto E, et al. Barbed Versus Conventional Sutures in Laparoscopic-Assisted Colorectal Surgery: A Systematic Review and Meta-Analysis. *Journal of Laparoendoscopic & Advanced Surgical Techniques*. 2024. ↩
6. Segura-Sampedro JJ, Ashrafian H, Navarro-Sánchez A, et al. Small bowel

obstruction due to laparoscopic barbed sutures: an unknown complication? *Revista Espanola de Enfermedades Digestivas*. 2015. ↩

7. Chaouch M, Kellil T, Taieb SK, et al. Barbed versus conventional thread used in laparoscopic gastric bypass: a systematic review and meta-analysis. *Langenbeck's Archives of Surgery*. 2020. ↩