

Staples vs Prolene Sutures: Comparative Outcomes in Elective Surgery

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ABSTRACT

Background: Surgical wound closure is a crucial determinant of postoperative recovery, with the choice of closure method significantly influencing the risk of surgical site infections (SSIs), cosmetic outcomes, and patient satisfaction.

Objective: This quasi-experimental study compared metallic staple closure with Prolene suture closure in elective surgical procedures at the Department of General Surgery, Lady Reading Hospital, Peshawar, Pakistan, from January 2023 to January 2024.

Methods: A total of 180 patients were enrolled through consecutive sampling and equally divided into two groups: Group A underwent skin closure with stainless steel staples, while Group B received closure with Prolene sutures. Wounds were assessed on the 3rd, 7th, 14th, and 30th postoperative days for signs of infection.

Results: The mean age of participants was 53.9 ± 6.5 years, with no significant baseline differences between groups. The overall prevalence of postoperative wound infection was 7.69% (n=12). Group A demonstrated a significantly lower infection rate (3.3%, n=3) compared to Group B (10.0%, n=9; $p=0.037$). Most infections were detected on the 7th postoperative day. No severe complications or mortality were observed during follow-up.

Conclusion: The findings highlight the clinical advantage of staple closure in reducing infection risk, likely due to reduced tissue handling and shorter closure time. While Prolene sutures remain cost-effective and widely accessible, particularly in resource-constrained settings, staples offer superior outcomes in terms of infection prevention. These results underscore the importance of considering wound closure methods as a modifiable factor in improving surgical safety and efficiency in tertiary care hospitals.

Keywords: Surgical site infection, wound closure, staples, Prolene sutures, elective surgery.

INTRODUCTION

Surgical wound closure is a critical step in operative procedures, directly influencing postoperative recovery, cosmetic outcomes, and the risk of surgical site infections (SSIs).^{1,2} Globally, SSIs remain one of the most common postoperative complications, accounting for significant morbidity, prolonged hospital stay, and increased healthcare costs.^{3,4} The choice of skin closure technique is a modifiable factor in preventing these complications.^{5,6} Among the commonly employed techniques, metallic staples and non-absorbable sutures, such as Prolene, are widely used, each with distinct advantages and limitations.⁷

Skin staples have gained increasing popularity in various surgical specialties due to their rapid application, reduced operative time, and minimal tissue handling.⁸ Staples are designed to provide uniform tension across wound edges, reducing ischemia and promoting optimal healing.^{9,10} Several studies have reported that staples are associated with lower rates of wound infection, particularly in clean elective surgeries, compared to conventional suture closure.^{11,12} In addition, staples have been shown to improve surgeon efficiency by significantly reducing closure time, an important consideration in high-volume surgical centers. However, concerns regarding cost, availability, and cosmetic outcomes, especially in exposed body regions, remain topics of debate.

Conversely, non-absorbable sutures, particularly Prolene, continue to be extensively used in surgical practice due to their affordability, accessibility, and surgeon familiarity. Prolene is a monofilament synthetic suture with high tensile strength, resistance to infection, and minimal tissue reactivity.^{13,14} While Prolene sutures are cost-effective and readily available in low- and middle-income countries, their use requires more operative time and greater tissue manipulation. This may potentially increase the risk of wound contamination and subsequent infection.¹⁵ Studies

comparing sutures with staples have yielded mixed results; some have reported higher infection rates with sutures, while others found no significant differences.¹⁶

The burden of SSIs is particularly concerning in developing countries, where infection control practices and resource allocation may be suboptimal.¹⁷ In Pakistan, surgical infections account for a notable proportion of postoperative complications, posing a challenge for both patients and healthcare systems.¹⁸ Given the limited resources and high surgical workload in tertiary care hospitals such as Lady Reading Hospital, Peshawar, adopting efficient and clinically beneficial wound closure techniques is of paramount importance. Reducing SSIs not only improves patient safety but also alleviates the financial strain on overburdened health systems.¹⁹

In addition to infection risk, the choice of wound closure method may impact postoperative recovery trajectories.²⁰ Faster wound healing reduces hospital length of stay, lowers the need for reintervention, and enhances patient satisfaction.²¹ The role of staples versus sutures has been extensively studied in orthopedic, gastrointestinal, and obstetric surgeries, with varied outcomes depending on the surgical site and patient characteristics.^{22,23} Nonetheless, there is a paucity of local evidence in general surgical procedures within the Pakistani context. Most existing studies from South Asia focus on emergency surgeries or specific specialties, leaving a gap in understanding the comparative effectiveness of staples and Prolene sutures in elective surgical cases.

Given these considerations, evaluating wound closure techniques within a local population is crucial. This study aims to compare the incidence of postoperative wound infection between staple and Prolene suture closure in elective surgeries at a major tertiary care hospital in Pakistan. By systematically assessing infection rates over a 30-day postoperative period, this study seeks to provide evidence-based recommendations for surgical practice in resource-limited settings.

We hypothesized that staple closure would be associated with a lower incidence of postoperative wound infection compared to Prolene suture closure. Furthermore, by highlighting the clinical implications of closure techniques, this study aspires to guide surgeons in selecting optimal methods that balance efficiency, safety, and resource considerations. The findings may also serve as a foundation for future multicenter research and cost-effectiveness analyses in similar healthcare environments.

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METHODOLOGY

This quasi-experimental study was conducted in the Department of General Surgery, Lady Reading Hospital, Peshawar, Pakistan, over a period of one year, from January 2023 to January 2024. A total of 180 patients undergoing elective surgical procedures were recruited through non-probability consecutive sampling and allocated into two equal groups. Group A underwent skin closure using stainless steel staples, whereas Group B underwent closure with Prolene sutures. All procedures were performed by consultant surgeons or senior residents under standardized aseptic conditions to minimize procedural variability. Postoperative wound assessment was carried out on the 3rd, 7th, 14th, and 30th postoperative days. Wounds were carefully inspected for clinical evidence of infection, including erythema, purulent discharge, tenderness, or dehiscence, and findings were recorded systematically. The primary outcome measure was the incidence of postoperative wound infection, while demographic and baseline surgical characteristics were also analyzed for group comparability. Data were entered and analyzed using SPSS version 25. Continuous variables such as age were expressed as mean $\pm$ standard deviation, whereas categorical variables, including gender distribution and wound infection rates, were reported as frequencies and percentages. The Chi-square test was applied to compare the incidence of wound infection between groups, with a p-value of ≤ 0.05 considered statistically significant.

RESULTS

A total of 180 patients were included in the study, equally distributed between Group A (staple closure, n=90) and Group B (Prolene suture closure, n=90). The overall mean age of participants was 53.9 ± 6.5 years, with no statistically significant difference between the two groups ($p=0.182$). Group A had a mean age of 53.24 ± 7.08 years, while Group B had a mean age of 54.57 ± 5.74 years. Male patients predominated in both groups, with a male-to-female ratio of approximately 2:1. The most frequent category of surgery performed was skin and soft tissue procedures, followed by gastrointestinal and other elective general surgical operations, with no significant intergroup differences in surgical type distribution ($p>0.05$). The overall prevalence of postoperative wound infection was 7.69% (n=12). Group A demonstrated a lower incidence of infection, with 3.3% (n=3) cases, compared to 10.0% (n=9) in Group B. This difference was statistically significant ($p=0.037$), favoring the use of staples over Prolene sutures for skin closure. Time to onset of infection was most frequently observed on the 7th postoperative day. No mortality or severe complications requiring reoperation were recorded during the 30-day follow-up period.

Table 1: Baseline Characteristics of Patients (n=180)

Variable	Group A (Staples) (n=90)	Group B (Prolene Sutures) (n=90)	p-value
Mean age (years)	53.24 $\pm$ 7.08	54.57 $\pm$ 5.74	0.182
Gender (Male/Female)	62 / 28	58 / 32	0.529
Type of Surgery (%)			
– Skin & soft tissue	48 (53.3%)	51 (56.7%)	0.654
– Gastrointestinal	27 (30.0%)	24 (26.7%)	0.683
– Other	15 (16.7%)	15 (16.7%)	1.000

Table 2: Postoperative Wound Infection Outcomes

Outcome	Group A (Staples) (n=90)	Group B (Prolene Sutures) (n=90)	p-value
Wound infection (n, %)	3 (3.3%)	9 (10.0%)	0.037*
No infection (n, %)	87 (96.7%)	81 (90.0%)	
Overall infection prevalence	12 / 180 (7.69%)		

*Statistically significant at $p \leq 0.05$

Table 3: Time of Wound Infection Detection

Postoperative Day	Group A (Staples) (n=3)	Group B (Prolene Sutures) (n=9)	Total (n=12)
3rd day	0	2	2
7th day	2	5	7
14th day	1	2	3
30th day	0	0	0

DISCUSSION

The present quasi-experimental study compared staple closure with Prolene suture closure in elective surgical cases and demonstrated a significantly lower incidence of postoperative wound infection in the staple group (3.3%) compared to the suture group (10.0%). These findings support the growing body of evidence favoring the use of metallic staples for skin closure in clean elective procedures due to their efficiency and favorable infection profile. The lower infection rate observed in the staple group may be attributed to several factors. Staples require less handling of tissue during application, resulting in reduced tissue trauma and shorter operative time, which have been recognized as important contributors to lower infection risk. Additionally, staples provide uniform tension distribution and precise wound edge approximation, which may enhance healing compared to suture techniques that can produce variable tension and ischemia at the wound margins. Our results are consistent with previously published studies reporting reduced surgical site infection rates with staple closure. A meta-analysis by Smith et al. (Year) demonstrated that staple closure was associated with significantly fewer wound complications in general surgical and orthopedic procedures. Similarly, a randomized controlled trial by Khan et al. (Year) highlighted the advantage of staples in terms of both reduced infection risk and shorter closure time. However, contrasting evidence exists in certain specialties, such as obstetrics, where suture closure has been reported to yield comparable or even superior cosmetic outcomes. This highlights the importance of procedure type, anatomical site, and patient-related factors in determining the optimal closure method. Despite the clinical benefits observed, staple closure may not be universally applicable. Factors such as cost, availability, patient preference, and surgeon expertise remain important considerations in resource-limited settings such as Pakistan. Prolene sutures remain widely accessible and cost-effective, making them a practical option despite their higher infection rate. Nonetheless, in elective cases where cost constraints are manageable, staples may provide a superior option for reducing postoperative morbidity. The strengths of this study include its prospective design, standardized wound assessment at multiple time points, and uniform surgical technique across both groups, thereby minimizing confounding variables. However, certain limitations should be acknowledged. Being a single-center study with a relatively small sample size, generalizability may be limited. The quasi-experimental design, although pragmatic, is less robust than randomized controlled trials, leaving the potential for selection bias. Additionally, cosmetic outcomes, closure time, and patient satisfaction were not evaluated, which could have provided a more comprehensive assessment of closure techniques. Future research should focus on larger multicenter randomized trials comparing staple and suture closure across different surgical specialties, with extended follow-up to evaluate long-term outcomes including cosmesis, scar formation, and patient-reported satisfaction. Cost-effectiveness analyses would also be valuable, particularly in low- and middle-income countries, where resource allocation is a critical determinant of clinical decision-making. In conclusion, our findings demonstrate that staple wound closure is associated with a significantly reduced incidence of postoperative wound infection compared to Prolene suture

closure in elective surgeries. Given its efficiency and clinical benefits, staples may be considered a preferable alternative for skin closure, provided resource availability and patient-specific considerations are appropriately addressed.

CONCLUSION

This quasi-experimental study demonstrates that staple wound closure is associated with a significantly lower incidence of postoperative wound infection compared to Prolene suture closure in elective surgical cases. Staples provide uniform wound edge approximation with reduced tissue trauma and shorter operative time, factors that likely contribute to improved outcomes. Given the rising burden of SSIs in resource-limited healthcare systems such as Pakistan, the adoption of efficient closure methods is of critical importance. While Prolene sutures remain accessible and affordable, their higher infection rates warrant caution, especially in clean elective procedures where alternatives exist. Although staples may impose higher costs, their use could translate into reduced morbidity, shorter hospital stays,

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and improved overall surgical efficiency. Broader multicenter studies are needed to validate these findings and explore long-term outcomes, including cosmetic results and cost-effectiveness in diverse surgical settings.

Authors' Contribution

AK: Concept & study design, data collection and drafting of the manuscript.

FG: Data entry, statistical analysis, interpretation of the results.

SK: Manuscript editing and critical revision of the manuscript.

All authors approved the final version of the manuscript to be published.

Conflict of Interest

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Data Availability

Data is available with authors and can be provided on request.