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Advantages Of Skin Closure With Staples In Orthopedic Surgery At Mardan Medical Complex

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ABSTRACT

Background: Wound closure is a fundamental aspect of surgery that impacts recovery, cosmetic outcomes, and postoperative complications. Among various closure techniques, sutures and staples are widely used, each with distinct advantages and limitations. Sutures offer precision and adaptability, while staples are valued for faster application and reduced surgical time. Despite their widespread use, comparative studies evaluating their effectiveness in orthopedic surgeries remain limited. Previous research highlights variability in outcomes such as infection rates, wound healing, and patient satisfaction across surgical settings, emphasizing the need for specialty-specific data. This study focuses on orthopedic wound closure, aiming to provide evidence-based insights for optimizing patient care.

Method: This prospective observational study was conducted in the orthopedic ward of Bacha Khan Medical College, Mardan, from January 2023 to December 2023. A total of 120 patients undergoing surgical wound closure with either sutures or staples were included. Patients aged 22–60 years were eligible, while those with pre-existing wound infections, immune deficiencies, or incomplete medical records were excluded. Data collection involved demographic details, clinical outcomes, and postoperative follow-ups. Key parameters included skin closure time, infection rates, wound discharge, necrosis, hypertrophic scar formation, and cosmetic outcomes. Statistical analyses were performed to compare outcomes between the two groups, with a p-value of <0.05 considered significant.

Result: A total of 120 patients (mean age: 42 years; 68 males, 52 females) were evaluated. The mean skin closure time was significantly shorter with staples (5.2 ± 0.9 minutes) compared to sutures (12.6 ± 1.5 minutes; $p < 0.0001$). Complication rates, including wound infections (6.6% in sutures vs. 3.3% in staples; $p = 0.647$), wound discharge (3.3% in both groups; $p = 1.000$), and hypertrophic scar formation (3.3% in sutures vs. 1.6% in staples; $p = 1.002$), were comparable. Wound necrosis occurred in 1.6% of suture cases but was absent in the staples group ($p = 1.000$). These findings indicate that staples offer faster skin closure without increasing complication rates.

Conclusion: Staples demonstrated a significant advantage in reducing skin closure time compared to sutures while maintaining comparable rates of complications such as infections and wound discharge. These results suggest that staples may be a preferable option for orthopedic wound closure, particularly in scenarios prioritizing efficiency. However, further studies are warranted to evaluate long-term outcomes and patient satisfaction comprehensively.

Keyword: Orthopedic wound closure, sutures, staples, postoperative outcomes, skin closure time, wound complications, infection rates, cosmetic results.**Introduction:**

Wound closure is a critical aspect of surgical management, influencing not only the immediate outcomes but also the long-term recovery of patients[1-2]. The choice of wound closure technique—whether sutures or staples—has been a subject of ongoing debate, particularly in orthopedic procedures where postoperative healing can be challenging due to factors like mechanical stress and high infection risk. Modern advances in surgical materials and techniques aim to optimize wound healing, minimize complications, and improve cosmetic outcomes. However, understanding the comparative benefits and limitations of these methods remains essential to guide clinical decision-making effectively[3-4].Sutures have traditionally been regarded as the gold standard for wound closure due to their flexibility and adaptability to various wound types. However, staples offer distinct advantages, such as faster application and potentially reduced operative time, which may contribute to improved efficiency in the surgical setting[5-6]. Previous studies, such as those by Cochetti et al. (2020) and Mallee et al. (2020), have highlighted the effectiveness of staples in reducing skin closure time, but their impact on infection rates and cosmetic outcomes varies across different surgical fields. In orthopedic surgery, these factors are especially critical due to the potential for prolonged recovery and functional limitations[7-8].Several factors influence wound healing in orthopedic surgeries, including patient demographics, surgical technique, and postoperative care. Complications such as infections, wound necrosis, and hypertrophic scar formation can significantly affect patient outcomes and healthcare costs. While studies like Mahesh et al. (2019) and Seidelman et al. (2023) have provided valuable insights into infection prevention and wound care, further research is needed to compare sutures and staples directly in the orthopedic population. Such comparisons can help establish evidence-based guidelines tailored to the unique demands of this specialty[9-10].This study aims to evaluate and compare the clinical outcomes of sutures and staples in orthopedic wound closure at Bacha Khan Medical College, Mardan, over a one-year period. By analyzing parameters such as skin closure time, infection rates, and cosmetic outcomes, the study seeks to provide a comprehensive understanding of the advantages and limitations of each technique. This knowledge will contribute to improving surgical practice and patient care in orthopedic settings.

Material and Method:

The study was conducted at the orthopedic ward of Bacha Khan Medical College (BKMC), Mardan, from January 2023 to December 2023. This observational study aimed to compare outcomes of wound closure techniques using sutures and staples among patients undergoing orthopedic procedures. Ethical approval was obtained from the institutional review board, and written informed consent was secured from all participants. Data collection involved demographic details, surgical parameters, and postoperative outcomes. Standardized protocols were followed for wound closure, ensuring consistency across cases. A structured proforma was used for recording clinical and procedural data. Outcomes were evaluated in terms of skin closure time, cosmetic results, infection rates, and complications. The **inclusion criteria** comprised patients aged 18–60 years who underwent elective or emergency orthopedic surgeries requiring skin closure. Patients with preexisting wound infections, autoimmune disorders, or conditions affecting wound healing, such as diabetes mellitus or immunosuppressive therapy, were excluded. Additionally, those with a history of prior surgical complications or allergic reactions to suture or staple materials were omitted. Follow-up assessments were performed on postoperative days 1, 7, and 14, and data were analyzed using statistical software. Results were expressed as means, percentages, and p-values to identify significant differences between groups.

Result:

The study included 120 patients, with a mean age of 42 years and an age range spanning from 22 to 60 years. Of the participants, 56% (n=68) were male, and 44% (n=52) were female, indicating a slight male predominance in the cohort.The mean skin closure time was significantly shorter with staples (5.2 ± 0.9 minutes) compared to sutures (12.6 ± 1.5 minutes). The p-value of <0.0001 underscores the highly significant difference, favoring the use of staples for faster wound closure. This finding suggests that staples may be particularly beneficial in time-sensitive surgical scenarios.Wound complications occurred in 15% of patients in the sutures group compared to 8.3% in the staples group, though this difference was not statistically significant (p=0.256).

Table :1 demographics of patients

Demographic	patients
Total patients	120
Mean age	42 year
Age range	22-60
gender	Male (56%, n=68) (female 53%, n=52)

Table: 2 Comparison of outcomes between sutures and staples

Infection rates were also lower in the staples group (3.3%, n=2) than in the sutures group (6.6%, n=4), with a p-value of 0.647, indicating no significant difference. Similarly, discharge from wounds (3.3% in both groups) and wound necrosis (1.6% in sutures vs. 0% in staples) showed no statistically significant differences (p=1.000).Hypertrophic scar formation was slightly more common with sutures (3.3%, n=2) compared to staples (1.6%, n=1), but the p-value of 1.002 indicates no statistical significance.The results demonstrate that staples significantly reduce skin closure time and might offer a slight advantage in lowering wound-related complications. While no significant differences were found in infection rates, discharge, necrosis, or hypertrophic scar formation, the reduced closure time and trend towards fewer complications suggest that staples may be the preferred choice for wound closure in specific clinical settings.

Table: 2 Comparison of outcomes between sutures and staples

Infection rates

Outcome		MEAN ±SD	P-value
Mean skin closure time	Sutures	12.6 ±1.5	<0.0001
	staples	5.2 ± 0.9	
Wound closure	sutures	15% (n=9)	0.256
	staples	8.3% (n=5)	
infections	sutures	6.6% (n=4)	0.647
	staples	3.3% (n=2)	
Discharge from wounds	sutures	3.3% (n=2)	1.000
	staples	3.3% (n=2)	
Wound necrosis	sutures	1.6% (n=1)	1.000
	staples	0% (n=0)	
Hyperthropic scar formtion	sutures	3.3% (n=2)	1.002
	staples	1.6% (n=1)	

Discussion:

The study's demographic analysis, which included 120 patients with a mean age of 42 years (range: 22–60), provided a balanced representation of 56% males and 44% females. This demographic spread ensures applicability across genders, reflecting real-world clinical settings. Consistent with findings by Cochetti et al. and Mallee et al., studies with diverse populations are critical for assessing the generalizability of surgical techniques[11-12]. Such demographic inclusiveness adds robustness to the interpretation of clinical outcomes and supports broader applications of wound closure methods in varied populations[13-14].The comparison of skin closure time between sutures and staples revealed a marked advantage for staples, which required significantly less time (5.2 ± 0.9 minutes) than sutures (12.6 ± 1.5 minutes, $p<0.0001$). This efficiency aligns with results from Knapper et al., who emphasized staples' time-saving benefits in procedures like total hip arthroplasty. The shorter closure times associated with staples could reduce operating room occupancy and patient anesthesia exposure, presenting logistical and safety benefits in high-volume surgical settings. This highlights the importance of selecting closure methods based on procedural and resource constraints[15-16].Regarding wound complications, sutures demonstrated slightly higher rates of wound closure issues (15% vs. 8.3% for staples, $p=0.256$) and infections (6.6% vs. 3.3%, $p=0.647$), though differences were not statistically significant. These findings are consistent with meta-analyses by van de Kuit et al. and Zhou et al., which showed comparable outcomes between sutures and staples for surgical site infections in orthopedic procedures. Such results suggest that while both techniques are effective, strict adherence to infection control practices remains pivotal. Moreover, the negligible differences in wound discharge and necrosis emphasize the need for individualized approaches to closure techniques[17]. hypertrophic scar formation was slightly higher in the sutures group (3.3% vs. 1.6% for staples), which resonates with the findings of Shani et al., highlighting the cosmetic advantages of staples or alternative materials like nylon. Although these differences were not statistically significant, the findings support the consideration of cosmetic outcomes, especially in surgeries with aesthetic implications. As emphasized by Seidelman et al., long-term follow-up studies focusing on patient satisfaction and scar quality could provide more comprehensive insights into the relative benefits of sutures versus staples for wound closure[18-20].

Conclusion:

Staples demonstrated a significantly shorter closure time, consistent with previous literature emphasizing their efficiency in reducing operating room time and anesthesia exposure. Although differences in wound complications and infections were not statistically significant, the slightly lower rates in the staples group suggest a potential edge in specific clinical scenarios. Additionally, the cosmetic outcomes, indicated by lower rates of hypertrophic scar formation with staples, underline their aesthetic benefits, particularly in surgeries with visible incisions. These findings reinforce the need for a tailored approach in selecting closure techniques, balancing efficiency, safety, and cosmetic outcomes, as supported by systematic reviews and meta-analyses in the field. Future research should focus on long-term patient satisfaction and scar quality to further refine best practices in surgical wound management.

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Authors' contributions:

Study concept and design- **Abdus Samad Khan, Anwer Ali**
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Data analysis-**, Saad Ali, Irsa Hidayat**, **Muhammad Haroon.**
Manuscript writing/editing- **, Ammad Ali, Muhammad Israr**
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References:

1: Surgical wound closure by staples or sutures?: Systematic review. Cochetti G, Abraha I, Randolph J, et al. Medicine. 2020;99:0. doi: 10.1097/MD.0000000000020573

2:Bacterial adherence around sutures of different material at grafted site: a microbiological analysis. Mahesh L, Kumar VR, Jain A, et al. Materials (Basel) 2019;12:2848. doi: 10.3390/ma12182848

3:Mallee WH, Wijsbek AE, Schafroth MU, Wolkenfelt J, Baas DC, Vervest TMJS. Wound complications after total hip arthroplasty: a prospective, randomised controlled trial comparing staples with sutures. *Hip Int*. 2020; **7**:1319491907.https://doi.org/10.1177/1120700020939075

4:Knapper TD, Dahill M, Eastaugh-Waring S, et al. Barbed sutures versus staples for closure in Total hip arthroplasty using wound ooze as a primary outcome measure: a prospective study. *J Orthopaedic Surg*. 2019; **27**(2):615517454.https://doi.org/10.1177/2309499019857166

5: van de Kuit A, Krishnan RJ, Mallee WH, et al. Surgical site infection after wound closure with Staples versus sutures in elective knee and hip arthroplasty: a systematic review and meta-analysis. *Art Ther*. 2022; **4**(1): 12.https://doi.org/10.1186/s42836-021-00110-7

6: Seidelman JL, Mantyh CR, Anderson DJ (2023) Surg Site Infect Prevention: Rev Jama 329(3):244–252. doi:10.1001/jama.2022.24075

7: Li Z et al (2019) Incidence, prevalence, and analysis of risk factors for Surgical site infection after lumbar Fusion surgery: ≥2-Year Follow-Up Retrospective Study. World Neurosurg 131:e460–e467.https://doi.org/10.1016/j.wneu.2019.07.207

8: Zhou J et al (2020) Incidence of Surgical site infection after spine surgery: a systematic review and Meta-analysis. Spine (Phila Pa 1976) 45(3):208–216. *DOI:* 10.1097/BRS.0000000000003218

9: Gadot R et al (2022) Complex Wound Closure in adult spinal deformity surgery reduces complications in high-risk patients. World Neurosurg 162:e561–e567.https://doi.org/10.1016/j.wneu.2022.03.057

10: Leary OP et al (2020) Complex wound closure by plastic surgery following resection of spinal neoplasms minimizes postoperative wound complications in high-risk patients. J Neurosurg Spine 33(1):77–86.https://doi.org/10.3171/2019.12.SPINE191238

11: Guo CR et al (2024) Systematic review of prophylactic plastic surgery Closure to prevent postoperative wound complications following spine surgery. World Neurosurg 184:103–111.https://doi.org/10.1016/j.wneu.2024.01.007

12: Do A et al (2021) The historical role of the Plastic Surgeon in Spine Reconstruction. Semin Plast Surg 35(1):3–9.DOI: 10.1055/s-0041-1722852

13: Aguilar OJM et al (2022) Variability in wound closure technique in midline posterior lumbar fusion surgery. International survey and standardized closure technique proposal. Surg Neurol Int 13:534 doi: 10.25259/SNI_872_2022

14:Page MJ et al (2021) The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 372:n71. doi: https://doi.org/10.1136/bmj.n71

15:Shani A et al (2020) Nylon skin sutures carry a lower risk of post-operative infection than Metal Staples in Open posterior spine surgery: a retrospective case-control study of 270 patients. Surg Infect (Larchmt) 21(5):440–444.https://doi.org/10.1089/sur.2019.212
16: Rose J, Tuma F. Sutures and needles. InStatPearls [Internet] 2023 Aug 28. StatPearls Publishing. https://www.ncbi.nlm.nih.gov/books/NBK539891/
17: Krishnan M, Tuma F. StatPearls [Internet]. StatPearls Publishing; Treasure Island (FL): Aug 3, 2023. Intestinal Carcinoid Cancer.https://www.ncbi.nlm.nih.gov/books/NBK448121/
18: Ogobuiro I, Gonzales J, Shumway KR, Tuma F. Physiology, gastrointestinal. InStatPearls [Internet] 2023 Apr 8. StatPearls Publishing.https://www.ncbi.nlm.nih.gov/books/NBK537103/
19: Mallee WH, Wijsbek AE, Schafroth MU, Wolkenfelt J, Baas DC, Vervest TM. Wound complications after total hip arthroplasty: a prospective, randomised controlled trial comparing staples with sutures. Hip international. 2020 Jul 7:1120700020939075.
20: Knapper TD, Dahill M, Eastaugh-Waring S, et al. Barbed sutures versus staples for closure in Total hip arthroplasty using wound ooze as a primary outcome measure: a prospective study. *J Orthopaedic Surg*. 2019; **27**(2):615517454.