

Stapler Suturing Versus Conventional Suturing: A Comparative Study on the Outcome of Abdominal Skin Incisions**Saptarshi Jyoti Roy Choudhury¹, A.K. Malhotra², Subimal Gupta³, Bahrul Hoda⁴**¹DNB General Surgery Resident, Central Hospital, South Eastern Railway²Principal Consultant, General Surgery, Central Hospital, South Eastern Railway³Senior Consultant, General Surgery, Central Hospital, South Eastern Railway⁴PDT, Surgical Oncology, Apollo Multispeciality Hospitals, Kolkata

Received: 01-05-2026 / Revised: 15-06-2026 / Accepted: 21-07-2026

Corresponding author: Dr. Bahrul Hoda

Conflict of interest: Nil

Abstract

Background: Skin closure is an important component of surgical wound management. Conventional suturing remains widely used, while skin staplers offer rapid and standardized approximation of wound edges. This study compared stapler and conventional suture closure of abdominal skin incisions with respect to closure time, postoperative pain, wound complications, cosmetic outcome, and removal time.

Methods: A prospective comparative study was conducted in the Department of General Surgery, South Eastern Railway Central Hospital, during November 2022 to October 2023. Eighty patients aged 18–65 years undergoing abdominal surgery with linear skin incisions were included and allocated into two groups of 40 patients each. Group A underwent conventional skin closure with non-absorbable nylon sutures and Group B underwent stainless-steel skin stapling. Postoperative pain was assessed using the Visual Analogue Scale at 6, 12, 24 and 48 hours and during removal. Wound complications were assessed clinically using the Southampton Wound Grading Scale. Cosmetic outcome was assessed using the Wound Cosmesis Score.

Results: The groups were comparable with respect to age and sex. Mean age was 45.35 ± 14.52 years in the stapler group and 44.48 ± 14.11 years in the suture group ($p=0.758$). Mean incision length was 14.95 ± 8.45 cm versus 17.03 ± 9.92 cm, respectively ($p=0.383$). Mean skin-closure time was significantly lower with staplers (376.78 ± 204.39 seconds) than with sutures (518.75 ± 275.49 seconds; $p=0.012$). Postoperative pain was significantly lower in the stapler group at 6, 12, 24 and 48 hours (all $p<0.001$). Mean wound cosmesis score was higher in the stapler group (6.55 ± 1.68) than in the suture group (3.85 ± 2.70 ; $p<0.001$). Overall complications occurred in 27.5% of stapler patients and 22.5% of suture patients ($p=0.606$). Stapler removal took longer than suture removal (278.00 ± 104.32 vs 127.68 ± 88.01 seconds; $p<0.001$).

Conclusion: In this study, stapler closure provided significantly faster skin closure, lower early postoperative pain, and better wound cosmesis than conventional suturing, while overall complication rates were not significantly different. The longer removal time is an important disadvantage. Staplers may therefore be considered a useful option for selected abdominal incisions when rapid closure and patient comfort are priorities.

Keywords: Skin Staples; Conventional Sutures; Abdominal Incision; Wound Closure; Postoperative Pain; Wound Cosmesis; Surgical Site Complications.

DOI: 10.25258/ijcpr.18.8.263

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

Introduction

Surgical wound closure aims to achieve accurate approximation of tissue edges, promote uncomplicated healing, minimize tissue trauma and inflammation, and provide an acceptable scar. Conventional suturing with needle and thread remains versatile and dependable, but placement can be time-consuming and the final result may depend on the operator's technique.

Mechanical skin staplers were developed to simplify and accelerate skin closure. Their principal advantages include rapid application and relatively uniform wound-edge approximation with limited tissue manipulation. However, staplers have disadvantages, including the need for a dedicated removal device, possible discomfort during removal, and concerns regarding wound

complications and cosmesis in some clinical settings.

The literature is not completely uniform. Some comparative studies have reported shorter closure times and acceptable or improved cosmetic outcomes with staples, whereas others have found increased wound infection or less favourable scars in selected populations. A systematic review has emphasized that the choice of closure method should consider both efficiency and wound outcomes. The present study was undertaken to compare stapler suturing with conventional suturing for abdominal skin closure. The study focused on skin-closure time, postoperative pain, wound complications, cosmetic outcome, and the time required for removal.

Aim and Objectives

Aim: To compare the clinical outcomes of stapler suturing and conventional suturing for closure of abdominal skin wounds.

- To compare the time required for skin closure.
- To compare postoperative wound complications.
- To compare postoperative pain at predefined intervals.
- To compare cosmetic appearance of the healed wound.
- To compare the time required for removal of sutures/staples.

Materials and Methods

Study Design and Setting: This was a prospective comparative study conducted in the Department of General Surgery, South Eastern Railway Central Hospital, and Kolkata. The study period was November 2022 to October 2023. The source thesis describes a total sample of 80 patients, divided equally into stapler and conventional suture groups.

Participants: Patients aged 18–65 years undergoing abdominal surgery with horizontal or vertical linear skin incisions were eligible. Written informed consent was obtained.

Patients unwilling to participate, outside the specified age range, unable to complete follow-up, those with HIV/AIDS, immunosuppressive treatment, chemotherapy/radiotherapy, critical damage-control surgery, multiple previous abdominal operations affecting tissue integrity, or severe systemic conditions expected to influence wound healing were excluded.

Allocation and intervention

Eighty patients were allocated using a pre-generated random allocation list. Group A (n=40)

underwent skin closure with non-absorbable nylon reverse-cutting sutures (2-0 or 3-0), using simple interrupted sutures. Group B (n=40) underwent closure with stainless-steel skin staples using a disposable skin stapler. The operative procedure itself was not altered by the study; the intervention concerned the method of skin closure.

Perioperative Care: Patients underwent routine preoperative evaluation and appropriate investigations. Preoperative antibiotics were administered approximately one hour before incision according to the clinical indication and treating surgeon. Standard antiseptic skin preparation and aseptic operative precautions were followed. Dressings were applied after skin closure, and postoperative antibiotic treatment was individualized.

Outcome assessment

Skin-closure time was recorded in seconds. Postoperative wound complications were assessed clinically using the Southampton Wound Grading Scale at postoperative days 3, 5, 7 and 15. Pain was assessed using a Visual Analogue Scale at 6, 12, 24 and 48 hours after surgery and during suture/staple removal. Cosmetic outcome was assessed using the Wound Cosmesis Score during follow-up. Time required for removal of staples or sutures was recorded.

Statistical Analysis: Categorical variables were expressed as numbers and percentages and compared using Pearson's chi-square test or Fisher's exact test as appropriate.

Continuous variables were expressed as mean, median and standard deviation. The thesis reports use of the Mann–Whitney U test because the data did not follow a normal distribution. Statistical analysis was performed using SPSS version 25. A p-value <0.05 was considered statistically significant.

Ethical Considerations: The thesis protocol states that ethical committee approval was to be obtained before initiation of the study and that voluntary written informed consent was obtained from participating patients. For journal submission, the authors should insert the institutional ethics committee name, approval/reference number and approval date if available in the official records.

Results

A total of 80 patients were included, with 40 patients in each group. Baseline characteristics were comparable between the two groups.

Table 1:

Variable	Stapler (n=40)	Suture (n=40)	p-value
Age, mean $\pm$ SD (years)	45.35 $\pm$ 14.52	44.48 $\pm$ 14.11	0.758
Incision length, mean $\pm$ SD (cm)	14.95 $\pm$ 8.45	17.03 $\pm$ 9.92	0.383
Number of staples/sutures, mean $\pm$ SD	18.53 $\pm$ 9.96	8.50 $\pm$ 4.66	<0.001
Skin closure time, mean $\pm$ SD (sec)	376.78 $\pm$ 204.39	518.75 $\pm$ 275.49	0.012
Wound cosmesis score, mean $\pm$ SD	6.55 $\pm$ 1.68	3.85 $\pm$ 2.70	<0.001
Removal time, mean $\pm$ SD (sec)	278.00 $\pm$ 104.32	127.68 $\pm$ 88.01	<0.001

Demographic characteristics: The mean age was 45.35 years in the stapler group and 44.48 years in the suture group, with no significant difference ($p=0.758$). The age distribution was also comparable ($p=0.807$). There were 24 females (60%) and 16 males (40%) in the stapler group, compared with 21 females (52.5%) and 19 males (47.5%) in the suture group; the difference was not significant ($p=0.499$).

Closure-related outcomes: The mean number of staples used was 18.53 $\pm$ 9.96, compared with 8.50 $\pm$ 4.66 sutures, with a statistically significant difference ($p<0.001$). Mean skin-closure time was 376.78 $\pm$ 204.39 seconds with staplers versus 518.75 $\pm$ 275.49 seconds with sutures, representing a significant reduction in closure time with stapling ($p=0.012$).

Postoperative pain

Table 2:

Assessment time	Stapler mean $\pm$ SD	Suture mean $\pm$ SD	p-value
6 hours	3.28 $\pm$ 0.75	6.50 $\pm$ 0.99	<0.001
12 hours	2.58 $\pm$ 0.64	5.85 $\pm$ 0.98	<0.001
24 hours	1.93 $\pm$ 0.47	5.40 $\pm$ 0.93	<0.001
48 hours	1.48 $\pm$ 0.68	4.60 $\pm$ 1.22	<0.001
During removal	6.25 $\pm$ 0.98	3.58 $\pm$ 1.68	<0.001

Pain scores were significantly lower in the stapler group at 6, 12, 24 and 48 hours. Conversely, pain during removal was significantly higher in the stapler group. Thus, stapling was associated with better early postoperative comfort but greater discomfort at the removal stage.

Wound Complications: Overall complications were recorded in 11 patients (27.5%) in the stapler group and 9 patients (22.5%) in the suture group; the difference was not statistically significant ($p=0.606$). The thesis also reports that seroma occurred somewhat more frequently in the stapler group (15.0% vs 7.5%), whereas wound gaping was 12.5% in each group in the corresponding distribution analysis ($p=0.563$ for the complication distribution).

Cosmetic Outcome: The mean wound cosmesis score was 6.55 $\pm$ 1.68 in the stapler group compared with 3.85 $\pm$ 2.70 in the suture group. This difference was statistically significant ($p<0.001$), favouring the stapler group according to the scoring system used in the thesis.

Removal Time: Mean removal time was significantly longer in the stapler group than in the suture group (278.00 $\pm$ 104.32 seconds versus 127.68 $\pm$ 88.01 seconds; $p<0.001$).

Discussion

The present prospective comparative study evaluated 80 patients undergoing abdominal

surgery and compared stainless-steel skin stapling with conventional non-absorbable nylon suturing.

The principal findings were that staplers shortened skin-closure time, reduced early postoperative pain, and produced higher wound cosmesis scores, while the overall complication rate did not differ significantly. The main disadvantage identified was a longer removal time and greater pain during removal.

Efficiency of Closure: The mean closure time was approximately 377 seconds with staplers versus 519 seconds with sutures. This statistically significant reduction is clinically relevant because skin closure is performed at the end of every operation and time saved at this stage may be particularly valuable in high-volume or emergency surgical practice. The finding is consistent with previous comparative studies cited in the thesis, including Pandove et al. and Varghese et al., both of which reported faster closure with staplers.

Postoperative Pain: Patients receiving stapler closure had substantially lower pain scores during the first 48 postoperative hours. The thesis attributes this finding to reduced tissue handling and more uniform approximation. Although the present study supports better early comfort with staplers, pain during removal was higher in the stapler group. This distinction is important when counselling patients: the closure itself may be

better tolerated, whereas the removal procedure may be more uncomfortable.

Cosmesis

The higher mean wound cosmesis score in the stapler group was statistically significant. Uniform spacing and consistent tension may contribute to satisfactory wound-edge approximation. However, cosmetic outcomes can depend on incision site, wound tension, patient factors and the specific scoring instrument; therefore, the result should be interpreted in the context of the study population and assessment method.

Complications

Overall wound complications were not significantly different between groups. The stapler group had a numerically higher proportion of patients with complications (27.5% vs 22.5%), but this difference was not statistically significant. The thesis notes a higher proportion of seroma in the stapler group and comparable wound gaping proportions in the corresponding analysis. These observations emphasize that the speed advantage of staplers does not eliminate the need for careful postoperative wound surveillance.

Comparison with previous literature: The findings are broadly consistent with literature cited in the thesis showing faster skin closure with staples. However, published evidence is heterogeneous with respect to infection and cosmesis. The thesis cites Varghese et al., who reported higher wound infection and better cosmesis with sutures, whereas other studies cited in the thesis reported advantages for staples. This variation suggests that closure method should be selected according to wound characteristics, patient factors, operator familiarity and clinical setting rather than by speed alone.

Strengths and limitations: Strengths include the prospective comparative design, equal group sizes, predefined pain assessments, standardized evaluation of wound complications, and use of a formal cosmesis score. Limitations include the single-centre setting, relatively small sample size, heterogeneity of abdominal procedures, and the absence in the provided thesis data of detailed subgroup analyses by operation type or wound class. The manuscript should not infer generalizability beyond the studied population without further evidence.

Conclusion

In this prospective comparative study of 80 abdominal surgical wounds, skin stapling significantly reduced the time required for skin closure and was associated with significantly lower postoperative pain during the first 48 hours and significantly better wound cosmesis scores. Overall

complication rates were not significantly different between stapler and conventional suture groups. Stapler removal, however, took longer and was associated with higher removal-related pain. Within the limitations of this study, skin staplers represent an effective option for selected abdominal skin incisions, particularly when rapid closure and early postoperative comfort are priorities.

Appropriate patient and wound selection and careful postoperative surveillance remain essential.

Declarations

Ethics approval: The thesis states that ethical committee approval was planned before study initiation and that written informed consent was obtained. For final journal submission, the authors should add the exact institutional ethics committee name, approval number and date from the official record.

Consent for participation: Written informed consent was obtained from participants according to the thesis protocol.

Consent for publication: Not applicable for the aggregate study data presented. If identifiable patient photographs are submitted, separate written consent for publication should be obtained.

Author contributions: Author contributions should be finalized and approved by all four authors before submission, in accordance with the target journal's authorship policy.

Data availability: The study data are contained in the institutional thesis records. Data-sharing arrangements should comply with institutional policy and participant consent.

Acknowledgement: The authors acknowledge the Department of General Surgery, South Eastern Railway Central Hospital, for institutional support. Additional acknowledgements should be included only after approval by the named individuals.

References

1. Cochetti G, Abraha I, Randolph J, Montedori A, Boni A, Arezzo A, et al. Surgical wound closure by staples or sutures? Systematic review. *Medicine (Baltimore)*. 2020;99:e20573.
2. Bhattacharya S. Wound healing through the ages. *Indian J Plast Surg*. 2012;45:177-179.
3. Schwartz S, Brunicki F. Schwartz's Principles of Surgery. 10th ed. New York: McGraw-Hill Medical; 2015.
4. Hochberg J, Meyer KM, Marion MD. Suture choice and other methods of skin closure. *Surg Clin North Am*. 2009;89:627-641.
5. Orlinsky M, Goldberg RM, Chan L, Puertos A, Slajer HL. Cost analysis of stapling versus

- suturing for skin closure. *Am J Emerg Med*. 1995;13:77-81.
6. Gottrup F, Leaper D. Wound healing: historical aspects. *EWMA Journal*. 2004;4(2):21-26.
 7. Tuuli MG, Rampersad RM, Carbone JF, Stamilio D, Macones GA, Odibo AO. Staples compared with subcuticular suture for skin closure after caesarean delivery: a systematic review and meta-analysis. *Obstet Gynecol*. 2011;117(3):682-690.
 8. Pandove PK, Sharma A, Kumar A, Pandove L, Aggarwal M, Singh R. A comparative study of wound closure with disposable skin stapler versus conventional sutures. *Int J Med Res Prof*. 2017;3(2):102-106.
 9. Varghese F, Gamalial J, Kurien JS. Skin stapler versus sutures in abdominal wound closure. *Int Surg J*. 2017;4(9):3062-3066.
 10. Chandrashekar N, Prabhakar G, Shivakumarappa G, Tauheed F. A comparative study between skin sutures and skin staples in abdominal surgical wound closure. *J Evol Med Dent Sci*. 2013;2(28):5180-5186.
 11. Basit A, Abbasi SH, Haider S, Kiani YM, Shah FH. To compare outcomes of stainless skin staples and polypropylene sutures for skin closure in clean elective surgeries. *Isra Med J*. 2018;10(1):32-35.
 12. Ananda BB, Vikram J, Ramesh BS, Khan HM. A comparative study between conventional skin sutures, staples and adhesive skin glue for surgical skin closure. *Int Surg J*. 2019;6(3):775-778.
 13. Kathare SS, Shinde ND. A comparative study of skin staples and conventional sutures for abdominal skin wound closures. *Int Surg J*. 2019;6(6):2168-2172.
 14. Karthikeyan S. Stapler suturing vs conventional suturing: a comparative study on the outcome of wound closure in abdominal skin incisions. *IOSR J Dent Med Sci*. 2018;17(2):9-15.
 15. Singer AJ, Clark RAF. Cutaneous wound healing. *N Engl J Med*. 1999;341:738-746.
 16. Gurtner GC, Werner S, Barrandon Y, Longaker MT. Wound repair and regeneration. *Nature*. 2008;453:314-321.