

A Comparative Study between Application of Skin Sutures versus Skin Staplers for Closure of Surgical Incisions

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Abstract:

Introduction: Accurate tissue approximation is essential for operative repair of defects and execution of defects and execution of safe healing process. The perfectness of tissue approximation and type of approximation influences the tissue healing rate, post-operative early and late complication of surgical wound and economic burden of the hospital. In this modern era broadly speaking the materials or gadgets for approximation of tissues are the sutures, staples or clips, glues, steritapes etc. the aim of this study is to compare the outcome of wound closure in terms of effectiveness, complications, patient satisfaction and cost efficiency.

Methods: This is a comparison study of prospective type conducted for a period of 6 months in a tertiary care hospital with 80 subjects. The included patients were distributed into two groups randomly of 40 subjects each and one group was applied sutures and other group applied skin staplers for skin closure. Data like wound length, duration of closure, complications, outcome of scar and patient satisfaction score noted.

Results: The study involved 80 participants, who underwent both emergency and elective surgical procedures. The mean time taken for skin closure using skin sutures is 8.42 minutes and mean time for skin closure using skin staplers is 2.03 minutes. Incidence of complications using skin sutures is 30% and reduced to 12.5% using skin staplers. The patient satisfaction was equivocal.

Conclusion: Staplers as compared to sutures are efficient method of surgical skin closure in terms of effectiveness, relatively less complication rate, and time conservation. Compliance for surgeons is also good for skin staplers, they are cost effective in terms of reducing complication rates and hospital cost burden.

Keywords: Sutures, Staplers, Skin closure, Wound closure, Surgical wounds, Surgery.

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Introduction

Accurate tissue approximation is essential for operative repair of defects and execution of defects and execution of safe healing process. The approximation must be achieved without tension and without compromising the integrity of the blood supply which is essential for healing process.

The perfectness of tissue approximation and type of approximation influences the tissue healing rate, post-operative early and late complication of surgical wound and economic burden of the hospital. Though the age's man sought for methods of binding wounds to promote healing. In olden days spider webs, warrior ants etc were used till suture materials were discovered. In this modern era broadly speaking the materials or gadgets for approximation of tissues are the sutures, staples or clips, glues, steritapes etc. The key principles involved to achieve perfect healing are sustaining

of blood supply, approximation of edges without tension, less tissue damage, correct suture spacing and suture bites with appropriate selection of suture materials.

Aims and Objectives

To study the outcome of surgical wound closure by skin sutures compared with skin staplers in the terms of:

1. Effectiveness of closure
2. Cost effectiveness
3. Complications rate
4. Patient Satisfaction

Materials and Methods

This is a comparison study of prospective type conducted for a period of 6 months from September 2022 to March 2023 in a tertiary care hospital

including 80 subjects who were underwent several emergency and elective surgical procedures.

Inclusion Criteria: patients undergoing emergency and elective surgeries were randomized into two groups and the incision of skin after surgery was closed using either skin sutures or skin staplers.

Exclusion Criteria: Patient with diabetes mellitus, tuberculosis, steroids intake, connective tissue disorders, past history of keloid / hypertrophic scar, drug allergies, patients with wounds under tension.

The patients considered for the study were randomly distributed into two groups of 40 subjects each to avoid selection bias. one group was applied skin sutures with materials like nylon, silk etc., the other group was applied skin staplers for skin closure.

The relevant data like age, sex, occupation, type of incision, length of incision, time taken for skin closure, gadget for skin closure, post-operative complications namely wound infection, wound gaping, seroma formation, stitch abscess, stitch

granuloma, adverse scars were observed for and recorded in the proforma. The postoperative day of suture removal is observed. The final outcome of the scar whether good, fair, or ugly was observed in the follow up period of day 7 and day 30 and recorded in the proforma.

Methods used for skin closure using suture materials were simple, mattress and subcuticular sutures using several suture materials which are chosen depending on their availability in the OT.

The patient satisfaction was assessed using a pre-validated questionnaire on the post-operative day 30.

Results

The study included a total of 80 subjects that went several surgeries at various sites and various types of incisions for a period of 6 months from September 2022 to march 2023. Out of the 80 subjects 40 patients skin incision was closed by sutures and 40 patients skin closure was done by 35mm skin staplers.

Table 1: % distribution of site of wounds:

S. No.	Site of Wound	No. of Patients	percentage
1.	Head and neck	20	25%
2.	Chest wall	24	30%
3.	Abdomen and Groin	36	45%

Table 2: Outcome for skin sutures

Site of the wound	Average length of wound	Type of suturing	Average speed of closure-minutes/ 10cm wound	Material used
Head and Neck	7.4cm	Simple for face & subcuticular for neck	8.14	Prolene
Chest wall	10.1cm	Vertical mattress	8.5	Prolene
Abdomen and groin	12.5cm	Vertical mattress	8.62	Prolene

Table 3: Outcome of skin staplers

Site of the wound	Average length of wound	Type of suturing	Average speed of closure-minutes/ 10cm wound	Material used
Head and Neck	7.62cm	35mm skin staplers	1.63	Ethicon skin staplers
Chest wall	8.5cm	35mm skin staplers	2.54	Ethicon skin staplers
Abdomen and groin	9.7cm	35mm skin staplers	1.92	Ethicon skin staplers

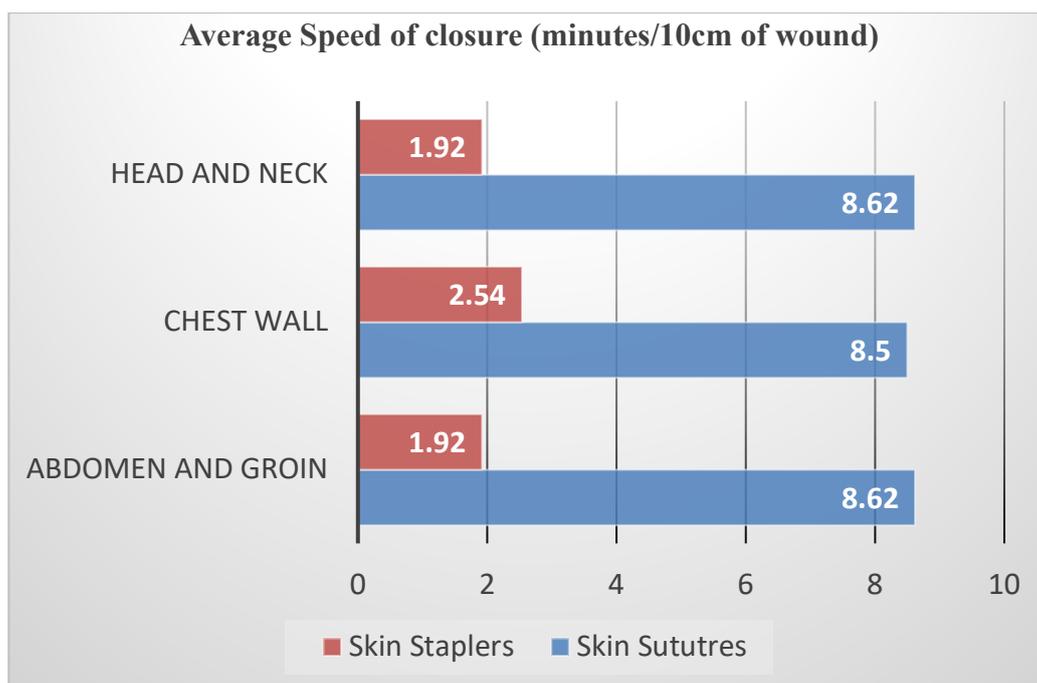


Figure 1: Comparison between skin staplers and sutures in terms of average wound closure time

Calculation:

- Length of each wound and its time consumed for closure by using is calibrated for length of 10cm.
- Thus, the average time taken for closing 10cm wound with skin sutures = $\Sigma x/n = 8.42$ minutes (please refer master chart for data).
- Thus, the average time taken for closing 10cm wound with skin staplers = $\Sigma x/n = 2.03$ minutes (please refer master chart for data).

Table 4: Comparison between overall outcome of skin sutures and skin staplers

Gadgets used	Average speed of closure in minutes per 10cm wound.	Compliance of patients and surgeons	Incidence of complications
Suture	8.42	Fair	30%
Stapler	2.03	Good	12.5%

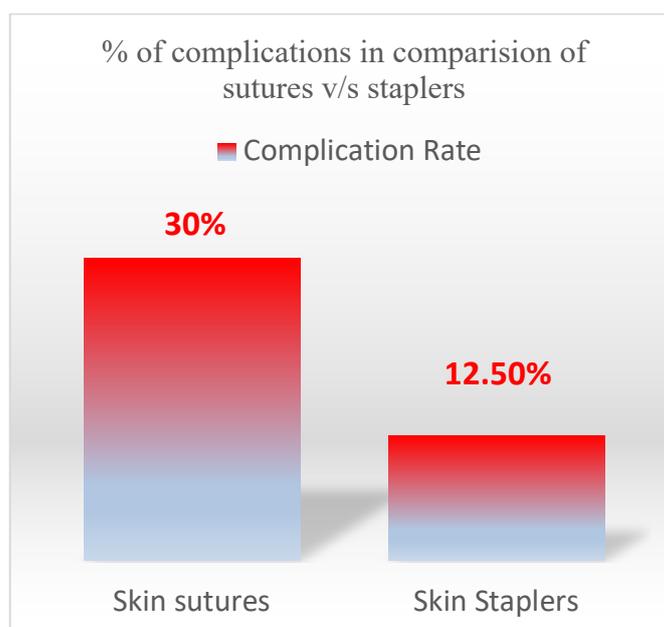


Figure 2: Comparison between skin staplers and sutures in terms of complication rate.

By using the formula, the chi-square value is calculated as 9.76.

From probability distribution table the P value for the obtained values is as follows: Value of chi-square for p value of 0.05 is 3.84 which is less than the calculated value. Value of chi-square for p

value of 0.005 is 7.88 which is less than the calculated value.

Patient satisfaction: The satisfaction of the patients was assessed based on the preformed approved questionnaire on day 30 and the average score is calculated.

Table 5: Comparison between patient satisfaction for skin sutures and skin staplers

	Mean patient satisfaction score
Suture	14.15
Stapler	13.60
P=0.684 (>0.05) indicates no significant difference	

Conclusion

- From the P value it is concluded that staplers are effective in terms of lower incidence of complication rate at the probability of 0.005.
- Staplers consume less time when compared to skin sutures particularly in major cases and in emergency which can reduce the duration of anaesthesia.
- Though the skin staplers are costly as compared to sutures, staplers by reducing the complication rate it is cost effective.
- Compliance for surgeon and patient is also good for staplers.
- Apart from gadgets that are used in wound closure there are other significant factors that contribute to overall complication rates.
- No significant variation was observed in terms of patient satisfaction on using skin staplers as compared to skin sutures.

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