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Dr. M Chennaiah

Assistant Professor, S.V. S. Medical
College, Mahaboob Nagar,
Telangana, India

Dr. L Sridhar

Professor, Department of Surgery,
Prathima Medical College,
Karimnagar, Telangana, India

A study of comparison between skin sutures and skin staplers

Dr. M Chennaiah and Dr. L Sridhar

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Abstract

Wound closure is as important as any other action performed by the surgeon. Apart from the need for producing a healthy and strong scar, it is the surgeon's responsibility to ensure its aesthetically pleasing physical appearance. Skin staples are an alternative to regular sutures in offering this advantage. The present study has helped to highlight the comparison between skin sutures and skin staplers. The skin stapling devices have revolutionized surgery for the purpose of rapid closure of abdominal wounds. However, staples have their own drawbacks. In view of this, this prospective study has been undertaken to highlight the outcomes of closure by staples and sutures with respect to speed of closure, cost effectiveness and post operative wound dehiscence, acceptance of scar and post operative pain. This is a prospective hospital based study conducted in our hospital from January 2017 to December 2018 at S.V.S Medical College. 200 patients who underwent various surgical procedures. Results were analyzed and compared with previous studies. It has been found that the use of staples in abdominal surgical wound closure gives faster speed of closure, less postoperative pain, and better cosmetic results. Staples, however, are costlier, and when used in emergency cases, associated with higher rates of wound dehiscence and a less acceptable scar.

Keywords: Nylon suture material, skin staples, post operative wound infection, operative scar

Introduction

The suturing of any incision or wound needs to take into consideration the site and tissues involved and the technique for closure should be chosen accordingly. Therefore, the correct choice of suture technique and suture material is vital, but will never compensate for inadequate operative technique, and for any wound to heal well, there must be a good blood supply and no tension on the closure. The selection of the proper incision, suture material, and closure technique is very important to assist the patient's own repair mechanism and restore normal anatomic relationships after surgery. Attention to these details also prevents such complications as dehiscence and infection, assuring a good cosmetic result ^[1, 2].

The perfectness of tissue approximation and type of approximation influences the tissue healing rate, post operative early and late complication of surgical wound and economical 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 secret to achieve a good wound healing lies in meticulous tissue dissection selection of suture material, methods of wound closure and post operative complications. The key principles involved to achieve perfect healing are preservation of blood supply, minimal tissue damage, approximation of edges without tension, correct suture spacing and suture bites with proper selection of suture materials.

In conclusion the surgical technique is far more important than the sutures used but a good scientific knowledge of different sutures and needles and how they perform, will aid the surgeon to achieve optimum wound healing. Since suture technology has kept in pace with advances in surgical techniques, it is imperative on the part of the surgeon not only to be fully aware of them but also to keep them in their surgical armamentarium. Skin staplers are far better for skin closure in terms of effectiveness, cost and in terms of compliance and complications.

This study is conducted for comparison of skin closure by using skin sutures and skin staplers with respect to effectiveness and complications-

Corresponding Author:

Dr. L Sridhar

Professor, Department of Surgery,
Prathima Medical College,
Karimnagar, Telangana, India

Methods and materials

This is a prospective type of comparison study conducted from January 2017 to December 2018 at S.S.V Medical College & Hospital 200 patients who underwent various surgical procedures.

The patients included in this study were randomly selected from those who underwent various surgical procedures including.

- Elective
- Emergency procedures with various incisions.

The relevant data of patients included in the study were collected and recorded as follows. Age of the patient, sex, occupation, type of incision, length of incision, gadget used for skin closure, time taken for skin closure, post operative complications namely wound infection, seroma formation, stitch abscess, stitch granuloma, wound gaping and adverse scars were observed for and recorded in the Proforma.

The post operative day of suture removal was also observed. The final outcome of the scar whether good, fair or ugly was observed in the follow up period and recorded in the Proforma.

Skin closure was done by using suture materials namely silk, Prolene, nylon etc., and compared with staplers and the outcome were observed and recorded. The methods used for skin closure with suture materials were simple, mattress and subcuticular sutures using various suture materials which are chosen based on the availability of suture materials in the operation theatre.

Results & observations

This study included total of 200 cases that underwent various surgical procedures at various site, various type of incision from the period of January 2017 to December 2018. Out of these 200 cases 100 cases underwent skin closure by sutures and 100 patients underwent skin closure by skin staplers.

Table 1: Showing % distribution of site of wounds

S. No	Site of wound	No. of patients	Percentage
1.	Head and neck.	40	20%
2.	Thorax.	40	20%
3.	Abdomen and groin.	80	40%
4.	Upper and lower limbs.	40	20%

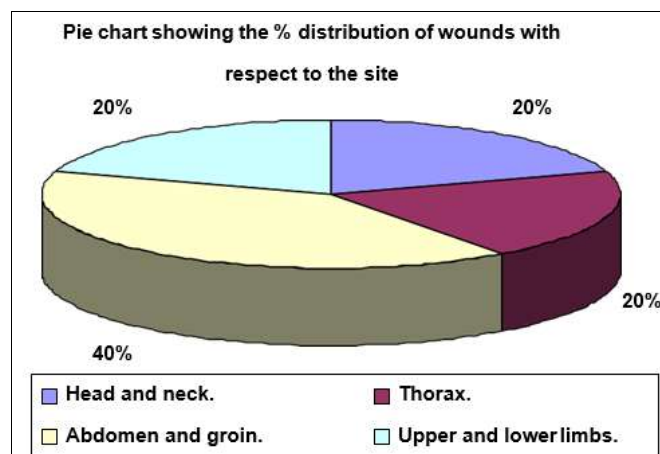


Fig 1: Showing % distribution of site of wounds

The methods adopted for skin closure was chosen randomly in this study revealed that suture materials were used in 100 patients and staplers in 100 patients.

Table 2: Gadgets for `skin closure

S. No.	Gadget used	No. of patients	Percentage
1.	Suture	100	50%
2.	Stapler	100	50%

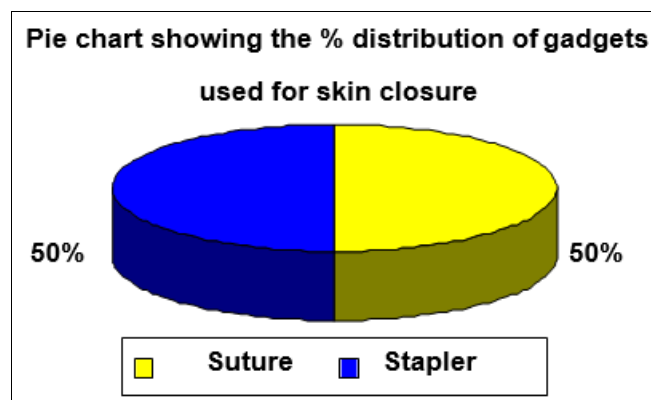


Fig 2: Gadgets for `skin closure

Table 3: Outcome for skin sutures

Site of the wound.	Average length of wound.	Type of suturing.	Average speed of closure – minutes / 10cm wound.	Materials used.	% of complications
Head and neck.	7.3cm.	Simple (for face) & vertical mattress (for scalp) & subcuticular (for neck).	8.04.	Prolene for face and neck and silk for scalp.	6.
Chest wall.	9.05cm.	Vertical mattress.	3.5.	Silk.	6.
Abdomen and groin.	12.9cm.	Vertical mattress.	8.52.	Silk.	14.
Upper and lower limb.	10.3cm.	Vertical mattress.	6.23.	Silk.	4.

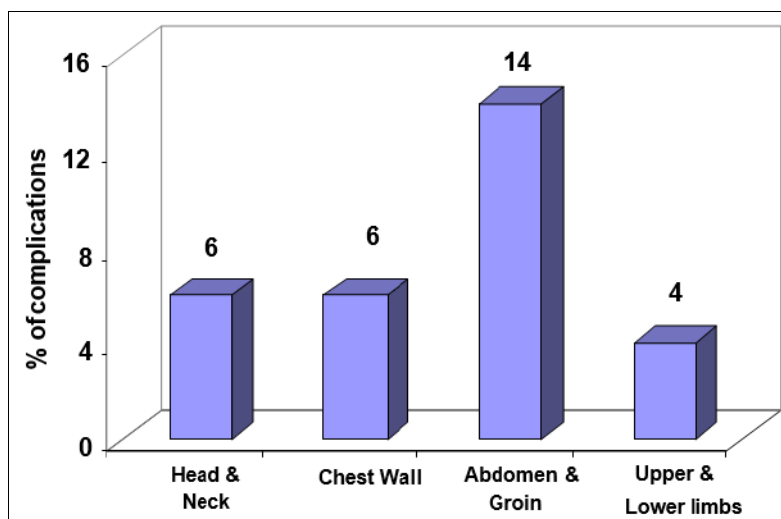


Fig 3: Outcome for skin sutures

Bar chart showing the % distribution of complication rates among wounds closed with skin sutures. Complications studied are wound gaping, wound infection, seroma formation, tissue reaction around the suture material, suture line necrosis, stitch abscess, granuloma and ugly scars.

Average length of wound and time of closure is nothing but the arithmetic mean obtained from the master chart.

Calculation

Length of each wound and its time taken for closure using skin sutures is calibrated for length of 10cm. Thus the average time taken for closing 10cm wound with skin sutures is $= \sum x/n = 6.61$ minutes (please refer to master chart for data).

Table 4: Outcome for staplers

Site of wound.	Average length of wound.	Materials used.	Average speed of closure in - minutes/10cm wound.	% of complications.
Head and neck.	7.52cm.	Staplers.	1.74.	1.
Chest wall.	8.5cm.	Staplers.	2.43.	3.
Abdomen and groin.	9.95cm.	Staplers.	1.65.	6.
Upper and lower limbs.	10.9cm.	Staplers.	1.54.	2.

Complications studied are wound gaping, wound infection, seroma formation, tissue reaction around the suture material, suture line necrosis, stitch abscess, granuloma and ugly scars.

Average length of wound and time of closure is nothing but the arithmetic mean obtained from the master chart.

Calculation

Length of each wound and its time taken for closure by using is calibrated for length of 10cm. Thus the average time taken for closing 10cm wound with skin staplers $= \sum x/n = 1.84$ minutes (please refer master chart for data).

Table 5: Comparison between sutures and staplers

Gadgets used.	Average speed of closure in minutes per 10 cm wound.	Compliance of patients and surgeon.	Incidence of complications.
Suture.	6.61.	Fair.	30%.
Stapler.	1.84.	Good.	12%.

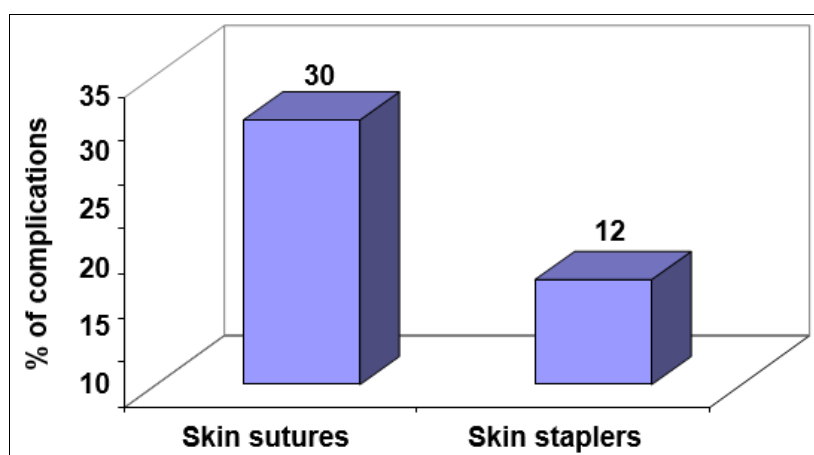


Fig 4: Percentage distribution of complications for sutures versus staplers

Table 6: Testing the significance (using null hypothesis)

S. No:	No. of patients with complications.	No. of patients without complications.	Total.	Complication rate.
Sutures.	30.	70.	100.	30%.
Staplers.	12.	88.	100.	12%.
Total.	42.	158.	200.	

By using the formula $\sum(O-E)^2/E$ the Chi-square value (X²) is calculated as 9.76. The degree of freedom for the above table is calculated by using the formula (Column-1) \times (Row-1) and the value is 1. From probability distribution table the P value for the obtained values is as follows:

The value of Chi square for a probability of 0.05 is 3.84 which is less than the calculated value.

Also the value of Chi square for a probability of 0.005 is 7.88 which is less than calculated value.

But, for the probability of 0.001 the Chi square value is 10.83 which is more than the actual value.

Discussion

A study conducted by Kanegaye *et al.* 1997, USA-studied 88 patients from 13 months to 16 yrs, attending the emergency department with scalp lacerations. Staples cost 39% less than per wound closure & the complications reported were none. Stapling was fast than suturing per wound.

A study conducted by Ritchie & Roke -1989, Northern Ireland-studied 200 cases with lacerated wound in scalp. Average speed of repair for staplers is 49 seconds and for skin sutures is 6 min & 20 sec. wound repair by staples is less painful than with skin sutures. There were no significant difference in cost & complications.

A study Brickman & Lambert in 1989 –USA –studied 76 patients with lacerations in scalp, trunk & extremities. Average time taken for staplers is 30 sec. one scalp wound & one leg wound dehiscence. Staplers were cost effective than sutures & compliance of was good.

A study by MacGregor *et al.* in 1989, Scot and -100 patients with lacerated wounds. Mean time for stapler repair is 18.6 sec & for suture is 124 sec. the cost of repair and the complication rate were almost same. Patient compliance with stapler is good than sutures & no local anesthesia applied for stapling.

A study by Orlinsky *et al.* in 1995, USA –studied patients presenting in emergency department with lacerations of scalp, trunk and extremities. The average speed of stapling is 8.3 seconds per cm wound for staplers & 63.2 seconds per cm wound for sutures. The cost of wound repair per wound was significantly higher in skin sutures than staplers.

In this study the average time taken for skin closure by staplers is 1.84 min per 10 cm of wound & for skin sutures, it is 6.61 min per 10 cm of wound. Complication rates for suturing are 30% & for staplers, it is about 12%.

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 anesthesia. Since 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 over all complication rates that is 21% in this study (that is 6% for skin staplers and 15% for skin sutures). Outcome of staplers is cosmetically superior to skin sutures.

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