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A STUDY OF COMPARISON BETWEEN SKIN SUTURES AND SKIN STAPLERS.

General Surgery

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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. Aside from gentle handling of tissues and careful dissection, the approximation must be achieved without tension and without compromising the integrity of the blood supply which is essential for healing process. 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.

AIM OF STUDY: To study the outcome of wound closure by skin sutures and skin staplers in terms of effectiveness and complications –a comparison study.

METHODS AND MATERIALS: This is a prospective type of comparison study conducted from August 2018 to July 2019 at RIMS, Ranchi includes 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.

CONCLUSION

- 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.

KEYWORDS

Suture, Stapler, effectiveness, Complications, Time.

INTRODUCTION

Accurate tissue approximation is essential for operative repair of defects and execution of defects and execution of safe healing process. Aside from gentle handling of tissues and careful dissection, the approximation must be achieved without tension and without compromising the integrity of the blood supply which is essential for healing process.

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, sterile tapes 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.

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.

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The relevant data of patients included in the study were collected and recorded as follows.

1. Age of the patient
2. Sex
3. Occupation
4. type of incision
5. length of incision
6. gadget used for skin closure
7. time taken for skin closure
8. post operative complications namely
   (a)wound infection
   (b)seroma formation
   (c) stitch abscess
   (d)stitch granuloma
   (e) wound gaping and
   (f)adverse scars were observed for and recorded in the Proforma.

The post operative day of suture removal was also observed. The final out come 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.

Category-1:
Wound healing by primary intention occurs within hours of repairing a full thickness skin incision. This surgical insult results in death of minimal number of cellular constituents.

Category-2:
If the wound edges are not reapproximated immediately, delayed primary wound healing transpires. This type of healing may be desired in case of contaminated wounds.

Usually the wound is closed surgically at this juncture and if the cleansing of the wound is incomplete chronic inflammation can ensue, resulting in prominent scarring.

Category-3:
Third type of healing is also known as healing by second intention.
In this type of healing, a full thickness wound is allowed to close and

heal by itself resulting in an inflammatory response that is more intense than with primary wound healing.

In addition, a larger quantity of granulomatous tissue is fabricated because of the need for wound closure.

Secondary healing results in pronounced contraction of wounds.

Category-4:
Epithelization is the process by which epithelial cells migrate and replicate via mitosis and traverse the wound. In wounds with partial thickness involving only the epidermis and superficial dermis, epithelization is the predominant method by which healing occurs.

Wound contracture is not a common component of this process if only the epidermis or epidermis and the superficial dermis are involved.

Configuration:
The configuration of a suture is based on the number of strands of material used to fabricate it.

A suture can be Monofilament (ie, singlestranded) or multifilament (ie, multistranded) Multifilam entous sutures are twisted or braided.

Suture Materials.
Sutures are classified as absorbable or Nonabsorbable, natural or synthetic, and multifilament or monofilament.

Metal Skin Staples.
Staples are formed from high-quality stainless steel and are available in regular and wide sizes. Staples are composed of:-

(1) A cross-member that lays on the surface of the skin perpendicular to the wound,
(2) Legs that are vertically placed in the skin, and
(3) Tips that secure the staple parallel to the cross-member.

Staples are relatively easy to place and may shorten the closure time by 70-80%. The primary utility of staples is in the closure of wounds under high tension on the trunk, extremities, and scalp.

They are also used to secure split-thickness skin grafts.
They are not used in delicate tissues or wounds in finely contoured areas, over bony prominences, or in highly mobile areas.

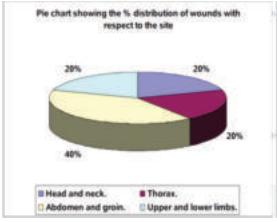
The surgeon's selection of a disposable stapler is determined by several important parameters of mechanical performance, including
1) handling characteristics
2) maximal angle of visual access to the staple
3) angle at which the staple enters the tissue
4) ease of positioning
5) prepositioning mechanism for staple
6) staple release mechanism
7) texture and
8) weight.

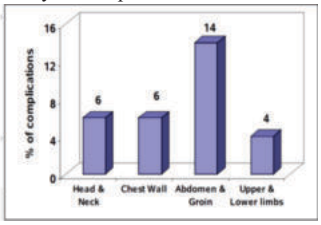
Stapler design must strive to diminish energy expenditure.

An important additional feature of the skin stapler is its prepositioning mechanism, which allows the surgeon to hold the staple in various positions during its formation.

Observation
This study included total of 200 cases that underwent various surgical procedures at various site, various type of incision from the period of August 2018 to July 2019.

Out of these 200 cases 100 cases underwent skin closure by sutures and 100 patients underwent skin closure by skin staplers.





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.

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.

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 $=\Sigma x/n= 6.61$ minutes

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.

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 $=\Sigma x/n=1.84$ minutes

COMPARISION 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%.

TESTING THE SIGNIFICANCE (USING NULL HYPOTHESIS):

Si 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 $\Sigma(O-E)2/E$ 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) × (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 AJ & Roke LG -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 KR & Lambert RW 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 dehisced. Staplers were cost effective than sutures & compliance of was good.

A study by MacGregor FB et al in 1989, Scotand -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 M 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 is 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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