

## SKIN STAPLERS VERSUS SKIN SUTURES IN ELECTIVE AND EMERGENCY ABDOMINAL SURGERIES – A COMPARATIVE CLINICAL STUDY

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### ABSTRACT

**BACKGROUND:**Patients whom underwent abdominal surgeries in both elective and emergency operation theatres in M K C G Medical College Berhampur hospital was included in this prospective study. Patients were assigned to skin sutures/staplers for wound closure and 50 cases were studied in each group (total – 100 cases). Cases were studied from November 2022 – October 2023. The wound was closed by skin staples or sutures. The wound was evaluated after 1 week, 1 month and 3-month interval for infection, swelling, discharge, overlapping of edges, separation of edges, wound dehiscence and scar.

### AIM AND OBJECTIVE:

1. To compare wound infection/ discharge
2. To compare wound dehiscence
3. To compare wound cosmesis
4. To compare post operative pain
5. To compare time consumption

### PATIENTS AND METHODS:

Patients whom underwent abdominal surgeries in both elective and emergency operation theatres in M K C G Medical College hospital was included in this prospective study. Patients were randomly assigned to skin sutures/staplers for wound closure and 50 cases were studied in each group (total – 100 cases). Cases were studied from November 2022 – October 2023. For all patients, subcutaneous sutures were put to relieve tension, dead space was closed and wound apposed. The wound was closed by skin staples or sutures. The wound was evaluated after 1 week, 1 month and 3-month interval for infection, swelling, discharge, overlapping of edges, separation of edges, wound dehiscence and scar. Photograph of the scar was taken for the evaluation of cosmetic appearance. A

senior surgeon, who was unaware of the method of closure, was consulted regarding the appearance of the scar.

## **RESULTS:**

In our study, 5 patients [10%] in the stapled group and 17 patients [34%] in the sutured group had wound infection/discharge. Mean Wound cosmesis score was 3.5 in stapled group and 2.7 in sutured group. The P value was 0.001 and was statistically significant. The average score for post operative pain was 5.2 in stapled group and 6.8 in the sutured group. The average time required to approximate 1cm of wound was 9.96 seconds with staplers whereas it was 51.66 seconds with sutures.

## **CONCLUSION:**

Hence, we conclude that skin staplers are superior to sutures for better wound cosmesis, in reducing the post operative pain, wound infection, seroma formation and very much significant in saving time for skin closure. Hence this study recommends the use of skin staplers.

## **INTRODUCTION:**

The term surgery was coined from the earlier name chirurgery which means handwork. It is the science that reveals the manner of exercising all manual operations necessary to heal or as much as possible by using of most expedient medicines. Development of surgical skills and handling of instrument has led to the understanding of an operative intervention. Emergency operations and insertion of foreign bodies are undertaken when one is confronted with acute sepsis – adhesives and staples are substituted for sutures, balloons challenge the bypass and lasers the scalpel. The evince of modern surgeon is the ability to know what to use, when to use and for how long.

“Many surgeons have genius without industry, other have industry without genius while many have both are still in judgement “– John Abernethy.

To access the underlying pathology, any surgical procedures will result in a wound. The principal idea is to get back the wound strength as quickly as possible with minimal damage to the tissues and an acceptable cosmetic scar. The important step is the accurate coaptation of dermal edges.

Surgical site infections are the most common nosocomial infections reported in hospital patients [1]. Upto 2.5% of patients undergoing clean extra 2 abdominal operations and upto 20% of intraabdominal operations will develop surgical site infections [2]. Infection is the most significant factor affecting wound healing [3]. The technique of closure of skin that penetrates the epidermis and dermis only serves to auto-inoculate the wound of the patient, driving surface flora deep into subcutaneous tissue [4].

Percutaneous suture closure also provides an additional source of contamination via the suture pathway. This results in a thin peri sutural cuff of dead epidermis, dermis and subcutaneous fat. Suture closure is a significant source of foreign body reaction within the susceptible subcutaneous tissue [5].

## **AIM AND OBJECTIVE OF THE STUDY:**

1. To compare wound infection/ discharge
2. To compare wound dehiscence
3. To compare wound cosmesis
4. To compare post operative pain

5. To compare time consumption

In view of comparative studies done between sutures and staples having different outcomes, this study is being conducted to further evaluate the advantages and disadvantages of staples and sutures

**MATERIALS:**

Patients whom underwent abdominal surgeries in both elective and emergency operation theatres in M K C G Medical College hospital was included in this prospective study from November 2022 – October 2023.

**Inclusion criteria:**

Patients undergoing emergency and elective abdominal procedures will be included in this study.

**Exclusion criteria:**

1. Traumatic wounds
2. Incisions which require to be closed under tension
3. Patients with diabetes mellitus
4. Patients with HIV
5. Age less than 12 years
6. Patients undergoing obstetrics and gynaecologic procedure

**METHODS:**

For all patients, subcutaneous sutures were put to relieve tension, dead space was closed and wound apposed. The wound was closed by skin staples or sutures. The wound was evaluated after 1 week, 1 month and 3-month interval for infection, swelling, discharge, overlapping of edges, separation of edges, wound dehiscence and scar. Photograph of the scar was taken for the evaluation of cosmetic appearance. A senior surgeon, who was unaware of the method of closure, was consulted regarding the appearance of the scar.

Wound appearance was scored as follows:

1	-	overlapping borders	-	0 – yes,	1 – no
2	-	contour irregularities	-	0 – yes,	1 – no
3	-	wound dehiscence	-	0 – yes,	1 – no
4	-	good overall appearance	-	0 –poor,	1 - acceptable

Score of 4 – optimal cosmetic appearance

Visual Analogue Scale was used for examining post-operative pain.

**Skin closure Suture:** The skin was approximated usually with vertical mattress sutures using non-absorbable sutures at a distance of 1cm from each other.

**Staple:** The edge of the wound was everted and lined up using toothed forceps. The stapler are then placed at a distance of 1cm from each other.

The time required for the closure of skin by either method was recorded.

Ethical clearance was obtained from our institution for conducting the study.

Patients were looked up for complications – infection, discharge, gaping and wound dehiscence - during the post operative period. Patients were usually discharged after the removal of suture on 7th - 8th day. In case of wound infection/discharge in any group, the discharge was sent for culture and sensitivity. Patients were re-evaluated at 1st month and 3rd month.

**RESULTS AND DATA ANALYSIS:**

**Table – 1.** Average Time for skin closure [ in seconds]

Suture/ Stapler	Mean [ seconds]	S.D	P value
STAPLERS	141.800	64.695	0.001
SUTURE	691.740	239.254	

The average time for closure of skin by suture was 691.74 seconds and that of staplers was 141.8 seconds. The P value was found to be 0.001. Hence this was statistically significant.

**Table – 2.** Wound Cosmesis Score

Suture/ Stapler	Mean	S.D	P value
STAPLERS	3.580	0.499	0.001
SUTURE	2.760	0.744	

The P value was found to be 0.001. Hence this was statistically significant. The closure of skin by stapler was found to be cosmetically better.

**Table -3.** Average time for closure (Secs / cm)

Suture/ Stapler	Mean	S.D	P value
STAPLERS	9.969	2.257	0.001
SUTURE	51.66	4.962	

The average time for closure of skin by stapler was 9.96 sec/cm of the incision and that of suture was 51.66 sec/cm. The P value was found to be 0.001. Hence this was statistically significant.

**Table -4.** Visual Analogue Scale for Post operative Pain

Suture/ Stapler	Mean	S.D	P value
STAPLERS	5.200	1.195	0.001
SUTURE	6.800	1.088	

Thus, the post operative pain was less in patients who underwent closure of skin by staplers.

**Table – 5.** Character of Wound

Suture/ Stapler	Clean	Clean Contaminated	Contaminated	Dirty	Total	
STAPLERS	13	21	9	7	50	
SUTURE	15	16	12	7	50	
Total	28	37	21	14	100	

**Table – 6.** Emergency/Elective

Suture/ Staple	Emergency	Elective

STAPLERS	20	30
SUTURE	19	31

**Table -7.** Complication

Complication	Staple	%	Suture	%	P value
Discharge	5	10	17	34	0.037
Granuloma	0	0	1	2	0.992
Scar	1	2	9	18	0.037
Seroma	3	6	14	28	0.027
Wound Gaping	1	2	2	4	0.986
Nil	40	80	7	14	-
<b>Total</b>	<b>50</b>	<b>100</b>	<b>50</b>	<b>100</b>	-

This table shows complications encountered in skin closure with sutures and staplers. About 20% of patients whom underwent skin closure by stapler had complications. Wound infection and discharge was the most common complication among this group. About 76% of patients whom underwent skin closure by sutures had complications. Wound infection and discharge was the most common complication among this group.

**Table - 8.** Complications according to type of wound

	STAPLERS	SUTURES	COMPLICATIONS	
			STAPLERS	SUTURES
CLEAN	13	15	1	11
CLEAN CONTAMINATED	21	16	2	15
CONTAMINATED	9	12	3	11
DIRTY	7	7	4	6

This table shows the distribution of complication among patients who have undergone skin closure by either suture/stapler, based on the category of the wound.

**DISCUSSION:**

Even though the sutures are inexpensive, they typically consume a longer duration and the risk of needle stick injury to the surgeon and the operating staff was high.

The problems encountered while suturing the wound are:

1. Needle stick injuries
2. Hematoma formation due to injury to the blood vessels in the skin
3. Onset of stitch abscess

In this prospective clinical study, 100 patients underwent surgeries in the abdomen [61 elective and 39 emergencies]. Out of this 100, 50 underwent skin closure with skin staplers while the remaining 50 had skin closure with non-absorbable sutures.

The comparison between these 2 groups was done by certain parameters like

1. post-operative wound complications
2. Wound cosmesis
3. post-operative pain

4. Time consumption

Wound complications: This includes

1. Discharge/infection
2. Granuloma
3. Seroma
4. Wound gaping

In our study, 5 patients [10%] in the stapled group and 17 patients [34%] in the sutured group had wound infection/discharge. This wound discharge was sent to culture and sensitivity. The most common surgical site infection in both the groups was – 1. Staphylococcus 2. Klebsiella [Oxytoca and Pneumoniae] 3. Pseudomonas 4. Proteus 5. E. coli This was statistically significant as the P value was 0.037[<0.05]. Hence wound infection and discharge was less with stapled group when compared to sutured group. Certain studies have shown that skin wounds closed by staples exhibit a superior resistance to infection than skin wounds closed with sutures [6]. The sutures and staplers, after they were removed, was also sent for culture and sensitivity but there was no growth in both of these. In our study, only 1 patient [2%] in suture group developed granuloma and no granuloma in stapled group. The P value was 0.992 and was not statistically significant. In the present study, only 1 patient [2%] in stapled group had hypertrophic/ugly scar and 9 patients [18%] of sutured group had an ugly scar. In this study, 40 patients [80%] in stapled group and 7 patients [14%] in sutured group had no complications.

**Wound cosmesis:**

“By your scars you will be judged” - Fitz Gibbon in 1968.

All the patients included in the study were followed up at 1month and 3 months after discharge for evaluation of the scar. A senior surgeon was consulted, who was blinded to the method of closure, to evaluate the scar. Wound cosmesis score was calculated and compared. Mean of this score was 3.5 in stapled group and 2.7 in sutured group. The P value was 0.001 and was statistically significant

**Post operative pain:**

Post operative pain for the patients in the study group was evaluated using visual analogue scale. The average score was 5.2 in stapled group and 6.8 in the sutured group. The P value was 0.001 and was statistically significant.

**Time consumption:**

In this prospective study, the time taken for complete wound closure was significantly less with staplers when compared to that of sutures. The average time required to approximate 1cm of wound was 9.96 seconds with staplers whereas it was 51.66 seconds with sutures, about 5 times longer. The P value was 0.001 [<0.05] and was statistically significant.

Kanagaye also observed that staplers were about 6 times quicker than standard sutures [7]. Eldrup et al also concluded that mechanical sutures took one third the time taken by the conventional sutures [8].

Meiring et al have also concluded that there was 80% time saving and also Havery and Logan have concluded 66.6% time saving with staplers [9,10].

**Cost:**

The cost of stapler application for a patient cost about Rs. 450 and that of sutures vary between Rs.80 to Rs.200

**CONCLUSION:**

Cosmesis an important factor in today's modern era. A cosmetic scar gives patient satisfaction and a mental ease to the operating surgeon. In our prospective comparative clinical study of skin staplers versus skin sutures in elective and emergency abdominal surgery, our inference was:

1. Wound infection / discharge was less with staplers.
2. Wound cosmesis was better with staplers.
3. Post operative pain was less with staplers.
4. Time consumed for skin closure with staplers was 5 times less than that of those closed with sutures.
5. Incidence of seroma was less with staplers.

Hence, we conclude that skin staplers are superior to sutures for better wound cosmesis, in reducing the post operative pain, wound infection, seroma formation and very much significant in saving time for skin closure. Hence this study recommends the use of skin staplers

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