ORIGINAL RESEARCH PAPER

General Surgery

AN OBSERVATIONAL STUDY OF STAPLES VERSUS CONVENTIONAL SUTURES FOR CLOSURE OF SURGICAL SKIN WOUND.

KEY WORDS: Surgical staples, conventional sutures, cosmetic outcome, wound complications.

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ABSTRACT

Background: The primary goal of tissue repair following skin incision is to restore strength quickly causing little tissue damage and inflammation resulting in a good scar. In recent years the use of stapling device for skin closure has increased in popularity to address these limitations. **Aims And Objectives:** Aim of this study is to assess the preferable skin closure among staples and conventional vertical mattress sutures in terms of their influence on wound healing process, cost effectiveness, time consumed and aesthetic results. **Materials And Methods:** This study is a prospective comparative study consisting of fifty cases admitted in Department of General Surgery, Dr.Pinnamaneni Siddhartha Institute of Medical Sciences & Research Foundation (Chinnoutpalli, Andhra Pradesh) from November 2020 to October 2022. Fifty cases (both elective and emergency procedures) were randomly selected to receive staples or conventional sutures for surgical skin wound closure. **Results:** In our present prospective study it has been noted that the method of closure by staples (mean time 142±75 sec) was significantly faster in comparison to sutures (408±25 sec). The current investigation found that three patients in staple group experienced wound infections were as suture group has eight incidences of postoperative wound infection and two cases of partial wound dehiscence . In our study, the scar cosmesis was good in 88% of patients in stapler group and 56% in suture group. **Conclusion:** The current study concludes that skin staples, albeit costly, significantly cut down on operational time and provided better cosmetic outcome without increasing wound complications.

INTRODUCTION:

Incisions are necessary during surgical procedures in order to detect, remove, or treat pathology. In these situations, a surgeon's objective is to promote healing while reducing the risks connected with wounds. Restoring strength as soon as possible after skin incisions with little tissue damage and inflammation is the main objective of tissue repair, which leaves a healthy scar. Numerous factors, including the site selection and suture material employed affect these objectives. To prevent dehiscence of the wound, localized swelling and an unsatisfactory cosmetic outcome a precise surgical procedure is required. The type of surgery, the length and the anatomical location of the wound all influence the various techniques and materials utilized for wound closure [1]. All of the surgeon's hard work is usually evaluated based on the final appearance of the surgicl scar. For many years, sutures have been utilized successfully to approximate skin margins. However in recent years the use of an automatic stapling device for skin closure has increased in popularity as a way to address these limitations. Skin Staples heal with minimum cross hatching and great wound eversion thus leading to a good scar. They are quicker to place than sutures and less likely to cause infection.

MATERIALS AND METHODS:

This study is a prospective comparative analytical study, including 50 cases that were admitted between November 2020 and October 2022 to the general surgery department at Dr. Pinnamaneni Siddhartha Institute of Medical Sciences & Research Foundation in Chinnaoutapalli, Andhra Pradesh. Staples or traditional sutures were randomly assigned to 50 study cases in order to close the surgical skin wounds. The cases are equally distributed among suture and staple groups.

Inclusion Criteria:

1)Patients undergoing surgery with a clean wound
2)Various abdominal incisions including midline, para median, paramedics, mc Burney's, right subcoastal, sub umbilical, inguinal incisions.

Exclusion Criteria:

1)Patients having lacerated, contaminated wounds with skin loss.
2)Patients having tension on wound closure.
3)Patients with tendency or family history of developing keloids or hypertrophic scars.
4)Patients with abnormal liver function tests (LFT) and renal function tests (RFT).
5)Patients not willing for follow up.

Data Collected:

the data needed for this study was collected from surgeon (regarding operating time, wound length and time of closure), from patients (postoperatively and during follow-up period), from pharmacy that supply staples and sutures for cost analysis.

The next sequence number that emerged from a randomization was used to determine how each patient's skin would be closed once the deeper layers of their wounds were closed. The amount of time required to close the wound was timed in seconds, the length of the wound was measured, and the number of staples or suture packs that were utilized was noted. A distance of roughly 1 cm was left between each staple or suture. Stapling is done using ACOS disposable skin stapler and suturing is done using 2-0 Ethilon. Staples were removed with a staple remover. Sutures are removed with scissors or sterile surgical blade.

Data Analysis:

Wounds are divided into group A(<7cm), group B (7 to 15 cm) and groupC (>15 cm)(Table 1). Sutures / staples were removed at seven days. Pain attributable at removal was graded using visual analogue score (VAS) from 0 to 10. 0- no pain, 1 to3 -mild pain, 4 to 6- moderate pain, 7 to 10 - severe pain (figure 1). Infection is assessed using ASEPSIS score. The visual appearance of scar was assessed at 30 days using VAS cosmesis scale for scars 0 (worst possible scar) to 100 (best possible scar). Wounds are categorized into good (100 to 76), average (75 to 51) and poor (50 to 0). Rate of wound closure is recorded as seconds/centimeter.

RESULTS:

The results of this study are documented in the tabular forms given bellow.

Table – 1: Classification Depending On Wound Length

	Group A (1 – 7 cm)	Group B (7 – 15 cm)	Group C (> 15 cm)
Sutures	10	8	7
Staples	11	8	6
Total	21	16	13

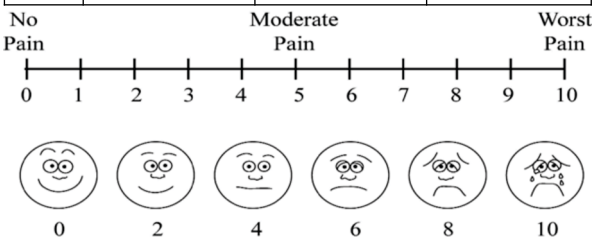

Figure 1: Visual Analogue Score (VAS) For Pain

Table 2: Sex Distribution

GROUP	MALE	FEMALE
SUTURES	14	11
STAPLES	13	12

Table 3: Distribution Of Region Of Incision

Group	Mc Burney's	Inguinal	Midline	Right Subcostal	Sub Umbilical Midline	Total
Staplers	6	9	4	3	3	25
Sutures	5	10	4	3	3	25
Total	11	19	8	6	6	50

Table 4: Time Taken For Wound Closure Between Staple Group And 2-0 Ethilon Suture Group.

GROUP	No. of Cases	Mean (SD)
Staple	25	142 ± 75.339
Suture	25	408 ± 253.566

Table 5: Rate Of Wound Closure (SEC/CM) Between Staple Group And 2-0 Ethilon Suture Group.

GROUP	No. of Cases	Mean (SD)	t - test	P value
Staples	25	13±1.044	-103.703	P < 0.001
Sutures	25	41±0.868		

Table 6: Incidence Of Wound Infection

	Sutures	Staples
Infected	8	3
Not Infected	17	22

Table 7: Cosmetic Outcome Between 2-0 Ethilon Suture Group And Staple Group After One Month.

Group	Good Scar	Average Scar	Poor Scar
Sutures	14	10	1
Staples	22	3	0

Table 8: Comparision Of VAS Cosmesis (appearance Of Scar) Between 2-0 Ethilon Suture Group And Staple Group.

Group	VAS Cosmesis			P Value
	Poor	Average	Good	
Sutures	4%	40%	56%	P < 0.05
Staples	0%	12%	88%	

Table 9: Pain Score On Visual Analog Scale (VAS) Between 2-0 Ethilon Suture Group And Staple Group During Removal.

Group	Number of cases	Mean ± SD	t-test	P value
Staples	25	2.133 ± 1.074	-3.610	P < 0.001
Sutures	25	3.333 ± 1.470		

Table 10: Cost Of Wound Closure(RUPEES) Between Staple Group And 2-0 Ethilon Suture Group.

GROUP	No. of Cases	Mean (SD)	t - test	P value
Staples	25	540±135	7.75	P < 0.001
Sutures	25	284±94.8		

Table 11: Cost Of Wound Closure Between Different Length Groups With Staples And Sutures.

Length Groups	Group A (<7cms)	Group B (7 – 15cms)	Group C (>15cms)	Anova (F value)	P Value
Staples	Rs. 500	Rs. 500	Rs. 667	82.181	P < 0.001
Sutures	Rs. 237	Rs. 237	Rs. 406		

DISCUSSION

Wound healing is a dynamic process that is impacted by numerous factors on both a local and systemic level. The aim is to cure the wound completely while leaving as little scar as possible. Another important factor to take into account is the chosen method of closure. Australia's Hulti Humer invented the surgical stapling tool in 1908. Over the past several decades, numerous changes were made. The advent of disposable, easily manipulated skin staplers has made this method of closing wounds one of the most widely performed. In a meta-analysis of randomized controlled studies comparing sutures versus staples for the treatment of surgical wounds, Lavazzo C et al [2] (2011) found that staples were quicker and caused fewer wound infections. In elective cases, cosmetic outcomes were comparable. The staples group's scar was deemed to be more patient-accepted and more aesthetically pleasing than the sutures group's scar. However, in emergency situations, the staples group's patient acceptance of the scar was lower than the sutures group's due to postoperative wound dehiscence.

Sex Distribution And Distribution Of Regions Of Incision:

In this study the total male patients are 27 of which 14 are in suture group and 13 are in staple group. Female patients are 23 in total, of which males are 11 and females are 12 (Table 2). Various abdominal incisions in both elective and emergency surgeries are being studied for the closure with sutures and Staples. The selection of Sutures or Staples for that particular patient is done randomly while surgery excluding the selection bias among the emergency and elective procedures. In the present study Total Patients with McBurney's incision are 11, Inguinal incision are 19, Midline incision are 8, right subcoastal incision are 6 and subcoastal Midline incision are 6 (Table 3). The age distribution and distribution of regions of incisions do not hold much of a significance in the distribution of the cases in this study.

Average Time Taken:

It has been observed in our current prospective study that the staple closure approach was noticeably quicker than the suture method. With staples, the mean time required was 142 + 75.339 seconds; with an ethilon suture it was nearly three times longer at 408 + 253.566 seconds (Table 4). This can be compared to similar study by Meiring et al's [3] which indicated that stapler use helped save 80% of time.

Rate Of Wound Closure:

In this study, the rate of closure with staples was 13 + 1.044 sec/cm whereas it required 41 + 0.868 sec/cm with Ethilon suture (Table 5). There was a saving of 28 seconds, nearly half of a minute or 68.3% of time for closure for each cm of wound length as identified by several other studies. In a similar study

by Ranaboldo et al[4] the rate of wound closure was 8 sec/cm with stapler and 12.7 sec/cm with sutures.

Incidence Of Wound Complications:

The principal aim of tissue repair of surgical skin incisions is a quick gain in strength with minimal damage to tissue and associated Inflammation and a good quality Scar. These goals are affected by a number of parameters, including the type of suture used and where it is placed. The current study found that three patients in the staple group experienced wound infections, where as there were 8 incidences of postoperative wound infection and 2 cases of partial wound dehiscence in the suture group. Total non infected cases are 17 in suture group and 22 in staple group (Table 6). This shows that the suture group has more incidence of infections when compared to staple group. In a similar study by Hiremath et al[5], noticed 3 times more complications with suture closure compared with staple closure in their prospective study.

Cosmetic Outcome:

Aesthetics are just as essential as function when it comes to wound closure. The surgeon has a responsibility to create a scar that is both functional and aesthetically acceptable. Skin staples provide this benefit as an alternative to traditional sutures. In our study, the scar cosmesis was Good in 88% of the patients in stapler group and 56% in suture group, which is like most studies (Table 7 and 8). Medina dos Santos et al [6] have noticed that in 80% of instances, stapler-closed wounds are more aesthetically pleasing.

Cost Analysis:

Wounds were separated into three groups for the purpose of conducting a study of the cost factor. These groups were termed groups A, B, and C accordingly and were based on their length: less than 7 cm, 7cm to 15cm, and more than 15 cm. The cost of employing a skin stapler was approximately Rs. 500 for both Group A and Group B, whereas it was approximately Rs. 667 for Group C. The cost of using staplers was much greater compared to the cost of using Ethilon sutures, which was only Rs. 237 per wound on average for Group A & B and Rs. 406 for Group C (Table 10 and 11). In general, the cost of using staplers was significantly higher. This disparity in price has also been thoroughly documented by past studies to a significant degree. In a similar study by Batra et al[7], concluded that there is significant ($P < 0.001$) cost difference among staples and sutures. But the cost difference is varied due to cost variations among different companies and suture material used. Thus, we can reduce the economic gap between if one can use a reusable stapler till the gun is empty.

Patient And Surgeon Acceptance:

In present study, it was found that with presence of good scaring & significant less pain on removal, patient satisfaction is better in staple group than in suture group. The only patient concern in staple group was the economic burden as most patients in this study belong to middle and low socioeconomic groups. The results of the Simcock JW et al [8] study indicate that patients who had undergone major abdominal surgery have a favourable view of their mature scars, regardless of the type of skin closure.

CONCLUSION:

The main line of defense against infections is the skin. The selection of wound closure techniques is equally important as the skill and expertise of the surgeon. In the modern world, cosmesis is highly sought after. According to this study, skin staples reduces the risk of postoperative wound infections, offer superior cosmesis compared to sutured skin closure, significantly decrease the length of the operation. It was discovered that staples are considerably more expensive. However, this can be decreased by employing reusable staple guns. Thus, the current study leads us to the conclusion that despite their high cost skin staples greatly reduces operating time, has less complications and improved esthetic results.

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