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SUTURES VERSUS STAPLERS FOR SKIN CLOSURE OF MIDLINE INCISION IN LAPAROTOMY PATIENTS AND THEIR OUTCOME IN SCB MEDICAL COLLEGE & HOSPITAL CUTTACK, ODISHA

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ABSTRACT

INTRODUCTION

With the development of new technique in surgery and the pressure placed on surgeons to reduce the length of stay in the hospital, the method of skin closure has become increasingly important surgery. Wound complications are one of the significant sources of morbidity and can prolong inpatient stay or lead to readmission. However, ideal technique and suture material for wound closure are yet to be decided. Various studies have compared sutures and staples but with a significant difference in results. Skin is the most significant organ of the body and also the protective covering of the body. Though skin closure depends upon the type of procedure and surgical sites and is associated with intraoperative and postoperative complications.

The goal of any skin closure technique should be appropriate skin approximation, minimum time consumption and adequate healing with minimum wound complication, scarring, pain and cost. Skin is a barrier between the human body

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and external environment and is protective and self-repairing. Skin closure fundamentals are that it should be performed without any tension, retain good vascularity, involve minimum tissue damage, and be comfortable for patient and aesthetic. This is achieved by obliteration of dead space, layered or mass closure and eversion of skin margins. Skin varies from patient to patient in texture, thickness, elasticity, the speed of healing and tendency of the scar. So we did a prospective study in mid line incision of laparotomy patients, with the objective of comparing skin staplers with sutures. Several studies show that sutures are superior for cosmoses and that they decrease postoperative pain and are more cost effective. So the cost of procedure should also be considered. The closure should serve both functions and aesthetic purposes [1, 2]. The aesthetically reduced scar can have an adverse impact on overall quality of life causing considerable distress and unhappiness [3, 4]. Precaution of would infection is also necessary as it may lead not only an ugly scar but also occurrence and recurrence of a hernia.

MATERIALS AND METHODS

Research was carried out at SCB Medical college & Hospital,Cuttack, Odisha,India from December 2020 to November 2023 on 80 patients undergone laparotomy and fulfilling the inclusion criteria were included. Patients were randomly classified into two groups A and B with 40 patients in each group. Inj. Ceftriaxone 1 gm was given half an hour before surgery. In a group, A staplers were used for skin closure while in group B skin was closed with interrupted sutures using Polyamide 2.0 and outcome of the patient was seen as the operative time taken for closure and cost-effectiveness. Patients were followed up at one week and two weeks and then at 1,3,6 months for surgical site infection; pain wound dehiscence and cosmetic satisfaction.

Inclusion and exclusion criteria:

A. Inclusion:

1. Both male and female.
2. Patient older than 18 years.
3. Only vertical incision closure.
4. Only laparotomy.

B. Exclusion:

1. Immuno-compromised patients, e.g. diabetes.
2. Perforations and infective peritonitis.

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Wounds were viewed, and dressings did on 3rd 6th and 10th day postoperatively in wards. Only positive swabs were counted as wound infection, and all the patients were given antibiotics for five days. Skin staplers or sutures were removed on day ten postoperatively.

OBSERVATION

The study was covered over a period of three years from December 2020 to November 2023 and study groups included 40 patients with group A who underwent closure of staplers and 40 patients of group B who underwent closure by sutures. Age of patients ranges from 20 years to 86 years for the stapled group with a mean age of 53 years and 22 years to 90 years for suture group with a mean age of 56 years. There were 26 males and 14 females in the stapled group while there were 22 boys and 18 girls in suture group. Various surgeries performed exploratory laparotomy for blunt trauma, obstruction, gastrectomy, gastrojejunostomy, cholecystojejunostomy, right hemicolectomy with iliotransverse anastomosis, feeding jejunostomy. Mean time taken for closure: mean time taken for wound closure with stapler application was 90.4 sec and that with suturing with 2.0 Polyamide was 480 sec, which was significant statistically. Staples took almost five times. **(Table -1)**

Table 1 Time taken for closure.

	Mean +/- S.D	T. value	Sig	Inference
Stapler	90.6+/- 14.78	-20.3225	.000	Significant
Suture	480+/- 120.28			

Cost of closure method: average cost of stapler was 1200, and that of sutures was only 140. This was also statistically significant. (Table 2)

Table 2 Cost of material.

	Mean +/- S.D	T. value	Sig	Inference
Stapler	1200+/- -	133.54	.000	Significant
Suture	140+/- 50.2			

Wound infection: Out of 80 patients wound infection was found in 8 patients (10%). In stapler group 3(7.5%) and in suture group 5 patients (12.5%).

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This is statistically significant. (Table 3)

Table 3 Incidence of infection.

No. of case of infection	P value	Inherence
3 (7.5%)	<0.05	Significant
5 (12.5%)		

Pain assessment: in stapler group A 5(12.5%) patients experienced mild postoperative pain, 22(55%) experienced pain moderate pain and 13(32.5%) experienced severe postoperative pain whereas in suture group B 4(10%) patients underwent mild postoperative pain, 24(60%) experienced moderate pain, and 12(30%) experienced severe postoperative pain. Pain perception by patients was almost similar to both methods of closure. There was no statistical significance. (Table 4)

Table 4 Postoperative pain.

	Mild pain	Moderate pain	Severe pain	P value	Inherence
Stapler	5 (12.5%)	22 (55%)	13 (32.5%)	>0.05	Not significant
Sutures	4(10%)	24 (60%)	12(30%)		

Table 5 Cosmetic outcome.

	Good scar	Average scar	Bad scar	P value	Inherence
Stapler	35 (87.5%)	4 (10%)	1 (2.5%)	<0.05	Significant
Sutures	22(55%)	13 (32.5%)	5(12.5%)		

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DISCUSSION

Prevention of surgical site infection is one of the fundamental issues in the study of any surgical discipline to enhance the quality of healthcare and patient safety [5]. Surgeries involving skin closure aim to attain an adequate approximation of skin edges to allow wound healing with minimal risk of infection and an optimal aesthetic result. Evidence-based recommendations concerning wound closure exist. The ideal technique and suture material for wound closure are yet to be decided. A recent survey of German abdominal surgeons demonstrated found that 79% used staplers to close the skin with remaining using either absorbable or non-absorbable suture [6]. Five randomized controlled trials dating from 1981 to 1992 have already been conducted to assess the outcome of staplers versus sutures for skin closure on superficial surgical site infection, pain, operation time and cosmetic outcome in patients who underwent abdominal surgery, three of the trials compared interrupted mattress sutures to staples [7,8,9], and two compared intracutaneous sutures versus staplers [10,11], including a comparison of different suture materials [11], while in the Pickford trial [9] the infection rate was significantly lower in favour of staplers (6.3% vs 17%), however, no significant difference could be demonstrated in the trials of Eldrup [7] and Gatt [8].The two trials comparing intracutaneous sutures to staples showed no significant difference regarding the incidence of superficial surgical site infections. Moreover, the suture material was proven to be of no impact [11]. All trials which additionally considered the cosmetic outcome [8, 10, 11] and closure time revealed no significant difference in the cosmetic outcome but a considerable reduction of the closure time. However, recent evidence from orthopedic surgery has raised concerns about wound infection rates, with a meta-analysis of 683 wound closure showing a four-time more significant rate of infection when staplers are compared with subcuticular [12].

Suture techniques and sterilization have always kept its pace along with latest surgical procedures. Surgical stapling was developed in 1908 by Humer Hulti in Australia. Von Petz does modifications and in 1934 Fredrick of Ulm designed an instrument that resembled the modern linear stapler. Next significant advances came from Russia after World War II. In 1958 Ravich, who through research and development refined the instruments to their current state and widespread use today [13, 14, 15].

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Time factor: In our study, the time is taken for closure, staplers significantly reduce operative time. Ranaboldo et al. re- ported that the rate of wound closure was 8 sec/cm with a stapler and 12.7 sec/c, with sutures [10].

Medina dos Santos et al. found in a prospective trial that means skin closure time with stapler was 5 minutes and 25 minutes with Polyamide suture [16]. Kanagaye et al. observed that staplers were six times faster than standard sutures. [17]. Eldrup et al. concluded that staplers took one-third of the time taken by conventional sutures [7].

Merring et al. have recorded that there was 80% time saving [18], whereas Harvey and Logan have reported 66.6% time saving with use of staplers. [19].

Cost factor: in our study, we found that disposable skin staplers were significantly more expensive than sutures.

Orlinsky et al. did a cost analysis of stapling versus suturing for skin closure and concluded that stapling is less costly than suturing and that the advantage appears to increase as wound length increases [20].

Wound Infection: For the surgeon, a scar may be the only trademark of surgical procedure done, as Fitz Gibbon has stated "By your scars, you will be judged" (Fitz Gibbon, 1968). Some patients with wound infection in stapler group (3 Cases) were less than that of suture group (5 Cases), though not statistically significant. Eldrup et al. recorded no difference in the incidence of wound infection between stapler closure and conventional suture closure [7]. Chunder et al. found that patients who had staples were at 6.93 times higher risk of wound infection ($p=0.014$) than those who had sutures in the closure of caesarean section wound [21].

Postoperative Pain: in our study, the postoperative pain perception regarding the severity of pain was similar in the two groups. There was no statistical significance found.

Selvadurai et al. showed no difference in pain response between two groups [22].

Cosmesis: in our study, 87.5% of stapler group patients had a good scar while 55% of suture group had a good scar. This was found to be statistically significant. Meiring et al. showed that the cosmetic result of staples is as good as if not better than with nylon sutures [18]. Lubowski D et al. compared

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stapled and sutured abdominal wound closure which resulted in almost equal cosmetic scores for vertical wounds [23]. Medina dos Santos et al. observed that wounds closed with staplers were cosmetically superior in 80% of the cases [16]. Selvadurai et al. conducted a randomised trial to compare the results of neck wound closure using metal (Michel) clips or subcuticular suture and found no difference in cosmetic results [22].

CONCLUSION

Skin, the most significant organ of the body, is the most important natural barrier to infection. Several methods of skin closure are available to close skin incisions like staplers, clips, steri strips and glue adhesions. Skill and technique of surgeon matter a lot. Wound infection is a significant hazard in abdominal skin closure, and its prevention is necessary as it may lead to ugly scar and occurrence and reoccurrence of a hernia. Cosmesis is essential and necessary in modern surgical practice. In this study, we compared the closure of abdominal skin wound using skin staples and sutures. We found that:

- Skin staples significantly shortened the operative time.
- Staples were found to be more expensive.
- The incidence of postoperative wound infection was less with staplers.
- Skin staples provided better cosmesis than the sutured skin closure.
- No difference in pain perception between the two methods.

Hence, from our current study, we conclude that skin staples, although expensive, considerably reduce operative time, less incidence of wound infection and provide better cosmetic outcome without any increase in wound complications.

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