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Assessment on Comparative Evaluation Between Skin Suture Versus Skin Stapler in Abdominal Surgery

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Abstract
Man has always looked for ways to bandage wounds in order to speed up the healing process. Surgeons employed a variety of tools in the past, but the key to a successful wound healing is careful tissue dissection, which is followed by suture material selection, wound closure techniques postoperative problems. In order to provide security against the potential leakage of blood or intestinal contents during anastomosis, staplers were first designed to solve the perceived patency issue. It is well acknowledged that skin wound closure may be accomplished with both sutures and staples. Eighty patients were divided into two groups, group A consisting of traditional sutures and group B consisting of staples, each comprising forty cases. Prolene 2-0 cutting body (Lotus) was used in group A to close wounds with interrupted sutures. In group B, Covidien staplers were used for wound closure. Compared to sutures, skin approximation was completed far more quickly using staples. Compared to the skin suture group, post-operative SSI was more frequent. When compared to the traditional suturing group, the staple group's scar's cosmetic appearance was judged to be better. The study's findings suggest that stapler skin closure may be preferable to traditional skin sutures.

INTRODUCTION

Before the discovery of suture materials, ancient materials such as spider webs, horsehair warrior ants were used. Surgeons have used a variety of materials and devices in the modern era to approximate tissues, such as sutures, staples or clips, glues, steritapes, etc., but the key to achieving a good wound healing is careful tissue dissection, which is followed by suture material selection, wound closure techniques postoperative complications. The preservation of the blood supply, minimum tissue injury, tension-free edge approximation, appropriate suture spacing suture biting with appropriate suture material selection are the fundamental concepts involved in achieving optimal healing[1]. Following surgical skin incisions, the main goals of tissue restoration are minimal tissue damage, no inflammation, quick strength gaina scar that looks good. Dead space eradication, layered tissue closureskin margin eversion may all help accomplish this. The degree of accuracy and kind of tissue approximation affect the pace of tissue healing, the early and late complications that arise from surgical wounds after surgery the financial strain on the hospital[2]. In order to provide security against the potential leakage of blood or intestinal contents during anastomosis, staplers were first designed to solve the perceived patency issue. It is well acknowledged that skin wound closure may be accomplished with either staples or sutures. Through the creation of a watertight, tension-free, non-inverted opposition of the edges, which facilitates quick healing and a scar that is aesthetically acceptable, both techniques aim to re-approximate the skin. Regarding the effectiveness, cost, frequency of problems aesthetic results obtained when comparing these two closure techniques for a range of applications, several research have shown contradictory findings[3].

Sutures have been used for many years to keep the cut tissues together until the wound has healed enough to be self-supporting, as well as to approach the skin margins. Many materials have been employed to approximate the skin margins since antiquity. As surgical procedures have advanced, so too have suture technology and suture sterilisation, giving the medical community access to a vast array of sutures with varying sizes as small as 30 microns. Nowadays, the surgeon has access to a large range of suture materials, including synthetic and natural, absorbable and non-absorbable monofilament and polyfilament. Sutures, however, have the drawback of taking longer to apply and leaving a less attractive scar.

Sutures have been shown to have better outcomes than staples when it comes to the risk of wound infections after clean surgical operations like caesarean sections[4,5]. Though the wounds are often exposed to a range of contributors of surgical site infections, such as endogenous flora from the alimentary or genitourinary tract, the ideal method of skin closure for abdominal surgery is still up for debate. A study conducted in the 1980s found that subcuticular sutures were not superior to staples in preventing incision infection. Similarly, a retrospective study found that after open hepatobiliary-pancreatic surgery, there was a significant difference in the incidence of superficial surgical site infection between the subcuticular suture group (2.6%) and the stapler group (11.3%)[27]. In order to overcome the shortcomings of a single research and determine the variations in SSIs between subcuticular staples and sutures in patients having abdominal skin closure, we thus carried out this meta-analysis.

MATERIALS AND METHODS

Eighty patients were divided into two groups, group A consisting of traditional sutures and group B consisting of staples, each comprising forty cases. Prolene 2-0 cutting body (Lotus) was used in group A to close wounds with interrupted sutures. In group B, Covidien staplers were used for wound closure.

Based on the chit system, which is provided to patients before to surgery, all patients were randomised into two groups: group A was assigned to traditional sutures, while group B was assigned to skin staplers. There are, correspondingly, twenty-five patients in each group.

Every examination and surgical treatment was conducted with the requisite informed written permission.

Data was gathered from the following sources after subjects were chosen and their informed consent for the study was obtained: 1) the operating surgeon following the procedure, who reported on the length of time it took, the ease of the surgery the surgical procedure itself, 2) patients after the procedure, who provided information on pain, cosmetic results, pain at suture or stapler removal, wound infection, etc and 3) patients who were followed up with in the outpatient department following their hospital stay.

A proforma was used to gather information on the patient's profile, diagnosis, investigationssurgical procedures. An Microsoft Excel sheet was then used to tabulate the data to a master chart.

Statistical Analysis: Data that were continuous were analysed using the unpaired t test. The 2 test by Pearson was used to analyse the categorical data. If $p<0.05$, differences were deemed statistically significant. The statistical software used was IBM SPSS Statistics for Windows, version 24 (IBM Corp., Armonk, N.Y., USA).

RESULTS AND DISCUSSIONS

In the present study, among staples group, the youngest patient was 12 years of age and the eldest was 59 years of age. While in sutures group, the

youngest patient was 13 years of age and the eldest was 57 years of age. The mean age among staples group was 36.71 years and among sutures group was 34.60 years. The distribution of age in this study is shown in the Table 1.

In the present study, out of 80 patients, 41 (51.2%) were male and 39 (48.7%) were female as depicted in Table 2.

In the present study, out of 80 cases, the commonest type of incision for surgical wound creation was McBurney's incision: 13 in staplers and 14 in suture group. Midline incision was given in 10 cases in staplers and 12 cases in suture group, inguinal incision was given in 8 cases in staplers and 6 cases in suture group, sub-costal incision was given in 4 case in each groupparamedian incision was given in 5 cases in staplers and 4 in suture group. The details of type of incision in the present study are given in Table 3.

Wounds are classified based on the length of incision as group A, <5 cm with 15 cases in staples and 16 cases in sutures group: group B, 5-10 cm with 13 cases in staples and 10 cases in sutures group and group C, >10 cm with 12 cases in staples and 14 cases in sutures group as shown in Table 4.

Time required for skin closure was classified as <5 minutes, 5-10 minutes, 10-15 minutes and >15 minutes. In staples group, time required for skin closure was <5 min in all the cases whereas in sutures group, no case completed skin closure in <5 minutes, 14 cases in 5-10 minutes, 2 cases in 10-15 minutes and 14 cases in >15 minutes. These results are shown in Table 5. Mean time for suture closure was 10.4 minutes. Mean time for staple closure is 5.8 minutes.

Southampton wound assessment scale was used for post-operative complications in this study.7 We observed that In staples group, 3 cases presented with clear discharge with grade (III) and 2 cases with purulent discharge with grade (IV) whereas in suture group, clear discharge with grade (III) was seen in 5 cases and purulent discharge with grade (IV) in 4 cases, rest of the cases are healed normally or by with mild bruising, as shown in Table 6.

A skin wound will always develop as a consequence of any elective abdominal surgical procedure in order to access any underlying intra-abdominal disease. Rarely are all of the surgeon's efforts evaluated based just on the final look of the surgical scar, which continues to be the only obvious testament to his competence. Skin staplers are a substitute for standard sutures, which are meant to close surgical wounds quickly. The current study categorises wounds according to the length of incision: group A includes 103 cases with staples and 14 cases with sutures in the incision <5 cm, group B includes 11 cases with staples and 8 cases with sutures in the incision 5-10 cmgroup C includes 7 cases with staples and 9 cases with sutures in the incision >10 cm. In the research by Chavan *et al.,* among the suture group, there were 2, 3216 patients in groups A, BC, respectively. Of the patients with staplers, four belonged to group A (wound length <5 cm), thirty to group B (wound length <10 cm)fourteen to group C (wound length >10 cm).8

According to the Ranabaldo *et al* research, the sutures group took 224 seconds, whereas the staples group took 147 seconds on average for closure[9]. The mean time for closure in the sutures group was 546 seconds and in the staples group was 104 seconds in the Naireen *et al* research[10]. After analysing 137 patients having thoracic or abdominal surgery, Eldrup et al. came to the conclusion that the primary benefit of employing staples was time savings, since the traditional technique of closure needed one-third the time when using mechanical sutures[11].

The time needed to suture a surgical wound was higher in this study than in previous studies that were used as a comparison because different interns and first-year postgraduate students completed the skin closure with sutures, which resulted in a significantly longer suture application time than in previous studies. However, the time needed to close the wound with staples was significantly less than that of sutures in this study.

For staples, the average time needed was 294 seconds. 576 seconds is the average amount of time needed for sutures. Staple and suture placement took about the same amount of time on average as in previous investigations.

In this investigation, the Southampton wound scale was used to evaluate the degree of wound infection[7]. Out of 40 cases in the staples group in the current study, 5 patients experienced complications in the form of clear discharge in 3 cases (12%) and purulent discharge in 2 cases (8%), in contrast, out of 40 patients in the sutures group, 9 patients experienced complications in the form of clear discharge in 5 cases (20%) and purulent discharge in 4 cases (16%). The remaining lesions either healed naturally or saw very little erythema.

The infection rates in this study are similar to those of studies conducted by dos Santos et al. However, because we have operated on contaminated cases and our expertise in skin suturing or stapling varies from intern to postgraduate, our infection rates were higher than those of studies conducted by Karbhari *et al.* (8% in staples and 14% in sutures), Naireen *et al.* (8% in staples group and 4% in sutures group)Chavan et al. (16% in staples group and 16% in sutures group)[12-15].

Staphylococcus aureus was the most frequently cultured pathogen in both groups in the current investigation, with two cases in the staples group and three cases in the sutures group.

Since there aren't many relevant research, this

Table 1: Age distribution.

Age group (in years)	Staples (n=40)	Sutures (n=40)
	N (%)	N (%)
<20	6 (15)	7 (17.5)
20-30	8 (20)	6 (15)
30-40	11 (27.5)	12 (30)
40-50	8 (20)	9 (22.5)
50-60	7 (17.5)	6 (15)
Total	40 (100)	40 (100)

Table 2: Sex distribution.

Sex	Staples (n=40)	Sutures (n=40)
	N (%)	N (%)
Male	22 (55)	20 (50)
Female	18 (45)	20 (50)
Total	40 (100)	40 (100)

Table 3: Type of incision.

Incision	Stapels (n=40)	Sutures (n=40)
	N (%)	N (%)
Midline	10 (25)	12 (30)
Inguinal	8 (20)	6 (15)
Subcostal	4 (10)	4 (10)
McBurney's	13 (32.5)	14 (35)
Paramedian	5 (12.5)	4 (10)
Total	40 (100)	40 (100)

Table 4: Classification based on length of wounds.

Group	Group A<5 cm	Group B 5-10 cm	Group C >10 cm	Total (%)
Stapels	15	13	12	40 (100)
Suture	16	10	14	40 (100)

Table 5: Time required for closure.

Time required for wound closure (minutes)	Staples (n=40)	Sutures (n=40)
<5	40 (100%)	0
5-10	0	19
10-15	0	7
>15	0	14
Total	40 (100%)	40 (100%)

Table 6: Post-operative complications.

Complications	Staples (n=40)	Sutures (n=40)
	N (%)	N (%)
Clear discharge	5 (12.5%)	7 (17.5%)
Purulent discharge	4 (10%)	6 (15%)
Total	7 (17.5%)	11 (27.5%)

study can't be said to be universally typical of all groups. For instance, obesity is thought to increase the risk of surgical site infections (SSI) in a number of ways, including insufficient oxygenation of tissues, less antibiotic penetration, demanding exposure during surgery and the ensuing extended operating time[16]. Although BMI was only provided in two trials, it is still important. Therefore, it was not possible to assess the influence of obese status. Similarly, Fry summarises a number of additional variables that may also contribute to wound complications, such as old age, diabetes mellitus, malnutrition, smoking, immunosuppressive medicines others. However, none of the included studies took into consideration their impact on wound complications.

CONCLUSION

The findings of our investigation suggest that skin closure using staplers may be favoured over traditional skin sutures since they are simpler to use, require a lot less time to apply, are easier to remove with less discomfort for the patients, provide better aesthetic outcomes are more affordable. Staplers aren't readily accessible everywhere, thus surgeons should be familiar with the fundamentals of skin closure techniques. We draw the conclusion that skin staplers may be employed in surgical incisions over the abdomen that are electively cleaned and free of contamination. However, further research with a larger sample size and a multi center investigation are needed to determine the function of staplers in skin approximation.

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