



Comparative Study on Skin Staples and Conventional Skin Closure for Abdominal Skin Closure

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Abstract

Introduction: The appearance of scar after surgery is of significant importance and is often the only reminder of surgery. Wound closure technique is of extreme importance which determine the healing process and nature of scar. The closure method is decided by the surgeon.

Aims And Objective:

This study was conducted to compare the outcome of two methods of skin closure following abdominal Surgery.

Methodology: After institutional ethics committee approval 200 consenting patients were included in the study to either undergone skin closure by skin stapler or conventional nylon suture closure in this prospective randomized study. Post operatively patients of both groups were compared regarding time taken for skin closure, cost of both methods, presence of wound infection, wound dehiscence, level of patient's discomfort, Vancouver scar scale and Visual Analogue score regarding patient satisfaction and cosmetic outcome.

Results: The result of this study shows there was no clinically and statistically difference in the two methods of wound closure with regards to patient satisfaction regarding aesthetic effect of the scar.

Conclusion: The choice of the appropriate method of wound closure in the hands of the surgeon according to his own personnel choice and the availability of the suture material at that time.

Keyword's: Wound Closure, Skin Staple, Nylon Suture, Scar Formation

INTRODUCTION

Patients place extreme importance on the appearance of the scar in addition to the symptoms of pain, tenderness and itching. An aesthetically poor scar can have a negative impact on the overall quality of life causing considerable distress, loss of self-esteem and unhappiness [1, 2]. The appearance of the scar is of significant importance and is often the only reminder of surgery.

The surgeon can choose the technique of closure and the suture material [3].

The technique of closure should be quick, easy, cost effective and simple, while maximizing wound cosmesis and patient satisfaction. The wound closure technique will ensure optimal wound healing [4]. The ultimate goal of any skin closure technique is to

produce skin approximation and adequate healing with minimum wound complications like pain, infection, scarring and Keloid formation. Most important to the patient is the pleasing aesthetic affect. Cost of the procedure should also be considered. Closure should serve both functional and aesthetic purposes [5].

AIMS AND OBJECTIVES OF THE STUDY

This study was conducted to compare two methods of skin closure following abdominal Surgery:

- A) Conventional interrupted suture versus.
- B) Skin stapler.

The specific objectives of the study were:

1. To study the total cost and surgeon's time requirement for suture and staple repairs.
2. To study the effect on wound healing with the use of sutures and staples.
3. To study the cosmetic results of these two techniques.
4. To study the degree of patient's acceptance with the two techniques.

MATERIALS AND METHODS

This prospective comparative randomized study was performed at a Government Medical College on 200 patients undergoing elective abdominal surgery with clean wounds. Consenting patients were divided into two groups by process of randomization, to receive either suture or staple repair. Out of the 200 patients, 100 underwent skin closure with Stainless steel skin staples and the remaining 100 with vertical mattress suturing with Monofilament Nylon. Patients undergoing operation were informed about the details of the study. Baseline demographics and clinical data were collected.

Patients with diabetes mellitus; immune compromised status like AIDS/HIV infection, patients on glucocorticoids; having severe co-morbidities i.e. Jaundice, Renal failure, failure of other organ systems and patients with skin diseases involving abdomen were excluded from the study.

Patients were selected for the study from the in-patients department, who needed elective abdominal surgery. Complete history with regard to presenting features of illness was recorded. Special attention was

paid to risk factors-i) age ii) sex iii) duration of illness iv) time gap between onset of symptoms & surgery v) any psychiatric illness vi) any skin diseases. All patients received prophylactic antibiotic (inj. Ceftriaxone 1g and skin preparation with 10% povidone iodine. The surgeon was informed about the study. Intra-operative exclusion was exercised as per set criteria e.g. Intra-operative spillage of gut content. Skin was closed using ethilon in an interrupted mattress fashion. Time taken for skin closure noted, sec/cm of wound, in both groups of patients. Great care was taken to avoid tension of the wound. Cost of both closure materials noted. Staples were used for the other method. For their application an assistant everted the skin edges and the stapler was placed firmly on the skin surface Perpendicular to the wound. It was pressed firmly avoiding indenting of the Skin. The centre mark on the stapler was aligned with the centre of the wound Margin. The stapler was squeezed, plunging the staple into the skin to form an incomplete rectangle. Staples were placed about 1cm apart. The incision was measured at the end of the procedure. Dressings were identical in both groups.

On the 3rd postoperative day, the wound was evaluated for inflammation, infection and wound gape. . Following surgery all patients were followed up for at least 4 weeks. Every patient was assessed with a visual analogue scale at the end of 2nd, and 4th weeks. Visual analogue scale of pain was used. Where 1 means no pain and 10 means very severe pain. Subjective analysis of scar was done by Vancouver scar scale (0-13) Participants were re-evaluated for infection / gape / inflammation/ discharge/ keloid formation/ scratch marks/ any redness and separation of the wound edges during follow-up on 15 days / 1 month. At 1 month follow up: visual analogue scale for cosmesis grading (1- 10).

Statistical evaluation was done using the student's unpaired 't' test and Mann-Whitney test to calculate the p value. Medcalc and Maxstat pro software were used for analysis.

RESULTS AND ANALYSIS

Demographical characteristics

Out of those 200 patients, 49 were under the age group (<30), 109 came under the age group (30-60), 42 came under the age group (>60).

Out of those 200 patients, 127 were male & 73 were female. Among the 127 male patients, 68 underwent suture closure & 59 underwent staples closure. Out of those 73 female patients, 32 underwent suture closure & 41 underwent staples closure described in Table 2

Table 1: Demographic characteristics

Variable		Sutures Group	Staples Group	P value
Age-	<30	23	26	>0.256
	30-60	53	56	
	>60	24	18	
Sex (M/F)		68/32	59/41	0.358

ASSESSMENT OF WOUND INFECTION and DEHISCENCE: -

Table 2 depicts incidence of wound infection and wound dehiscence among the two groups which were statistically not important.

Table 2

Variable	Sutures Group	Staples Group	P Value
Infection (No/yes)	87/13	92/8	0.3562
Dehiscence(No/Yes)	93/7	95/5	0.7659

PAIN EXPERIENCED ON 15TH DAY AND 30 TH DAY: -

Calculated as per visual analog scale of (1-10) Statistical analysis by unpaired t test. Score given by patients as per in table 3

At the end of 15th day, the the staple group people had increased mean VAS score which was statistically significant but at 30 th day both the groups had comparable pain score.

Table:3

Variable	Staple group	Suture Group	CI (95% of mean)	P value
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	(Mean±S D)	(Mean±S D)	differen ce	
15th Day VAS score	6.0070 ±1.526	5.080 ±1.495	± 0.421	<0.001
30 th day VAS score	2.882 ± 1.118	2.718 ± 1.453	± 0.358	0.3647

Table 4 describes the cosmetic outcome by means of Vancouver scar scale, time taken for wound closure and cost analysis among the two groups. Vancouver scar scale had no difference between the two groups. The closure time was significantly less in staple group whereas the cost was also significantly higher in staple group in comparison to suture group.

TABLE:4 SCAR ANALYSIS BY VANCOUVER SCAR SCALE, TIME TAKEN FOR CLOSURE AND COST ANALYSIS-

Variable	Staple Group	Suture Group	P value
Vacouver Scar scale	3.690 ± 2.912	3.830 ±2.216	0.702
Time taken for closure(days)	9.548 ± 4.236	41.003 ± 11.297	<0.0001
Cost analysis	826.650 ± 240.860	165.330 ± 48.172	<0.0001

Discussion

This study was undertaken to compare wound infection rate, wound dehiscence, pain, cosmetic outcome and cost benefit of surgical closure of abdominal wounds with sutures or staples.

1. Wound Infection

In this study, regarding wound infection,13 patients from suture had wound infection while 7 from staple group had wound infection, which was statistically

insignificant. Johnson et al [8] and Stillman et al [9] suggested that skin stapling might cause less damage to the wound's defenses than non-absorbable sutures. This was based on the principle that the presence of a foreign material might compromise the immune response. Furthermore, Pickford et al suggested that as staples do not penetrate the incision but cross the incision site, this might prevent the introduction of foreign material. [10] Poor technique can lead to suboptimal healing. [11] This might cause oozing wound edges and delay in healing and increase the potential for infection. Risk of the infection spreading through the dermal layers to the implant such as mesh. Eldrup j et al [12] found no difference with regard to wound infection, but pain was more frequent after stapling.

Wound dehiscence was also statistically insignificant between the two groups.

Pain & discomfort experienced by patients on 15th day was significantly higher in staples group. It was assessed by Visual Analog Scale of pain (0 - 10). Suture and staples were removed on 15th day. Patients experienced more pain while removing staples, needed specialized staple remover.

Pain & discomfort experienced by patients on 30th day was assessed by Visual Analog Scale of pain (0 - 10). Graham et al [13] proposed that deposition of wound collagen is directly related to wound oxygenation and perfusion. [15,16] Johnson k et al [8], reported more favourable blood perfusion characteristics in wounds closed with staples rather than sutures, in addition to a significantly higher blood contact in the wound at seven days compared with the suture group (P=0.02).

Patients' satisfaction regarding cosmesis, appearance of scar was evaluated on 30th day with help of Visual Analog Scale (patients) and Vancouver scar scale (VSS). Both group of patients had similar results in cosmesis. Scar complications were statistically insignificant and cosmetic outcome is equal in both methods.

Time taken for closure was noted as seconds/cm of incision. There was significant difference between both techniques. Staple closure is significantly faster than suture closure. In a study by Eldrup j et al [12] randomized trial, with 137 patients having elective abdominal and breast surgery. The median duration of

skin closure with the stapler was 80 seconds, which was significantly shorter than the median of 242 seconds with conventional closure. Study by C J Ranaboldo for the closure of midline abdominal wounds [18], 48 patients were randomized to receive skin staples or subcuticular polydioxanone sutures. The mean (range) time for closure with staples was 8.0 (3.4–14.8) s cm⁻¹ while subcuticular closure took 12.7 (9.6–28.0) s cm⁻¹. The mean time saved per patient with skin staples was 77s. Wound pain and requirements for analgesia were significantly lower in the sutured group. The mean cost per patient was £ 1.41 for subcuticular closure and £7.72 for stapling; the latter also incurred an additional cost of £6.27 for staple removal. No clear benefit derives from the use of staples in the closure of abdominal wounds. In our study we also found the cost of closure was higher in stapler group .

Some authors have suggested that there might be greater satisfaction for surgeons in using staples than sutures. The time saving benefits of staples might have a psychological effect on surgeons and theatre staff, particular after a long operation.[19] .

While there seems to be consensus that staple closure is faster than suture closure [18], there remains some variation between studies for cosmetic results and pain outcomes. There seemed to be no significant difference in complication rates, including wound infection, between abdominal wounds closed with sutures compared with staples.

Conclusion

The result of this study shows there was no clinically and statistically difference in the two methods of wound closure with regards to patient satisfaction regarding aesthetic effect of the scar. Early post op duration & removal was painful for stapled patients. Pain & discomfort after 4 weeks were similar. There is also no added benefit in relation to wound infection and dehiscence.

This leaves the choice of the appropriate method of wound closure in the hands of the surgeon according to his own personnel choice and the availability of the suture material at that time.

Limitations of the study

Patients are followed up at 4 weeks only. Some wound complications can such as incisional hernia or keloid can develop much later. Full healing may take months but no major difference appears regarding the cosmesis after 6 weeks. Emergency procedures were not included which demands more time management.

Clinical scar assessment lacks a standardized methodology and a systematic approach, and thus studies continue to lack consensus regarding the most appropriate and applicable evaluation instrument.

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