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Original Research Article

Closure of skin in surgical wounds with skin stapler and conventional sutures: a comparative study

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ABSTRACT

Background: Application of suture is the technique of choice for apposition of skin edges in surgical wounds. The same procedure performed with application of staplers is faster and produce better cosmetic outcomes. A comparative study between conventional suture and stapler closure of skin in abdominal surgical wounds was undertaken to study the merits and demerits of the techniques. The aim was to study the time required for closure of surgical wounds, aesthetic outcome, post-operative complications and patient's compliance.
Methods: This was a single centre, prospective, observational study, conducted upon 100 patients undergoing abdominal surgeries. 50 patients were selected for skin closure of surgical wounds with stapler and the other 50 patients for closure with conventional nylon sutures. Data were collected for time required for closure of skin, aesthetic outcome, post-operative complications and patient's compliance for both the groups for comparison. Data were analysed using student t test for comparison and chi square test of significance.
Results: There was significant better results in stapler group in terms of cosmetic outcome (96% vs 88%, $p<0.001$), time taken during closure (60 vs 219 seconds, $p<0.001$) and patient's compliance VAS of 1.44 vs 4.58 $p<0.001$).
Conclusions: Closure of skin with stapler is a faster method. Patient's compliance with stapler closure is better. It produces cosmetically acceptable scar and less discomfort or pain during its removal.

Keywords: Surgical wounds, Staplers, Sutures, Discofort

INTRODUCTION

An ideal method of wound closure should be rapid, inexpensive, easy to implement, comfortable for the patient, effective in terms of wound healing and cosmetically acceptable.[1] Rapid and aesthetic healing of skin incisions requires accurate re-approximation of wound margins.[2] Application of suture is the technique of choice for approximation of skin edges in surgical wounds. Approximation edges (closure) of skin in surgical wounds with application of staplers is a faster method of closure with better cosmetic outcome. Rate of complications are low in comparison to conventional closure with application of suture materials. There is evidence that stapler causes considerably less damage to wound defences when compared even with least reactive non-absorbable suture materials.[3] A comparative study between application of conventional suture and stapler closure of skin in abdominal wound following surgery was undertaken to compare the merits and demerits of the techniques with the aim to study the time required for closure of surgical wound with stapler, aesthetic outcome, post-operative complications and patients compliance in order to determine the better method in comparison to other.

METHODS

This was a single centre, prospective, clinical observational study conducted upon 100 patients who had

undergone elective, abdominal surgeries, in Gauhati medical college hospital during June 2019 to May 2010. Fifty patients were selected for skin closure with staples and the other 50 patients for closure with conventional nylon sutures following abdominal surgery. The time required for closure of surgical wounds, its aesthetic outcome, post-operative complications and patients' compliance were recorded for both the groups. All patients in 25 to 65 years age group undergoing elective clean and clean contaminated abdominal surgery with ASA class I and II were included in the study. Patients on long term steroid and immunomodulation therapy, ASA class III and above, patients with previous open abdominal surgery (Elective/ emergency were excluded from the study. Patients' demographic data with study protocols were compiled in a preformed Performa. Pre-operative prophylactic antibiotics was injected to all patients. All pre and per operative antiseptic precautions were taken. Skin was prepared with 10% betadine and was allowed to dry before incision was made. On completion of surgery, absorbable running suture (Poly-diaxanone) was used for fascial and muscle closure at gaps of 1 cm. The method of skin closure for each case was determined after repair of the deeper layers by randomization. The process of closure was timed in seconds. Staples or sutures were placed approximately 1 cm apart. The first post-operative dressing was done at 48 hours post op. The wound evaluated and checked for any evidence of collection or infection. Staples were removed on 10-12 post operative day. Staples were removed with a device that painlessly opened them sideways, while sutures were removed in the conventional way. Patients' compliance with removal of suture, stapler on removal was recorded. Pain attributable to the removal of stapler or suture was assessed using VAS. The cosmetic appearance was assessed at two weeks with the help of a wound evaluation score. Good scar was considered as those which had optimal healing (i.e., 6/6 score). Wounds that (scored 0/6) with thick, wide or raised edges and were considered poor in healing process with unacceptable scar. Wound which scored in between the two were considered as sub optimally healed and were considered as an acceptable scar. The study was approved by the institutional ethics committee.

Data analysis

Each parameter was presented in tables and charts. Proportions were compared using chi-square test of significance. Student t test was used for comparison of parametric data.

RESULTS

This study was conducted upon 100 patients who underwent elective, open abdominal surgeries. One group consisting of 50 patients underwent abdominal wound skin closure with nylon (as conventional suture), and the other group of 50 patients underwent skin closure with skin stapler. Among both groups, the youngest patient was aged 25 years and the oldest patient was 65 years old. The most common age group in the study was between 35-50 years (Table 1).

Table 1: Age distribution in study groups.

Age group (years)	No. of patients in stapler group	No. of patients in suture group
<35	18	25
36-50	24	22
51-65	8	3

There were 27 males and 23 females in the stapler group, while there were 26 male and 24 females in the suture group (Table 2).

Table 2: Sex distribution in study groups.

Sex	No. of patients in stapler group	No. of patients in suture group	Total
Male	27	28	53
Female	23	24	47

The region of various incisions with methods of skin closure was shown in Table 3.

Table 3: Type of closure with various abdominal incisions.

Type of closure	Subcostal incisions	Mc Burney incisions	Inguinal incisions	Midline incisions
Stapler	28	8	12	2
Suture	27	11	10	2

The maximum length of incision was 12 cm and minimum length was 5 cm in stapler group. In the suture group the maximum length of incision was 12.5 cm and the minimum length was 5.8 cm mean length (Table 4).

Table 4: Mean length of incision and SD.

Closing methods	Mean length of incisions	Standard deviations
Stapler	8.5	2.00
Suture	8.7	2.10

It was found that the mean duration of time taken for stapler closure was 60±15.37(95% CI:55.6-64.3) seconds. The mean duration of time taken for closure with application of suture was 219.3±47.72 (95% CI: 205.7-232.8) seconds (Table 5). The time taken was four times more than that of stapler closure ($p<0.001$).

The appearance of post operative scar at removal of staple and suture were found to acceptable (96%) in stapler group (Table 6).

Table 5: Average Time taken for closure in various wounds.

Incisions	Stapler, (Sec)	Sutures, (Sec)	P value	Remarks
Sub-costal	67.96±3.62	246.78±9.52	<0.0001	Significant
Burney's	33.75±3.54	160.45±8.89	<0.0001	Significant
Inguinal	52.67±5.87	185.20±12.34	<0.0001	Significant
Midline	97.5	342.5	Indeterminate	Small sample size

Table 6: Cosmetic appearance with closing methods.

Closure methods	Good, (%)	Acceptable, (%)	Poor, (%)	P value
Stapler	84	12	4	<0.001
Suture	56	32	12	

In the present study 5 out of the total 50 patients who underwent skin closure with staplers had post-operative wound infection as compared to 7 out of 50 in the suture group. There was significant difference between the patient's acceptance and pain during removal of stapler or suture (Figure 1). It was found that with stapler the mean pain score in VAS was 1.44±0.58 (95% CI: 1.27-1.6) whereas with suture the mean pain score in VAS was found to be 4.58±0.88 (95% CI: 4.3-4.8). Which was found to be statistically significant (p<0.001).

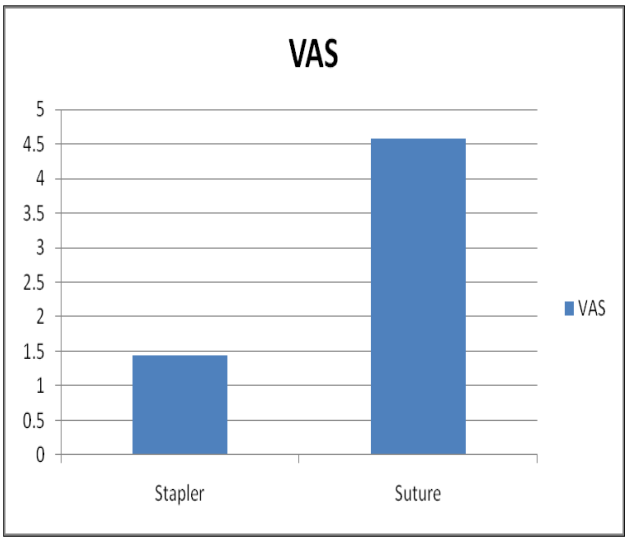

Figure 1: VAS score for pain during removal of stapler and suture.

DISCUSSION

Approximation of skin during wound closure is the final step in all surgical procedures. With advancement in science and technology the methods of skin closure have significantly improved over time. Skin closure holds importance in post-operative recovery, early discharge of patients. Faster methods of skin/wound closure would enable the anesthetic team to wean the patient of anesthesia within a shorter period of time thereby decreasing postoperative morbidity and mortality.

Complications associated with skin closure, can affect the post-operative recovery of the patient. Various complications like wound infection would mean a longer hospital stay affecting both recovery and total expenditure.

In the present study, the time taken to complete skin closure was significantly low with the use of staplers as compared to that of sutures. The mean time required for closure with stapler was 60 seconds with a standard deviation of 15.37 seconds whereas with suture closure it was 219.3 seconds with a standard deviation of 47.72 which was statistically significant (p<0.001). This was comparable with several other studies.[4-8] In the present study acceptable, healthy scar was present in 84% of cases in the stapler group and 56% of the cases in the suture group. This was consistent with similar other studies.[6,9-11] In various studies was reported that skin apposed with staplers were associated with low incidence of post-operative infection. In the present study, 5 out of 50 patients (10%) in stapler group and 7 out of 50 (14%) patients in suture group encountered wound infection and the difference was found to be statistically insignificant which was in accordance with other studies.[11-14] In the present study it was found that patient compliance during removal of staple was better than that of suture removal. There was significant difference in the patient's acceptance for closure with skin stapler. Experience of pain during removal of staple studied in VAS was found to be less in stapler group.[14]

Limitations

This study is conducted in a single institute. The study population is small. A multi-cantered controlled trial may yield more acceptable results.

CONCLUSION

Approximation of skin edges with stapler is a faster mode of closure of surgical wounds. Patient's compliance in cosmetically acceptable scar, less discomfort and pain during removal in comparison to application of conventional suture material. However, there was no significant post-operative complications in either group.

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