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Original Research Article

Comparison of staple closure of skin versus suture closure of skin in elective surgical wounds

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ABSTRACT

Background: The development of surgical skills and the handling of instruments have led to an understanding of operative procedures. Emergency surgeries and insertion of foreign bodies are done when one deals with acute sepsis adhesive and staples are used instead of sutures. The principle idea is to regain the wound's strength as quickly as possible with the most minor tissue damage and an acceptable cosmetic scar. The critical step is the accurate co-optation of dermal edges. The skin closure technique auto-inoculates the patient's wound, deepening surface flora into the subcutaneous layer.
Methods: Patients who underwent abdominal surgeries in an elective setting in NRI Medical College hospital, Chinakakani, were included in this prospective study. Patients were randomly assigned to skin sutures/staplers for wound closure in elective surgeries and 50 cases were studied in either group (total–100 cases). Cases were studied from August 2022–April 2024.
Results: About 16% patients who underwent staple skin closure had complications. About 82% patients who underwent suture skin closure had complications. Discharge and seroma are the most common complications in this group. The cosmetic outcome for incisions closed with staples was better than sutures. The time taken for removal of staples is significantly less compared to suture removal. The postoperative pain is more or less the same in both the groups.
Conclusions: we conclude that skin staplers are superior to sutures in wound cosmesis, reducing the wound discharge/ infection, seroma formation, granuloma formation and very much significant in saving time for skin closure. With reduction in the incidence of postoperative complications, wound healing improved and gaping significantly reduced giving better cosmetic scar.

Keywords: Sutures, Staples, Seroma

INTRODUCTION

The principal idea post-surgical wound is to regain the wound's strength at the earliest with least tissue damage and cosmetically acceptable scar. The critical step is the accurate approximation of skin edges. Surgical site infection is the most common hospital acquired infection reported in patients.[1,2] Up to 2.5% of patients who underwent clean extra-abdominal operations and up to 20% of intra-abdominal operations developed surgical site infections.[3] Infection is one of the most important factors influencing wound healing.[4] The skin closure technique itself auto-inoculates the surface flora into the wound, deeper tissues.[1] The suture material is a source of inflammatory reactions within the subcutaneous layer.[5]

Aims and objectives

To compare skin staples with sutures for abdominal skin closure in surgeries for the following characters. To

compare the time taken for wound closure. To compare seroma formation. To compare surgical site infection. To compare postoperative pain. To compare wound dehiscence. To compare wound cosmesis. The advantages of staples include the rapid of closure of wound, reproducibility, dependability, decreased skin allergy and lesser risk of wound infection, as there is a decreased chance of bacterial inoculation into the subcutaneous layer. The capillaries in the dermis are not injured during placement of staples, with better wound edge eversion avoiding strangulation of tissue due to excess pressure, resulting in minimal cross-hatch scarring and decreased foreign body reaction. Staple closure prevents needle stick injury. Wound closure with the age-old technique of skin suturing causes lesser pain, cheaper and easy to remove. Hence, this study is being conducted further to assess the advantages and disadvantages of sutures and staples.

METHODS

Patients who underwent abdominal surgeries in an elective setting in NRI Medical College hospital, Chinakakani, were included in this prospective study. Patients were randomly assigned to skin sutures/staplers for wound closure in elective surgeries and 50 cases were studied in either group (total–100 cases). Cases were studied from August 2022–April 2024. Study started after Institutional ethics committee approval. For all patients, subcutaneous suturing was done to relieve tension, dead space was obliterated and skin approximated. The wound was evaluated at 1 week, 1 month and 3 months intervals for discharge, infection, swelling, overlapping edges, separation of edges, wound dehiscence and scar. A photograph of the scar was taken to evaluate its cosmetic appearance. A senior surgeon, who was unaware of the method of wound closure, was consulted regarding the appearance of the scar at the end of 3 months.

Data was collected by a trained surgery resident and entered into an electronic database (MS Excel, Microsoft, Redmond, WA). Analysed using statistical software SPSS (IBM, Armonk, NY, USA). The outcome measures were calculated as mean and standard deviation. Continuous variables were analysed using a two-tailed student t-test. The results were reported as per the guidelines of the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology). Wound appearance was scored as overlapping borders: 1-no, 0–yes, contour irregularities: 1–no, 0–yes, wound dehiscence: 1–no, 0–yes, good overall appearance: 1-acceptable, 0–poor, score of 4–optimal cosmetic appearance. Visual analogue scale was used to examine postoperative pain.

Inclusion criteria

Patients undergoing elective abdominal surgeries will be included in this study.

Exclusion criteria

The categories will be excluded from the study like traumatic wounds, infected wounds, incisions which require to be closed under tension, patients on immunosuppression, age less than 18 years.

RESULTS

Table 1 shows the distribution of patients with respective age who underwent skin closure with either staples or sutures. Table 2 shows the distribution of patients with respective to sex who underwent skin closure with either staples or sutures. Table 3 shows the distribution of patients with different incisions closed with either staples or sutures. Table 4 depicts the average time taken for skin closure by staples and sutures. The average time taken for staple closure was 52.7 seconds and that of sutures was 478.5 seconds. The p value was calculated to be <0.0001, which is statistically significant.

Table 1: Age distribution.

Age (in years)	Staple	Suture	Total
18-25	3	12	15
26-50	32	27	59
>50	15	11	26
Total	50	50	100

Table 2: Sex distribution.

Staple/ Suture	Staple	Suture	Total
Male	22	22	44
Female	28	28	56
Total	50	50	100

Table 3: Type of incision.

Incision	Staple	Suture
Lanz	2	6
Gridiron	8	4
Inguinal	4	10
Inguinoscrotal	6	-
Transverse	15	15
Midline	15	15

Table 4: Average time for skin closure (in seconds).

Staple/Suture	Mean	Standard deviation	P value
Staple	52.7	13.447	<0.0001
Suture	478.5	137.478	

Table 5 depicts the visual analogue scale for postoperative pain in patients whose incisions were closed with staples or sutures. The p-value is found to be 0.482 which is not statistically significant. Thus, the

postoperative pain is more or less the same in both the groups.

Table 5: VAS for postoperative pain.

Staple/Suture	Mean	Standard deviation	P value
Staple	3.96	1.0879	0.482
Suture	3.8	1.1773	

Table 6: Average time for staple/suture removal.

Staple/Suture	Mean (In seconds)	Standard deviation	P value
Staple	45	11.2938	0.0001
Suture	53.6	10.3529	

Table 6 depicts the average time taken for removal of staples and sutures. The p value is calculated to be 0.0001, which is statistically significant. Hence, the time taken for removal of staples is significantly less compared to suture removal.

Table 7: Wound cosmesis score.

Staple/Suture	Mean	Standard deviation	P value
Staple	3.580	0.499	0.001
Suture	2.760	0.74	

Table 7 depicts the wound cosmesis score for incisions closed with staples and sutures. The p-value is found to be 0.001, which was statistically significant. Therefore, the cosmetic outcome for incisions closed with staples was better than sutures.

Table 8: Complications.

Complication	Staple	%	Suture	%	P value
Discharge	2	4	11	22	0.0147
Seroma	2	4	12	24	0.0076
Granuloma	-	-	4	8	0.2424
Scar	3	6	6	12	0.487
Gaping	1	2	8	16	0.0309
Nil	42	84	9	18	-
Total	50	100	50	100	-

Table 8 depicts the postoperative complications in wounds closed with staples and sutures. About 16% patients who underwent staple skin closure had complications. About 82% patients who underwent suture skin closure had complications. Discharge and seroma are the most common complications in this group.

DISCUSSION

Sutures are comparatively less expensive as compared to skin stapler. Frequent problems encountered in cases with suture closure are suture needle injuries. Injury to blood vessels during skin closure can lead to haematoma stitch granuloma/abscess. Staplers are expensive compared to sutures but they typically consume a lot less duration and are made of inert materials. Less risk of injury to the underlying subcutaneous tissue minimizes postoperative complications. In this prospective clinical study, 100 patients who underwent elective surgeries were studied. Out of these 100 patients, 50 underwent skin incision closure with skin staplers while the remaining 50 underwent skin closure with non-absorbable suture materials.

The comparison between these 2 study groups was assessed by the following parameters.

Time consumption, post-operative pain, post-operative wound complications, wound cosmesis wound complications include discharge, seroma, infection, wound gaping, scar formation, granuloma formation

In our study, 2 patients (4%) in the stapled group and 11 patients (22%) in the sutured group had wound discharge. The discharge from the wound was sent for culture and sensitivity.

The most common organism at the surgical site infection in both the groups was *Staphylococcus, Pseudomonas, Klebsiella pneumoniae, Proteus, E. coli.*

This was statistically significant as the p value was 0.014 (<0.05). Hence wound discharge was significantly less in patients with stapled skin closure when compared to sutured group of patients. Some studies have shown that skin incisions closed with staples exhibited higher resistance to surgical site infections than skin incisions closed with suture materials.[6]

The sutures and staplers, after they were removed, were also sent for culture and sensitivity but there was no growth in both of these. In this study, 2 patients (4%) in stapled group had seroma and 12 patients (24%) in sutured group had seroma formation. The p value was

found to be 0.0076 (<0.05) and was statistically significant.

In our study, 4 patients (8%) in suture group developed granuloma and no formation of granuloma was observed in stapled group. The p value was 0.242 (>0.05) which was not statistically significant. In the present study, 1 patient (2%) in stapled group had hypertrophic scar and 8 patients (16%) of sutured group had hypertrophic scar. The p value was 0.0309 (<0.05) which was statistically significant. In this comparative study, 1 patient (2%) in stapled group and 8 patients (16%) in sutured group had wound gaping. The p value was 0.0309 (<0.05) which was statistically significant. In this study, 42 patients (84%) in stapled group and 9 patients (18%) in sutured group had no postoperative complications.

Wound cosmesis

All the patients in this study were followed up at 1 week, 1 month and 3 months after the surgery for evaluation of the scar. A senior surgeon, who was blinded to the type of skin closure, was consulted to evaluate the appearance of scar. WWound cosmesis score for each group was calculated and then compared. Mean of this score was 3.580 in stapled group and 2.760 in sutured group. Standard deviation of this score is 0.499 in stapled group and 0.74 in suture group. The p value was 0.001 which was statistically significant.

Post operative pain

Post operative pain was evaluated using visual analog scale for the patients in this study group. The average score was 3.96 in stapled group and 3.8 in the sutured group. The p value was 0.482 and was not statistically significant.

Time consumption

In this prospective clinical study, the time taken for complete closure of the incision was significantly less in case of staplers when compared to that of sutures. Mean of this score was 52.7 seconds in stapled group and 478.5 seconds in sutured group. The average time required to approximate 1cm of the incision was about 5 times longer in case of suture closure. The P value was 0.0001 (<0.05) and was statistically significant.

Kanagaye also concluded in his study that skin closure staplers were about 6 times faster as compared to standard suture closure.[7] Eldrup et al, also observed that closure with mechanical sutures took only one third the time taken by the conventional suturing method.[8] Meiring et al have observed that nearly 80% of the time can be saved and Havery et al have observed that 66.6% of the time can be saved with staplers.[9,10]

Cost

The cost of stapler is about Rs. 800 and that of sutures is about Rs. 200.

Limitation of the study

Limitation of the study was small sample size, element of bias. Comorbidities like diabetes mellitus etc were not taken into consideration in study participants which effect wound healing adversely.

CONCLUSION

Based on our clinical study, we infer that skin staplers are superior to sutures in wound cosmesis, reducing the wound discharge/ infection, seroma formation, granuloma formation and very much significant in saving time for skin closure. With reduction in the incidence of postoperative complications, wound healing improved and gaping significantly reduced giving better cosmetic scar.

Recommendations

The study recommends the use of skin staplers.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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