

An Outcome Assessment in Surgical Site Infection in Post-Op Patients for Whom Wound Closure is Done Using Staplers and Sutures; A Comparative Study

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Abstract

Aim: The aim of the present study was to compare skin closure using sutures versus staplers in elective orthopaedic surgery cases that are followed for 4 weeks for postoperative surgical site infection.

Material & Methods: The Present study was prospective observational study, carried out in the Department of Orthopaedics for the duration of the study 24 months. A total of 100 patients were included in the study.

Results: There was no significant difference in mean ages, gender, BMI, co-morbidities and smoking status (p value >0.05). The present study shows a statistically significant higher incidence of wound infection among stapler group as compared to conventional sutures in terms of type of incision and type of wound closure. Among the Suture group, 14 out of the 50 had wound infection whereas in stapler group 36 out of the 50 had wound infection and this difference was found to be statistically significant. Mean operating time did not differ among the two groups of staple and sutures while closure time was significantly higher in suture group. Prolonged wound discharged was observed more with staples while the problem was lesser in suture group. This difference was also statistically significant with p value <0.05. More pain was felt by the patients in staple group reported as number of patients with VAS score of 3 or higher. No significant difference was observed between infection rate and wound dehiscence in the current study.

Conclusion: By this study it can be concluded that sutures can be used for wound closure instead of staplers in elective orthopaedic surgical procedures as the rate of surgical site infections (SSIs) were less in patients whose wound closure were done using sutures.

Keywords: Surgical site infection, staplers, sutures, wound closure.

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Introduction

In the context of orthopaedic surgery, surgical site infection (SSI)—defined as the occurrence of wound infection following surgery [1,2] are frequent postoperative complications that represent 20% of all nosocomial infections. SSIs are clinically classified as the occurrence of infection affecting either the superficial or deep incision sites within 30 days postoperatively or within 1 year if an implant is left inside the patient. [1] Orthopaedic SSIs are frequent postoperative complications that represent 20% of all nosocomial infections. In addition, orthopaedic SSIs have been shown to extend postoperative hospital stay, double hospital

readmission rates and increase annual healthcare costs up to 300%. [1-4]

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. [5] An infection that appears to be related to the operation and involves the deep soft tissues of the incision or any part of the body other than the incision that was made or manipulated during the operation is referred to as a surgical site infection. It occurs within 30 days of the surgical procedure if no implant is left in place, or within one year of surgery if an implant is present. [6]

Wound complications are one of the significant sources of morbidity and can prolong inpatient stay or lead to readmission. Surgical site infections have become one of the most common and expensive types of hospital acquired infections (HAIs), accounting for 20% of all HAIs. The patient's skin flora is the main source of surgical site infection. [7] Surgical site infection (SSI) is one of the most common complications following orthopaedic surgeries. Despite heightened awareness and precautions, there is no significant reduction in surgical site infection. [8] The type of suture material for skin closure is also reported to influence postoperative wound complications. With advancement and increasing use of staples for wound closure in orthopedic surgeries the present study aimed at finding out the difference in outcomes when compared with the conventional sutures.

The aim of the study was to compare the incidence of post-operative wound infection between skin staples and conventional sutures in abdominal skin closures and to compare the cosmetic outcome of stapled closure with conventional sutures.

Material & Methods

The Present study was prospective observational study, carried out in the Department of Orthopaedics, Katihar Medical College and Hospital, Katihar, Bihar, India for the duration of the study 24 months. A total of 100 patients were included in the study.

Inclusion Criteria

- Patients who are undergoing orthopaedic procedures.
- Patients Who Had Closed Fractures.
- Skeletally Matured Patients.
- Patients Who Are Willing To Participate In The Study.
- Patients Who Are Willing For Follow Up.

Exclusion Criteria

- Patients with open fractures.
- Skeletally immature patients.
- Patients who are not willing to participate in the study.
- Patients who are not willing for follow up.

Methodology

Informed consent was obtained from the patients willing to participate in the study. A detailed history of each patient was obtained starting with history of presenting symptoms and any co-existing, co-morbid conditions like, DM, HTN were ruled out. A thorough general physical examination was done. Preoperatively all patients underwent following investigations: complete blood count, urine examination, blood sugar, blood urea, serum creatinine, liver function test, chest x-ray, electrocardiogram. Shaving of the abdomen was done prior to Surgery. Patients were grouped into two categories- suture and staplers group based on the technique of wound closure. In group A wound closure was done using staplers and in second group (group B), sutures (ethylon) were used. Age group matching of the cases was done in both categories of closure technique. After the surgery, wound swab was taken from the surgical site wound on 2nd, 5th, 10th days and 4th week, the wound was evaluated using Southampton wound grading system. Wound gaping has also been considered. The wounds were evaluated at 1 month follow up and rated for cosmesis on Visual Analogue Score by a senior surgeon

Statistical Analysis:

The data was subjected to statistical analysis using paired T test. SPSS software was used to tabulate and analyse the data.

Results

Table 1: Distribution of baseline characteristics of the study participants across staple and suture groups

		Staple Group (n=50)	Suture group (n=50)	P value
Mean age (years) ± SD		55.24 ± 12.48	58.12 ± 14.16	0.2534
Gender	Male	28	26	0.4336
	Female	22	24	
BMI in Kg/m ²	18.5 -24.99	24	26	0.7848
	<18.5	6	4	
	>24.99	20	20	
Smoking	Yes	15	12	0.736
	No	35	38	
Co-morbidity	Present	18	16	0.9328
	Absent	32	34	

There was no significant difference in mean ages, gender, BMI, co-morbidities and smoking status (p value >0.05).

Table 2: Distribution of study population based on type of incision and type of wound closure

		Closure technique			Total
			Suture	Stapler	
		Count	45	50	95
Type of incision	Midline laparotomy incision	% within SUR	47.36%	52.64%	100.0%
		% within CLOSRE	90%	100%	95%
Subcostal incision		Count	5	0	5
		% within SUR	100%	0%	100%
		% within CLOSRE	10%	0%	5.0%
		Count	50	50	100
Total		% within SUR	50%	50%	100%
		% within CLOSRE	100%	100%	100%

The present study shows a statistically significant higher incidence of wound infection among stapler group as compared to conventional sutures in terms of type of incision and type of wound closure.

Table 3: Study population based on type of wound closure and outcome

		Outcome			Total
			Normal healing	Wound infection	
		Count	28	14	42
Suture		% within CLOSRE	66.66%	33.34%	100%
		% within outcome	56%	28%	42%
Closure	Stapler	Count	22	36	58
		% within CLOSRE	37.93%	62.07%	100.0%
		% within outcome	44%	72%	58%
		Count	50	50	100
Total		% within CLOSRE	50%	50%	100%
		% within outcome	100.0%	100.0%	100%

Among the Suture group, 14 out of the 50 had wound infection whereas in stapler group 36 out of the 50 had wound infection and this difference was found to be statistically significant.

Table 4: Outcome parameters assessed and significance of difference between the two groups

Outcome Parameters	Staple Group (n=50)	Suture group (n=50)	p value
Mean Operating Time (minutes)	86.24 ± 22.2	94.54 ± 26.24	0.412
Closure Time (minutes)	4.6 ± 1.2	11.9 ± 2.3	0.0001
Surgical Site Infection	6	4	0.270
Prolonged wound Discharge (>4 days)	10	5	0.0000
Abscess	0	1	0.307
Wound dehiscence	3	1	0.350
Pain (Visual Analogue Score) ≥3	38	28	0.036
Poor cosmetic appearance	8	9	0.9542

Mean operating time did not differ among the two groups of staple and sutures while closure time was significantly higher in suture group. Prolonged wound discharged was observed more with staples while the problem was lesser in suture group. This difference was also statistically significant with p value <0.05. More pain was felt by the patients in staple group reported as number of patients with VAS score of 3 or higher. No significant difference was observed between infection rate and wound dehiscence in the current study.

Discussion

According to the World Health Organization (WHO), Surgical Site Infection (SSI), which affects one-third of patients who have had any surgery, is the most common and frequently reported type of Healthcare-Associated Infections (HAI) in low-

and middle-income countries including India. The incidence of SSI is the second most common HAI type. [9] About 20% of all nosocomial infections are Orthopaedic SSIs and are common surgical sequelae. Moreover, it has been demonstrated that orthopaedic SSIs prolong postoperative hospital stays, raise hospital readmission rates, and boost yearly healthcare expenses by up to 300%. [10] Wound closure is a critical component of orthopedic surgeries. Orthopedic surgeries are procedures performed to correct or treat injuries or diseases affecting the musculoskeletal system, which includes bones, muscles, tendons, ligaments, and nerves. These surgeries are often complex and involve extensive soft tissue dissection, which can result in significant wounds that require specific management.

There was no significant difference in mean ages, gender, BMI, co-morbidities and smoking status (p value >0.05). The present study shows a statistically significant higher incidence of wound infection among stapler group as compared to conventional sutures in terms of type of incision and type of wound closure. Among the Suture group, 14 out of the 50 had wound infection whereas in stapler group 36 out of the 50 had wound infection and this difference was found to be statistically significant. In a study done by Shetty et al [11] it was discovered that when metal staples were used to suture skin wounds following hip fractures, the frequency of superficial wound infection increased considerably. Contrasting to this another meta-analysis found no significant difference in infection among patients who receive staples and sutures for skin closure. [12] A meta-analysis by Pencovich et al found that wound closure with sutures was associated with a lower risk of wound dehiscence compared to staples. The study also found that staples were associated with a higher incidence of wound infections and complications. [13] A study conducted by Tuuli MG et al, showed that Staple closure was associated with a twofold higher risk of wound infection or separation compared with subcuticular suture closure. [14] A multicentric study among 1080 patients conducted by Tsujinaka T et al, showed no significant difference in wound infection between the two groups. [15]

Mean operating time did not differ among the two groups of staple and sutures while closure time was significantly higher in suture group. Prolonged wound discharged was observed more with staples while the problem was lesser in suture group. This difference was also statistically significant with p value <0.05 . More pain was felt by the patients in staple group reported as number of patients with VAS score of 3 or higher. No significant difference was observed between infection rate and wound dehiscence in the current study. Eldrup et al, analysed 137 patients undergoing abdominal or thoracic surgery, and concluded that the main advantage of using staples was the time saved, as closure with mechanical sutures took one third of the time required for the conventional method. On the other hand, closure with staples resulted in the major disadvantages of additional expense, as the cost was forty-seven times higher than that of the suture with Dermalon. [16] Meiring et al, reported slightly better cosmetic results in a group of 40 patients undergoing laparotomy with an 80% in time saving. They also concluded that the final cost of the stapler was crucial for selecting the method. [17]

A systematic review by Pencovich et al [13] found that suture closure was associated with improved cosmetic outcomes compared to staples in both hip

and knee arthroplasty. Another study by Ting et al compared cosmetic outcomes between suture and staple closure in Achilles tendon repair and found that suture closure was associated with superior cosmetic outcomes. While cosmetic appearance is not a primary outcome measure in wound closure, it is an important patient-centered outcome that should be considered when choosing a wound closure method. [18] Medina dos Santos LR et al, in their study of 20 consecutive patients concluded that the use of skin staplers speeds up closure by 80%, with a better cosmetic result, and does not increase the incidence of complications, although the slightly higher cost was involved. [19] Basha et al, determined that staples were associated with increased risk of wound infection. Wound complications led to a decrease in patient satisfaction, however it was not statistically significant to associate staples with decreased satisfaction. [20] Cromi et al, found there were equivalent cosmetic outcome amongst closure methods. [21]

Conclusion

Several methods of skin closure are available to close the skin incisions in place of sutures like staples, clips, steristrips and glue adhesives. Wound infection is a great hazard in abdominal skin closure as it can lead to disastrous complications. Cosmesis is essential and important aspect in this day of modern surgical practice. A cosmetic scar gives satisfaction to the patient and also to the surgeon. Preventing wound infection is necessary as it may lead not only to an ugly scar but also occurrence and recurrence of hernia. In the present study, skin staplers versus sutures in abdominal wound closure, we found that incidence of post-operative wound infection was more with skin staples, sutures provided better cosmesis than skin staples and skin staplers saves operative time as compared to sutures. Hence, we conclude that Sutures are associated with low incidence of wound complications, provides good cosmetic outcome but takes considerably more time for skin closure.

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