

A STUDY ON COMPARISON OF SUTURES AND STAPLES FOR WOUND CLOSURE IN ORTHOPAEDIC SURGERIES IN A TERTIARY CARE HOSPITAL IN SRI GANGANAGAR, RAJASTHAN

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Abstract

Background: One of the most prevalent and significant nosocomial infections in post-operative patients is surgical site infections (SSIs). In orthopaedic surgery, surgical wound complications are a major issue, with wound infection, dehiscence, and poor cosmetic appearance all significantly increasing patient morbidity. A large number of research studies have been conducted to describe clinical outcomes, and surgical procedures and adjuvant modalities are continuously being developed with the intention of avoiding these problems. **Materials and Methods:** Participants were randomly assigned to sutures or staples for wound closure, and outcome measures were assessed that included wound complications, pain scores and scar appearance which was assessed by a blinded dermatology consultant. **Result:** 281 patients were included in a study with two groups: wound closure with staples (n=145) and sutures (n=136). Both groups were matched in age, gender, BMI, comorbidities, and smoking status (p value >0.05). Operating time was similar for staple and suture closure, but suture closure took significantly longer. Prolonged wound discharge was more common with staples 9.6% than with sutures (4.5%), and patients in the staple group reported more pain (41 with VAS score of 3 or higher vs 24 in suture). Infection rate and wound dehiscence did not differ significantly between the groups. (p <0.05). **Conclusion:** The selection of the wound closure method was influenced by factors such as the nature and site of the incision, the underlying tissue, and the conditions of the patient.

INTRODUCTION

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.^[1]

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.^[2]

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%.^[3]

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.

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.

MATERIALS AND METHODS

Study participants comprised of patients scheduled to undergo orthopedic surgery with a minimum incision length of 5 cm from a single tertiary care teaching hospital namely Dr. SS Tania Medical College, Hospital and research center. Patients with a history of allergy to sutures or staples, bleeding disorders, or any other medical condition that may interfere with wound healing were excluded from the study. The participants were randomly assigned to either the sutures or staples group for wound closure. The surgeon determined the number of sutures or staples required for wound closure based on the incision length, underlying tissue, and patient conditions. Outcome measures comprised of the incidence of wound complications including infection, dehiscence, delayed wound healing post-surgery, pain scores and scar appearance. A consultation from dermatology department was done to assess the cosmetic appearance of scar which was blinded and independent.

Sample Size Calculation

Based on previous studies, it was estimated that the incidence of wound complications with sutures was 10% and with staples 5%. With a power of 80% and

a 5% significance level, minimum 136 participants were required to be recruited in each group to detect a 5% difference in the incidence of wound complications between the groups.

Data Collection and Analysis

All data were collected by trained research personnel who were blinded to the groups. Descriptive statistics were used to summarize the demographic and clinical characteristics of the participants. The primary and secondary outcomes were analyzed using the chi-squared test and other appropriate statistical tests, such as the t-test and z-test, wherever applicable. Ethical considerations: The study was conducted in accordance with the Declaration of Helsinki and Good Clinical Practice guidelines. The study protocol was reviewed and approved by the institutional review board, and informed consent was obtained from all participants before enrollment.

RESULTS

A total of 281 patients were included in the study which consisted of two groups one where the wound closure was done with staple (n=145) and other with conventional suture technique (n=136). Matching was done to maintain similar characteristics in both the groups as depicted in table 2. There was no significant difference in mean ages, gender, BMI, co-morbidities and smoking status (p value >0.05).

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

		Staple Group (n=145)	Suture group (n=136)	Test Value	p value
Mean age (years) ± SD		57.21 ± 13.54	59.14 ± 15.12	t= 1.129	0.2599
Gender	Male	70	72	X ² = 0.611	0.4343
	Female	75	64		
BMI in Kg/m ²	18.5 -24.99	81	80	X ² = 0.4906	0.7824
	<18.5	10	7		
	>24.99	54	49		
Smoking	Yes	31	27	X ² = 0.0998	0.752
	No	114	109		
Co-morbidity	Present	39	36	X ² = 0.0065	0.9357
	Absent	106	100		

Table 2: shows the outcome parameters assessed and significance of difference between the two groups.

Outcome Parameters	Staple Group (n=145)	Suture group (n=136)	Test Value	p value
Mean Operating Time (minutes)	89.23 ± 21.2	91.59 ± 27.25	t= 0.813	0.417
Closure Time (minutes)	4.6 ± 1.2	11.9 ± 2.3	t= 33.6492	0.0001
Surgical Site Infection	8	4	z = 1.067	0.284
Prolonged wound Discharge (>4 days)	14	6	z = 5.356	0.0000
Abscess	0	1	z = -1.034	0.302
Wound dehiscence	3	1	z = 0.9432	0.347
Pain (Visual Analogue Score) ≥3	41	24	z = 2.1116	0.034
Poor cosmetic appearance	12	11	z = 0.057	0.9521

Mean operating time did not differ among the two groups of staple and sutures (t=0.813, p value >0.05) while closure time was significantly higher in suture group (11.9 vs 4.6 minutes, p value <0.05). Prolonged wound discharged was observed more 14 (9.6 %) with staples while the problem was lesser 6 (4.5 %) 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 (41 in staple vs 24 in suture) (p <0.05). No significant difference was observed between infection rate and wound dehiscence in the current study.

DISCUSSION

The findings of this trial will provide valuable insights into the use of sutures and staples for wound closure in orthopaedic surgery. The results will help to inform in clinical decision-making and improve patient outcomes. If one method is found to be superior to the other, it can lead to a change in clinical practice and potentially reduce the incidence of wound complications in orthopaedic surgery.

In this study, overall rate of 4.6 % (13/281) of patients experienced infections. Prior research comparing sutures and staples showed infection rates ranging from 0.04% to 13%.^[4-9]

In a meta-analysis, performed with Review Manager V.5.0 which comprised 13 studies, between sutures and staples, there was no discernible difference in infection rates. The total relative risk was 1.06 (0.46 to 2.44) similar to the findings of present study.^[10]

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] Another study by Walcott-Sapp et al compared wound closure with staples and sutures in total joint arthroplasty. The study found that the incidence of wound dehiscence was significantly lower in the suture group compared to the staple group. However, the study also found that there was no significant difference in wound infection rates between the two groups.^[14]

While sutures appear to be associated with a lower risk of wound dehiscence compared to staples, it is important to consider other factors such as ease of use, closure time, and cost. The use of sutures may require more time to place and tie compared to staples, which can potentially prolong surgical time and increase associated costs. Moreover, the technique for suturing may have a steeper curve compared to stapling, which could potentially influence surgeon preference. Cosmetic appearance is another important consideration in wound closure following orthopaedic surgery, as patients often desire minimal scarring and a satisfactory cosmetic outcome. Several studies have justified the association between wound closure methods and cosmetic appearance. 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.^[15]

CONCLUSION

From this study it is concluded that, wound closure is a crucial aspect of orthopaedic surgeries that requires careful consideration and attention. The choice of closure technique will depend on the type and location of the incision, the underlying tissue, and the patient's individual needs. Proper wound closure techniques can help promote healing, reduce the risk of infection, and improve patient outcomes, while improper techniques can lead to complications and poor outcomes. As such, orthopaedic surgeons must be knowledgeable about different wound closure methods and choose the appropriate technique for each patient.

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