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Comparison of surgical site infection in post-op patients for whom wound closure is done using staplers and sutures

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Abstract

Background: Surgical site infection (SSI) is a common healthcare-associated infection with a complication rate of up to 10%-20% of surgeries. After a surgical procedure, skin closure is crucial in preventing infection at the surgical site. The purpose of this study is to compare skin closure using sutures versus staplers in elective orthopaedic surgery cases that are followed for 4 weeks for post-operative surgical site infection.

Materials and Methods: This is a prospective study of 30 patients who underwent elective orthopaedic procedures between October 2021 to November 2021 with a follow up duration of 4 weeks. Our primary outcome was any surgical site infection and wound gaping within 4 weeks of surgery. 30 patients were divided into two groups of 15 each. In group A wound closure was done using staplers and in group, B sutures (ethylon) were used. There was no statistical difference of risk factors between two groups in terms of age, gender and operative time.

Results: The patients were divided into 2 groups of 15. In group A, there were 6 surgical site infections and in group B, there were 3 cases of surgical site infection identified. The overall rate of SSI was lower in group B (SUTURES).

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

Introduction

Surgical site infection (SSI) is a prevalent healthcare-associated illness with a complication rate of up to 10%-20% of surgeries, putting a significant drain on healthcare resources. Aside from the commonly used treatments for reducing surgical site infections, such as proper hair removal on the surgical site, prophylactic antibiotics, perioperative glycaemic management, and avoidance of hypothermia^[1]. Increased morbidity and death are the results. Surgical site infections (SSIs) are morbid and widespread. 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^[2]. 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^[3]. The importance of skin closure in preventing surgical site infection cannot be overstated (SSI). The skin closure creates tensile strength, which holds the wound's edges together and provides an efficient seal until the wound heals. Effective wound healing reduces the danger of infection while also providing a pleasing appearance. In orthopaedic surgery, surface infections are linked to a higher risk of deep infection and a lower implant survival rate. Staples were found to be superior to sutures in terms of skin closure time. When compared to sutures, staples were found to cause more pain. Many trials using relevant data found nonsignificant differences in cosmetic results and patient satisfaction.

Aim of this study is to compare skin closure by sutures and staplers in elective orthopaedic surgery cases and followed up for 4 weeks duration for post-op surgical site infection (SSI).

Materials and Methods

This is a prospective study of 30 patients after the ethical committee approval (SMC/IEC/2020/11/85) who underwent elective orthopaedic procedures between October 2021 to November 2021 with a follow up duration of 4 weeks in a group of 30 patients. Our primary outcome was any surgical site infection and wound gaping within 4 weeks of surgery. 30 patients were divided into two groups of 15 each. In group A wound closure was done using staplers and in second group (group B), sutures (ethylon) were used. There was no statistical difference of risk factors between two groups in terms of age, gender and operative time. After the surgery, wound swab was taken from the surgical site wound on 2nd, 5th, 10th days and 4th week. Wound gaping has also been considered. The aim of this study is to compare the percentage of surgical site infection in post op orthopaedic surgery patients.

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

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

Results

Total of 30 patients were included in this study. They were divided into two groups, group A (n=15) and group B (n=15). For group A patients, staplers were used and for group B patients, sutures (ethylon) were used for wound closure in patients who underwent orthopaedic surgeries. In group A, mean age (SD) is 51 and in group B, the mean age (SD) is 38. 9 males and 6 males were included in group A. 8 males and 7 females were included in group B. There was no statistical difference of risk factors between two groups in terms of age, gender and operative time. Post operatively wound swab was taken on 2nd, 5th, 10th days and 4th week. Wound gaping is also considered (table 1). In group A patients, 6 (40%) had post operative surgical site infection (figure 1) and in group B patients, 3 (20%) had post operative surgical site infection (figure 2).

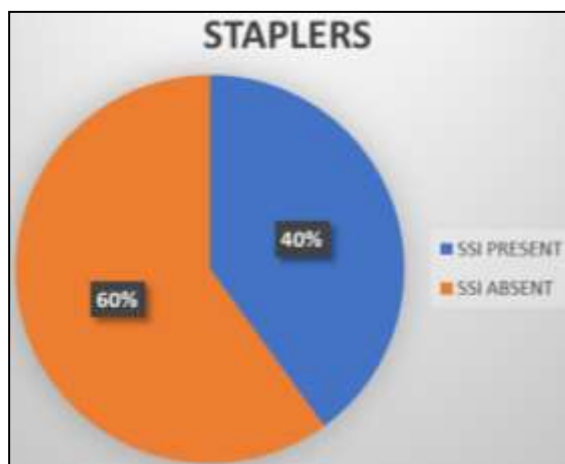


Fig 1: Incidence of SSI in the stapler group

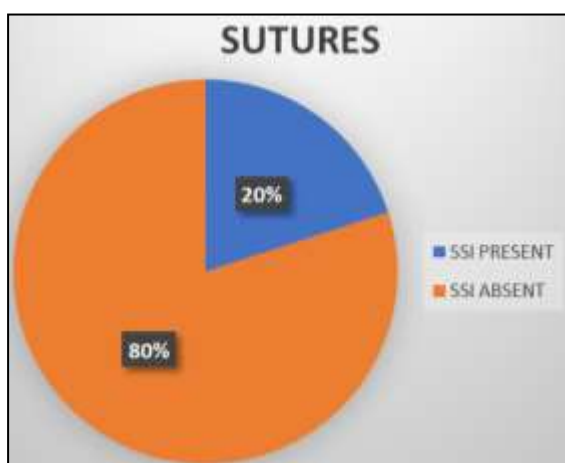


Fig 2: Incidence of SSI in the sutures group

The overall rate of surgical site infections was lower in group B (sutures).

Table 1: Patient demographics and data

S. No	Age	Sex	Side	Wound Closure	Adverse Effects In Skin	Duration of Surgery	Size of Wound	Follow UP Wound SWAB				Wound Gaping
								2 ND Day	5 TH Day	10 th Day	4 Weeks	
1.	24	M	Right Upper LIMB	Sutures	No	3 HRS	5 CMS	-VE	-VE	-VE	-VE	No
2.	36	F	Right Lower LIMB	Staplers	No	2 HRS	3 CMS	-VE	-VE	-VE	+VE	Yes
3.	27	M	Left Upper LIMB	Sutures	No	1 HR	5 CMS	-VE	-VE	-VE	-VE	No
4.	33	F	Right Upper LIMB	Staplers	Yes	1 HR	4.5 CMS	-VE	-VE	-VE	-VE	No
5.	45	F	Left Lower LIMB	Sutures	No	2 HRS	8 CMS	-VE	-VE	-VE	-VE	No
6.	22	F	Right Upper LIMB	Sutures	No	3 HRS	10 CMS	-VE	-VE	-VE	-VE	No
7.	37	F	Left Upper LIMB	Staplers	No	2 HRS	15 CMS	-VE	-VE	-VE	-VE	No
8.	31	M	Right Lower LIMB	Sutures	No	2 HRS	6 CMS	-VE	-VE	-VE	-VE	No
9.	60	M	Left Lower LIMB	Sutures	No	3 HRSS	10 CMS	-VE	-VE	-VE	+VE	Yes
10.	42	M	Right Upper LIMB	Staplers	No	1 HR	5 CMS	-VE	-VE	-VE	-VE	No
11.	56	M	Right Lower LIMB	Staplers	No	3 HRS	12 CMS	-VE	-VE	-VE	-VE	No
12.	40	M	Right Lower LIMB	Sutures	No	3 HRS	7 CMS	-VE	-VE	-VE	+VE	Yes
13.	39	M	Left Lower LIMB	Sutures	No	3 HRS	4 CMS	-VE	-VE	-VE	-VE	No
14.	24	M	Right Upper LIMB	Sutures	No	1 HR	4 CMS	-VE	-VE	-VE	-VE	No
15.	51	F	Right Lower LIMB	Sutures	No	1 HR	7 CMS	-VE	-VE	+VE	+VE	Yes
16.	52	M	Left Upper LIMB	Staplers	No	4 HRS	15 CMS	-VE	-VE	-VE	+VE	Yes
17.	38	F	Right Lower LIMB	Staplers	No	2 HRS	7 CMS	-VE	-VE	-VE	-VE	No
18.	47	M	Left Lower LIMB	Staplers	No	2 HRS	6 CMS	-VE	-VE	-VE	-VE	No
19.	45	F	Right Upper LIMB	Sutures	No	2 HRS	7 CMS	-VE	-VE	-VE	-VE	No
20.	42	F	Left Upper LIMB	Sutures	No	2 HRS	5 CMS	-VE	-VE	-VE	-VE	No
21.	60	M	Left Lower LIMB	Sutures	No	2 HRS	6 CMS	-VE	-VE	-VE	-VE	No
22.	29	F	Left Upper LIMB	Sutures	No	3 HRS	6 CMS	-VE	-VE	-VE	-VE	No
23.	35	F	Right Lower LIMB	Sutures	No	4 HRS	10 CMS	-VE	-VE	-VE	-VE	No
24.	36	F	Left Lower LIMB	Staplers	No	3 HRS	9 CMS	-VE	-VE	-VE	+VE	Yes
25.	43	M	Right Upper LIMB	Staplers	No	4 HRS	4 CMS	-VE	-VE	-VE	-VE	No
26.	54	M	Left Lower LIMB	Staplers	No	5 HRS	15 CMS	-VE	-VE	-VE	+VE	Yes
27.	70	M	Left Lower LIMB	Staplers	No	3 HRS	9 CMS	+VE	+VE	+VE	-VE	No
28.	69	M	Right Upper LIMB	Staplers	No	3 HRS	6 CMS	-VE	-VE	-VE	-VE	No
29.	81	F	Left Upper LIMB	Staplers	No	2 HRS	5 CMS	-VE	-VE	-VE	-VE	No
30.	78	M	Right Upper LIMB	Staplers	No	3 HRS	6 CMS	-VE	+VE	+VE	+VE	Yes

Discussion

Infection of a wound is described as the invasion of organisms through the tissues as a result of a breakdown in local and systemic host defences, with local and systemic consequences. Infection at the surgical incision site is referred to as a surgical site infection. SSI is one of the most common causes for hospital acquired nosocomial infections. Bacteria present in the site without signs and symptoms of inflammation. Mostly less than 10^5 cfu/ML. transient exposure of the wound to the infective organism is called as contamination. Signs and symptoms of inflammation is seen. Variable exposure to the infective organism can be seen. Mostly the time of exposure is less than 6 hours. The surgical site infection may be primary or secondary. If the wound is the primary site of infection, it is termed as primary infection. If the infection arises following a complication that is not related to the wound, it is termed secondary infection. Most common organisms causing surgical site infections are staphylococcus aureus, pseudomonas, streptococcus etc. some of the factors that increase the risk of serious surgical site infections are long and complicated surgeries, use of implants, use of immunosuppressive drugs, increase in number of geriatric cases, laxity of aseptic techniques. SSIs may be self-limiting, serious or fulminant which may be fatal and leading to permanent disability. Antibiotic resistance is further exacerbated by surgical site infections, which increase broad-spectrum antibiotic exposure and necessitate prolonged antibiotic treatment for deep and prosthetic joint infections. Given the seriousness of SSIs, there has been a renewed focus on surgical site infection prevention in recent years. Theresa Lamagni *et al* states that the prevention of infection in orthopaedic surgeries depend on elimination or proper

management of the risk factors which may lead to SSI. The translation of the evidence base into a framework of practises for the prevention of surgical site infections is aided by quality standards and recommendations [7]. Systems-based approaches, according to Kevin I Perry *et al*, promote hand and environmental hygiene protocols, infection surveillance, surgical delay for identifiable and modifiable risk factors, patient risk assessment and screening, coordination of care, physician 360° reporting, and unit-based safety programmes [8]. Surgical morbidity is associated with a longer operative length in hospitals. The longer a wound is open, the greater the risk of SSI. Obesity, diabetes management, smoking, and immunosuppressive treatment are all modifiable patient-related risk factors for SSI. Increased prevalence of Enterobacteriaceae - related orthopaedic infections, combined with an ageing surgical population, may need a rethinking of antibiotic preventive methods. Sutures are mostly used in skin closure of surgical wounds. Alternative wound closure techniques include staples. Many suture materials like silk, ethylon, vicryl, monocril have been widely used in orthopaedic and other surgeries. Staples were found to be superior to sutures in terms of skin closure time. When compared to sutures, staples were found to cause more pain. Many trials using relevant data found nonsignificant differences in cosmetic results and patient satisfaction. Sutures fall into a different category of skin closure than staples. The soft tissues must be handled differently with sutures and staplers. The sutures are inserted into or through the dermis, then pulled back out to be knotted and fastened. Staples, on the other hand, are inserted from the outside to the inside and then bent internally to achieve and maintain skin approximation. They also have varied closure times, removal

strategies, and timings ^[9]. The suture material used for the wound closure is very important for many orthopaedic surgeons. The collected results of several comparative trials proves that choice of the type of the suture material used to close the surgical wound have an impact on the rate of surgical site infections (SSIs). The advantage of employing staples for wound closure is that it is a quick and straightforward approach; nevertheless, staple removal may be more painful than suture removal, and much depends on the staple application technique. The continuous suturing approach causes skin strangling at the wound's margins, which might lead to difficulties during post-operative wound healing. The sutures' flexibility, non-toxicity, strength, and degrading qualities are all positives. Staples are a good substitute for sutures and are typically constructed of stainless steel, though absorbable staples are increasingly available. Despite the fact that sutures are the most often utilised method of closure. They may raise the risk of infection at the surgical site. In fact, the sutures may promote ischemia in the wound flaps, which interferes with the normal healing process. The low amount of tissue reactivity is an advantage of utilising staples in surgical wound closure. As a result of the lack of external material and degradation of the patient's local immune response, infection resistance in infected wounds is higher ^[10]. In this study, we compare the percentage of surgical site infection in post op orthopaedic surgery patients in terms of wound swab results of surgical site on 2nd, 5th, 10th days and 4th week and wound gaping. The limitations of this study is that the factors like use of antibiotics, patient comorbidities, type of surgeries were not taken into considerations.

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 were less in patients whose wound closure were done using sutures.

Conflict of Interest

Not available

Financial Support

Not available

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