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Wound related complications of skin sutures: A prospective study

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Abstract

Introduction: Wound dehiscence occurs when a surgical incision reopens either internally or externally. It's also known simply as dehiscence. Although this complication can occur after any surgery, it tends to happen most often following abdominal or cardiothoracic procedures. It's commonly associated with a surgical site infection. Complications may involve a hematoma formation due to poor hemostatic control.

Material & Methods: This is a prospective study was conducted in the Department of General Surgery at Prathima Institute of Medical Sciences over a period of 1 year. All the patients who were admitted as In patients for surgical treatment for various diseases in the department of General Surgery, total of 100 patients were enrolled. A total of 140 patients who were satisfying the inclusion criteria were enrolled into study. 70 patients underwent skin closure with silk and remaining 70 with prolene.

Result: In our study most of the patient were male in both the group. In our study in both the group maximum patients had diagnosis of Inguinal hernia and least were Duodenal perforation. Surgical site infection or wound infection were 76.93% in silk group and in prolene group were 100%. Moreover, acute wound dehiscence seen only in Silk group. In silk group 22.8% complication were present and in Prolene group only 8.5% were present.

Conclusion: Wound infection is a great hazard in abdominal skin closure as it can lead to disastrous complications. Preventing wound infection is necessary as it may lead not only to an ugly scar but also occurrence and recurrence of hernia. The present study concluded that type of suture material is associated with post-operative surgical wound complications with P value of 0.03.

Keywords: Wound, complications, skin sutures, silk sutures prolene sutures

Introduction

Wound management is an essential part of emergency medicine practice. The clinicians care for wounds ranging from minor and simple lacerations or abrasions to complex wounds. Wound closure techniques have evolved significantly and now range from simple sutures to adhesive compounds, and techniques have also improved [1]. For injuries that require further management, it is imperative to assess the wound and determine how best to treat it. Multiple techniques can be used for wound closure. These include sutures, staples, and adhesives [2].

Anyone who closes wounds should understand sutures. Unfortunately, no suture is ideal for every wound, and in most cases, several types of sutures are required to close the wound adequately. Today there are natural, synthetic, absorbable, non-absorbable, multifilament, and monofilament sutures available [3]. Synthetic sutures are preferred around the face as they cause a limited reaction, and inflammation is minimized. Absorbable sutures are used in areas where there is no need for extensive support, and the wound heals faster, and these are also used in internal layers [4]. Non-absorbable sutures are used when one wants continued mechanical support. Monofilaments are less susceptible to infection but can be traumatized by surgical instruments. The multi-filaments can sustain infections, but they are prone to tangles [5].

Complications can arise in this procedure as in any other procedure. Immediate complications may involve a hematoma formation due to poor hemostatic control. Human bites and some animal bites, particularly felines, have a very high chance of getting infecting early on [6]. Antibiotics are imperative for such bite wounds, and these should be thoroughly cleansed. Late complications may involve scar formation due to improper technique [7]. An unfortunate outcome in some people may be hypertrophic scars and keloid formation. Wound necrosis may also ensue in rare cases [8].

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Material & Methods

This is a prospective study was conducted in the Department of General Surgery at Prathima Institute of Medical Sciences over a period of 1 year. All the patients who were admitted as In patients for surgical treatment for various diseases in the department of General Surgery, total of 140 patients were enrolled.

A total of 100 patients who were satisfying the inclusion criteria were enrolled into study. 70 patients underwent skin closure with silk and remaining 70 with prolene.

Inclusion Criteria

Patients who are willing to give an informed written consent.

Exclusion criteria

Patients who are not willing to participate in the study, Patients with immune deficient states, Patients with conditions like diabetes, arterial diseases which effect wound healing.

All the patients meeting the inclusion criteria were taken into the study. A pre-designed, pre-tested, semi structured and pre-coded proforma was used for recording all the findings. The questions were partially closed ended. The duration of the interview, on an average was 20 minutes for each participant. The questionnaire had the questions regarding the following

Demographic information: Details like age, gender, were obtained.

Clinical Data: Details about the diagnosis of the conditions, physical examination and investigations. Investigations included

1. Complete blood picture to rule out anemia.
2. Complete urine examination, renal function tests to rule out kidney abnormalities.
3. Blood sugar levels to rule out diabetes.
4. Liver function tests, Chest X ray and ECG were done (if necessary)

Anesthesia either general or spinal was given. Pre operative procedures like shaving 24 hours prior to the surgery, antibiotic test dose etc was given to all the patients

After the surgery, 50 patients underwent skin closure with silk and remaining 50 patients underwent skin closure with prolene.

On the 3rd post operative day, the wound was evaluated for infection and gape. Patients were discharged after suture removal on 7-8th post operative day. In cases of any wound infection or discharge in any group, discharge was sent for culture and sensitivity. Patients were re-evaluated for inflammation, infection and gape during the follow up on 15

days and one month.

Result

The study was conducted in the Department of General Surgery. The results of the study are as follows:

Table 1: Showing the age distribution of study population

Age in years	Silk group		Prolene group	
	Frequency	Percentage	Frequency	Percentage
< 20 years	5	7.1	4	5.7
20-29 years	14	20	17	24.2
30-39 years	24	34.2	27	38.5
40-49 years	13	18.5	11	15.7
50-59 years	9	12.8	7	10
>60 years	5	7.1	4	5.7
Total	70	100	70	100

Table 2: Showing the gender distribution of study population

Gender	Silk group		Prolene group	
	Frequency	Percentage	Frequency	Percentage
Male	47	67.1	43	61.4
Female	23	32.8	27	38.5
Total	70	100	70	100

In our study most of the patient were male in both the group in table 2.

Table 3: Showing the diagnosis of study population

Diagnosis	Silk group		Prolene group	
	Frequency	Percentage	Frequency	Percentage
Inguinal hernia	32	45.7	29	41.4
Incisional hernia	9	12.8	10	14.2
Umbilical hernia	8	11.4	7	10
Appendicitis	13	18.5	15	21.4
Cholecystitis	6	8.5	6	8.5
Intestinal obstruction	2	2.8	0	0
Duodenal perforation	0	0	3	4.2
Total	70	100	70	100

In our study in both the group maximum patients had diagnosis of Inguinal hernia and least were Duodenal perforation in table 3.

Table 4: Showing the complications noted among the study population

Complications	Silk group		Prolene group	
	Frequency	Percentage	Frequency	Percentage
Acute wound dehiscence	2	12.5	0	0
Surgical site infection or wound infection	14	87.5	6	100
Total	16	100	6	100

In table 4, Surgical site infection or wound infection were 76.93% in silk group and in prolene group were 100%. Moreover, acute wound dehiscence seen only in Silk group.

Table 5: Showing the association between complications among the study population

Complications	Silk group		Prolene group		Chi Square test and P value
	Frequency	Percentage	Frequency	Percentage	
Present	16	22.8	6	8.5	Chi Square value is 4.213 P = 0.02 (2 tailed)
Absent	54	77.1	64	91.4	
Total	50	100	70	100	

In table 5, in silk group 22.8% complication were present and in Prolene group only 8.5% were present.

Discussion

Wound closure is as important as any other action performed by the surgeon. And apart from the need for producing a healthy and strong scar, it is the surgeon's responsibility to ensure its aesthetically pleasing physical appearance. Skin staples are an alternative to regular sutures in offering this advantage. Sutures

are used to facilitate the process of wound healing by:

1. Closing dead space within wound
2. Supporting wounds until their tensile strength is increased
3. Approximating skin edges.
4. Sutures initiate a foreign body response (i.e., tissue reaction). The initial tissue reaction is attributed to the injury inflicted by the passage of suture and needle and reaction to the suture material itself. The reaction of living tissue to injury or foreign bodies is called inflammation.

The inflammatory response usually peaks between 2 to 7 days after implantation. The longer a suture mass stays in the human body, the more likely it is to produce undesirable tissue reactions. For the surgeon, a scar may be the only trademark of the surgical procedure performed, as Fitz Gibbon has stated, "By your scars you will be judged." (Fitz Gibbon, 1968) ^[9].

In the present study, 50 patients underwent suturing with silk. 68% underwent hernioplasty, 16% underwent appendectomy, 10% underwent cholecystectomy and 6% underwent resection and anastomosis or intestinal obstruction. Wound related complications were present in 26% of the study population. 23.07% had acute wound dehiscence and 76.93% had surgical site infection or wound infection.

In the present study, 50 patients underwent suturing with prolene. 64% underwent hernioplasty, 14% underwent appendectomy, 14% underwent cholecystectomy and 8% underwent Graham patch repair for duodenal perforation. Wound related complications were present in 10% of the study population. All 10% of them had surgical site infection or wound infection. There were no cases of abdominal wound dehiscence in the prolene group.

The findings of the present study showed a statistically significant association with the type of suture material used with P value of 0.03. Use of Silk as suture material is associated with more complications than prolene. However, the development of acute wound dehiscence and wound infection also depend on many factors other than suture materials as discussed above.

Silk sutures are old standbys. They are a natural, non-absorbable material actually produced by the silkworm ^[10]. They are a braided material that is easily used by the surgeon. Silk is typically not used in the presence of infection ^[11]. Silk sutures are specially treated with silicone to give strength and smoothen the surface which provides easy passage through tissues. Silk sutures are specially treated with silicone to give strength and smoothen the surface which provides easy passage through tissues ^[12].

Pecha describes its use in intestinal surgery, a common practice of surgeons globally. In three cases Pecha described, the silk suture migrated toward the intestinal lumen, causing ulcerations and bleeding up to six months postoperatively. ^[13] As with natural absorbable sutures, silk also tends to cause more tissue reaction than a synthetic product of the same size. ^[14] Because silk is used as a braided suture, some feel the crevices caused by the braiding process can harbor bacteria or more foreign material which reacts with body tissues, especially in a bacteria-rich environment such as the bowel ^[15].

However, silk is still popular in ocular, neural, and cardiovascular surgery owing to its advantageous characteristics. One of the major drawbacks associated with silk sutures is its poor microbe-resistance characteristics ^[16]. Other drawback of silk suture is since is not absorbed; progressive degradation of the proteinaceous silk fibre *in vivo* may result in a gradual loss of the suture tensile strength over time ^[17].

Adverse effects associated with the use of this device include wound dehiscence, gradual loss of strength over time, allergic response in patients that are known to be sensitive to silk, calculus formation in urinary and biliary tracts when prolonged contact with a salt solution such as urine or bile occur, infecting wounds, acute inflammatory tissue, and transitory local irritation ^[18].

Polypropylene sutures are monofilament sutures of an isotactic crystalline stereoisomer of polypropylene, a synthetic linear

polyolefin. Polypropylene sutures are non-absorbable and provide permanent wound support. ^[19] Polypropylene sutures have excellent tensile strength and are used for orthopaedic, plastic and micro surgeries, general closure and cardiovascular surgeries ^[20]. Polypropylene sutures elicit minimal tissue reaction and do not cause tissue rupture or support infection. Its advantages include minimal tissue reactivity and durability. ^[21] Its disadvantage is that it requires the use of an ultrasonic generator, a reusable hand piece, and a disposable welding component. Other disadvantages include fragility, high plasticity, high expense, and difficulty of use ^[22].

The findings of the present study showed a statistically significant association with the type of suture material used with P value of 0.03. Use of Silk as suture material is associated with more complications than prolene.

Increased incidence of wound infections in the silk group can be attributable to the poor microbe resistance property of the silk suture. Despite this property, this is the most commonly used suture material owing to its cost. It's cheaper when compared to other suture materials. In contrast to the present study, there are studies that did not demonstrate significant differences between different types of suture material.

Conclusion

Several methods of skin closure are available to close the skin incisions in place of sutures such as staples, clips, steri strips, and glue adhesives. Wound infection is a great hazard in abdominal skin closure as it can lead to disastrous complications. Preventing wound infection is necessary as it may lead not only to an ugly scar but also occurrence and recurrence of hernia. The present study concluded that type of suture material is associated with post operative surgical wound complications with P value of 0.03.

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