

A Randomized Trial of Vacuum-Assisted Wound Closure and Alginate Dressings in Healing Surgical Site Infections

Vacuum-Assisted
Wound Closure
and Alginate
Dressings in Site
Infections

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ABSTRACT

Objective: This study aimed to compare the efficacy of vacuum-assisted wound closure dressings with that of alginate dressings in superficial surgical site infection in terms of mean time for wound healing.

Study Design: A randomized controlled trial study

Place and Duration of Study: This study was conducted at the Surgical Unit I of the POF Hospital Wah Cantt from January 2019 to June 2019.

Materials and Methods: The patients were randomly assigned to two groups of fifty patients each. In the VAC group, patients were treated with a vacuum-assisted wound closure dressing and those in the Alginate group were treated with an alginate dressing. All information was recorded on a predesigned proforma. All patients were given injections of ceftriaxone (1 gm) I/V 8 hourly for 5 days. The time taken for complete wound healing was recorded.

Results: The average age of the patients was 38.07 ± 9.01 years. Mean wound healing time was significantly shorter in the VAC group compared to control [53.44 ± 21.46 vs. 91.16 ± 29.71 days; $p = 0.0005$].

Conclusion: We conclude that, in superficial surgical site infection, VAC therapy can contribute to quicker wound healing than alginate therapy. Thus, VAC therapy is highly useful in an outpatient setting and could help improve the long-term care, quality of life and health outcomes of patients undergoing surgery.

Key Words: Wound healing, Blood coagulation, VAC dressing, Alginate dressing, wound healing.

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INTRODUCTION

A surgical site infection (SSI) is an infection that occurs within 30 days after a surgical operation is performed or within one year if an implant is left in place after the procedure. SSIs can occur at the site of incision or in deep tissue at the operation site.¹ The healing of accidental or surgical wounds is a complex biological process achieved through four phases, hemostasis, inflammation, proliferation and remodeling. The infection of a surgical site wound can inflict increased costs in treatment, partly due to an increase in the length of the patient's hospital stay.¹ Several risk factors like high body mass index, smoking, video-assisted procedures, blood transfusion, skipping the preoperative bath, and pre-existing chronic diseases predispose patients to SSI.²

SSI is a common post-operative problem, which can often result in a decrease in patient mobility, increased

risk of morbidity, and can inflict high cost of treatment. With a variety of wound dressing options available, researchers need to find an optimum method of wound dressing for quicker patient recovery. This study is aimed to compare VAC dressings with alginate dressings in terms of the duration of wound healing. We hope our work will help surgeons decide which dressings are most suitable for their patients.

MATERIALS AND METHODS

Study Design and Sample Selection: Patients ($n = 100$) who presented to the Surgical Unit I of the POF Hospital Wah Cantt with an infection at a site of surgery from January 2019 to June 2019 were included in the study. Patients with diabetes were excluded from the study. Informed consent was obtained from all patients. Initial data on age, gender, and contact information was recorded on a predesigned proforma. The weight and height of all patients was recorded by the researcher herself. The patients were randomly assigned to two groups of fifty patients each: the VAC group and the Alginate group. As the names imply, patients in the VAC group were treated with VAC dressings and patients in the Alginate group received alginate dressings.

Ethical Approval: The study was approved by the ethics committee of the POF Hospital Wah Cantt. All patients provided written, informed consent for

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participation in the study. The study was conducted in accordance with the Declaration of Helsinki.

Procedure: In the VAC group, for the VAC dressing, after thorough wound debridement and saline wash, a sterilized foam sponge was applied to the wound using a suction catheter and an op-site dressing was used to cover the entire wound. A pressure of 100 mm of Hg was applied to the wound and the dressing was changed every 48 hours by the researcher herself.

In the Alginate group, for the alginate dressing, after thorough wound debridement and saline wash, the wound was covered with alginate followed by an op-site dressing. The dressing was changed every 48 hours by the researcher herself.

All patients were given an injection of 1 g ceftriaxone intravenously 8 hourly for 5 days. Time taken for complete wound healing was recorded in a proforma.

Data analysis procedure: The data was entered in SPSS version 20. Descriptive statistics were used to calculate means \pm standard deviation for quantitative variables i.e., age, BMI and healing time. Frequencies with percentage were calculated for qualitative variables i.e., gender, type of surgery. An independent sample t-test was applied to compare mean healing time in both groups. Effect modifiers like age, gender and BMI were controlled by stratification. An independent sample t-test was applied post-stratification. A p value < 0.05 was considered significant.

RESULTS

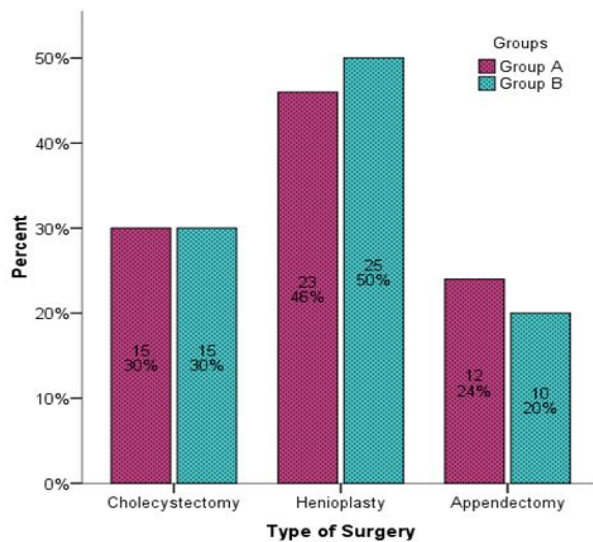


Figure No. 1: The proportion of patients who underwent cholecystectomy, hernioplasty, and appendectomy in both groups

We enrolled 100 patients with SSIs in this study. Of these, 30% of patients had undergone cholecystectomy, 48% had undergone hernioplasty, and 22% underwent appendectomy. These statistics are presented in Figure 1. The average age of the patients was 38.07 ± 9.01

years, and the mean BMI of the patients was $24.30 \pm 2.76 \text{ kg/m}^2$. Of the study participants, 62% were male and 32% were female, as shown in Figure 1.

Figure 2 shows a comparison of mean wound healing time between groups in superficial SSI. The mean of the time taken for wound healing was smaller for the VAC group compared to the Alginate group [53.44 ± 21.46 vs. 91.16 ± 29.71 days; $p = 0.0005$]. Stratification analysis was performed by controlling for age, gender, BMI, and type of surgery, as shown in Table 2.

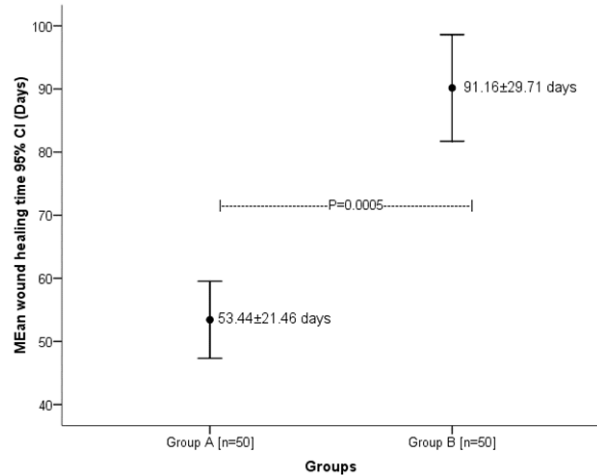


Figure No. 2: Comparison of mean wound healing time between groups in superficial surgical site infection; n = 100

Table No. 1: Baseline characteristics of patients

Characteristics	VAC group (n = 50)	Alginate group (n = 50)
Age (years)		
≤ 30	11 (22%)	15 (30%)
31 to 40	19 (38%)	17 (34%)
41 to 50	16 (32%)	10 (20%)
51 to 60	4 (8%)	8 (16%)
Gender		
Male	34 (68%)	28 (56%)
Female	16 (32%)	22 (44%)
Type of surgery		
Cholecystectomy	15 (30%)	15 (30%)
Hernioplasty	23 (46%)	25 (50%)
Appendectomy	12 (24%)	10 (20%)
Body Mass Index	24.56	24.04

Table No. 2: Comparison of mean wound healing time between groups in superficial surgical site infection stratified by effect modifiers

Effect Modifier	Mean Wound Healing Time		p value
	VAC group	Alginate group	
Age (years)			
≤ 30	55.27	78.33	0.066
31 to 40	53.68	88.29	0.0005
41 to 50	52.25	94.60	0.0005

51 to 60 Gender	52.00	110.75	0.005
Male	55.75	88.05	0.0005
Female	52.35	91.82	0.0005
Body Mass Index			
Healthy (18–24.9)	55.07	85.28	0.0005
Overweight (25–30)	51.00	98.83	0.0005
Type of Surgery			
Cholecystectomy	58.93	79.80	0.063
Hernia repair	48.52	93.92	0.0005
Appendectomy	56.00	96.30	0.05

DISCUSSION

Our skin is a natural barrier against infection. Even with many precautions and preventive protocols in place, any surgery that causes a break in the skin can lead to an infection. SSIs remain a major cause of morbidity and mortality, despite improvements in infection control techniques and surgical practice, and impose substantial demands on healthcare resources.¹ Continuing vigilance is therefore required to minimize the incidence of such infections. Historically, surgical incisions and wound care practices have been thoroughly documented so that wound infections at surgical sites may be prevented.³ Wound care practices are changing all the time. Once a wound care technique proves useful, it can be implemented more frequently to help patients recover safely and quickly.

Care for a wound can begin even before a surgical incision is made, with the disinfection of equipment, and can last until the patient's wound heals completely. VAC therapy is, in fact, a type of NPWT that can have several advantages as a technique for healing wounds. It produces a moist environment while allowing for the drainage of wound exudates. It can also reduce tissue edema, remove bacteria from deep wounds, and speed up the development of vascularized granulation tissue.^{4,5} An alginate dressing is a natural wound dressing derived from carbohydrate sources released by clinical bacterial species, in the same manner as biofilm formation. These types of dressings are best used on wounds that have a large amount of exudate.⁶

To compare VAC dressing with Alginate dressing in superficial SSI in terms of mean time for wound healing, 100 patients with SSI were included in this study and randomly assigned to two groups. Most patients were between 30 and 50 years of age and the average age of the patients was 38.07 ± 9.01 years. The risk of development of SSI is known to be associated with old age.^{7,8} One retrospective, case-control study revealed that being older than 65 years of age was an independent risk factor for the development of an

infection at the site of surgery; this risk was directly associated with an increase in age.⁷

In patients treated with cholecystectomy, the rate of infection after laparoscopic procedures is thought to be nearly 1.1%, whereas it is 4% in patients who have undergone open procedures.⁹ Likewise, in patients with acute appendicitis, the rate of infection is much lower, almost 2%, with minimally invasive procedures compared with open procedures (8%).⁹ The patients included in our study had undergone several types of surgery, including cholecystectomy in 30% of participants, hernia repair in 48% of participants, and appendectomy in 22% of participants.

Our study has demonstrated that rate of healing of wounds was two times fast with VAC therapy when compared with conventional alginate therapy in patients with superficial SSI [53.44 ± 21.46 vs. 91.16 ± 29.71 days; $p = 0.0005$]. The findings of the study are similar to those from another study that compared the efficacy of conventional wound dressings with VAC wound therapy.¹⁰ The authors showed that with negative pressure treatments, wounds healed faster and granulation tissue formed at a faster rate over the wound ($p = 0.002$). One randomized trial that enrolled 24 patients showed that with NPWT, wounds healed twice as fast compared to sodium hypochlorite treatment in patients with difficult-to-heal wounds.¹¹ However, there is inconclusive evidence to prove whether negative pressure treatment is better than any other treatment methods.

CONCLUSION

We conclude that, in superficial surgical site infection, VAC therapy can contribute to quicker wound healing than alginate therapy. Thus, VAC therapy is highly useful in an outpatient setting and could help improve the long-term care, quality of life and health outcomes of patients undergoing surgery.

Author's Contribution:

Concept & Design of Study: Maria Zafar
 Drafting: Sidra Munawar, Muhammad Azhar
 Data Analysis: Muhammad Ali, Sadia, Huda Ali
 Revisiting Critically: Maria Zafar, Sidra Munawar
 Final Approval of version: Maria Zafar

Conflict of Interest: The study has no conflict of interest to declare by any author.

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