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Original Article

The effect of subcutaneous drain insertion after median sternotomy on surgical site infection in obese patients

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Abstract

Background: Sternal wound infection after cardiac surgery is associated with high morbidity and mortality. This study aimed to assess the effect of subcutaneous wound drainage on surgical site infection in overweight patients undergoing cardiac surgery via median sternotomy.

Methods: This prospective study was conducted on 100 obese patients undergoing sternotomy as a part of cardiac surgery from March 2021 to June 2022. The study included two groups. Group 1 (n= 45) had prophylactic subcutaneous drainage after surgery, and Group 2 (n= 55) did not have prophylactic subcutaneous drainage.

Results: Hospital stay (7.8±1.9 vs. 8.65±1.38 days; P= 0.013) were higher in patients without drains. Deep sternal wound infection [2 (4.44%) vs. 9 (16.4%); P= 0.105], superficial wound infection [2 (4.44%) vs. 7 (12.7%); P= 0.18] and debridement with secondary suture [1 (2.2%) vs. 6 (10.9%); P= 0.125] were non-significantly lower in patients with subcutaneous drains.

Conclusion: Obese cases who received prophylactic subcutaneous wound drainage after sternotomy wound closure could have a lower incidence of wound complications. A larger randomized trial is recommended.

KEYWORDS

Drainage; Infection; Obese; Sternotomy

Article History

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Introduction

Median sternotomy is the most common incision used in cardiac surgery. Median sternotomy is associated with a 0.8–1.5% risk of sternal wound infection and dehiscence. After grafting the internal mammary artery, this risk could be as high as 2.4%, resulting in various complications and possibly mortality [1].

Superficial sternal wound infection (SSWI) affects the cutaneous and subcutaneous (SC) tissue and pectoralis fascia with an incidence of 0.5 – 8% and a death rate of 0.5 - 9%. Intravenous antibiotics and local wound care can prevent superficial sternal wound infection. Despite advances in prevention, the incidence of deep sternal wound infection (DSWI) remains high, ranging from 0.5 - 6.8%, with in-hospital death rates ranging from 7 - 47% [2].

For secondary sternal wound closure, there are a variety of therapeutic options, including closed suction antibiotic catheter systems, vacuum closure, omental transposition, the pectoralis major muscle flap, the pedicled pectoralis major muscle twisting flap, the rectus abdominus muscle flap, myocutaneous pectoralis major muscle flaps on both sides, the latissimus dorsi muscle flap and combined techniques. Early wound exploration is essential in the treatment of any DSWI. Many treatment regimens incorporate sternal fixation with sternal plating methods [3].

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Subcutaneous (SC) drains reduce seroma, hematoma formation, and dead space, which occurs in obese people with substantial subcutaneous fat tissue. Negative pressure therapy has been proven to benefit wound healing and the production of granulation tissue, leading to rapid wound healing. However, prophylactic SC wound drainage after surgery is not universally supported. Some researchers have indicated that drains are ineffective and can lead to greater discomfort and more stay in the hospital [4].

This study aimed to evaluate how subcutaneous wound drainage affected surgical site infection (SSI) in overweight individuals who had heart operations via median sternotomy.

Patients and Methods

Design and patients

The present study was a prospective study conducted on 100 obese patients undergoing cardiac surgery via median sternotomy from March 2021 to June 2022. Patients were grouped into two groups; Group 1 (n= 45) had prophylactic SC drainage after surgery, while Group 2 (n= 55) did not have prophylactic subcutaneous drainage.

Our study included patients with a body mass index (BMI) of more than 30 kg/m2. The study excluded patients who required emergency operation, bilateral use of the internal thoracic artery, patients who needed re-exploration, or who had transverse sternum fractures. The local ethical committee approved the study.

Data:

Baseline demographic and clinical characteristics were recorded during the initial interview, including age, sex, smoking, diabetes mellitus, chronic kidney disease (CKD), peripheral vascular disease (PVD), BMI, chronic obstructive pulmonary disease (COPD), asthma, valve replacement, on-pump coronary artery bypass grafting (CABG) and off-pump CABG (OPCAB).

Technique:

Preoperative prophylactic antibiotics were administered according to the infection control policy of Shebin El Kom Teaching Hospital. Intravenous 3rd generation cephalosporin was started 3 to 4 hours preoperatively and continued until five days postoperatively.

The incision was washed with saline and povidone-iodine solution just before skin closure. The rectus sheath stitches were done by continuous 0-vicryl, the pectoralis major stitches were done by continuous 2-0 polyglycolic multifilament, and SC stitches were done by continuous 2-0 polyglycolic acid in 2–3 layers depending on SC tissue thickness, leaving no dead space. 2-0 monocryl was used to seal the skin.

Table 1: Comparison of the baseline data between patients who had prophylactic drain (Group 1) and no prophylactic drain (Group 2). Continuous data were presented as mean and SD and categorical data as numbers and percentages

Parameter	Group 1 (n= 45)	Group 2 (n= 55)	P-value
Male	21 (46.7%)	28 (50.9%)	0.693
Age (mean ± SD) [years]	56.1±4.7	56.53±4.86	0.666
Diabetes mellitus	37 (82.2%)	50 (90.9%)	0.24
Smoker	21 (46.7%)	25 (45.5%)	0.904
CKD	7 (15.6%)	13 (23.6%)	0.452
PVD	3 (6.7%)	5 (9.1%)	0.727
BMI (mean ± SD)	31.7±1.9	32.8±1.8	0.787
COPD/asthma	10 (22.2%)	21 (38.2%)	0.083
Valve replacement	7 (15.6%)	7 (12.7%)	0.686
OnCABG	5 (11.1%)	3 (5.5%)	0.462
OPCAB	34 (75.6%)	43 (78.2%)	0.814

CKD: chronic kidney disease, PVD: peripheral vascular disease, COPD: chronic obstructive pulmonary disease, OnCABG: on-pump coronary artery bypass grafting, OPCAB: off-pump coronary artery bypass grafting

Table 2: Postoperative outcomes in patients with drains (Group1) and without drains (Group 2). Data were presented as numbers and percentages

Variable	Group 1 (n= 45)	Group 2 (n= 55)	P-value
SSI Prolonged oral antibiotics with or without healing by secondary intention	2 (4.44%)	7 (12.7%)	0.18
DSWI	2 (4.44%)	9 (16.4%)	0.105
Debridement with 2ry suturing with or without Prolonged iv antibiotics for SSI	1 (2.2%)	6 (10.9%)	0.125
Need for VAC dressing	1 (2.2%)	4 (7.3%)	0.23
Re-exploration with rewiring	0	1 (1.8%)	0.273
Hospital stay [days]	7.8±1.9	8.65±1.38	0.013
Need for re-admission within one month due to separation of the incision	0	1 (1.82%)	0.273

SSI: surgical site infection, DSWI: Deep sternal wound infection

A multipore suction drain tube was introduced into the wound to lie directly on the outer table of the sternum and deep into the muscles and subcutaneous tissues layer for the first group. The outer part of the drain was attached to a suction drain and was separated from the incisions. Once the discharge became clear with a volume <10 ml/24 hours, the drain was removed.

The positive bacterial culture findings confirmed the diagnosis of wound infection. Empiric antibiotic treatment was recommended after the collection of swabs. The sample was taken from the wound's margin and inner part. The sample was gathered by puncturing deep wounds with a needle. After being adequately sealed, the aspirated sample was put into the transport medium and delivered to the laboratory in special containers within two hours.

Diagnosis of DSWI depends on the bacterial culture of the mediastinum; signs of mediastinitis observed during surgery [5], chest discomfort, unstable sternum, or fever more than 38 °C, as well as purulent mediastinal discharge [6].

SSI patients were detected within a month after surgery [7] according to the Centers for Disease Control and Prevention (CDC): Organisms detected in an aseptically acquired culture of fluid or tissue and purulent drainage from the superficial wound even if had no laboratory confirmation. Other signs of infection were pain or soreness, localized edema, redness, or increased temperature, and a shallow wound was purposely opened by the surgeons [8].

Statistical analysis:

Data were analyzed statistically using the SPSS (statistical package for social science- IBM Corp-Armonk- NY- USA) computer version 22 for Windows, with a P-value of 0.05 deemed statistically significant for all analyses. The Chi-square test with a two-tailed P-value and Fisher's exact test were used. Continuous variables were examined using an unpaired t-test.

Results:

There were no differences in the demographic data between groups. Age was 56.1±4.7 years in patients with SC drains vs. 56.53±4.86 in patients without drains (P= 0.666). Males were 21 (46.7%) in patients with drains and 28 (50.9%) in patients without drains (P= 0.693). (Table 1).

The study revealed that hospital stay [days] was significantly higher in patients without drains than in patients with drains (7.8±1.9 vs. 8.65±1.38 days; P= 0.013). Deep sternal wound infection [2 (4.44%) vs. 9 (16.4%); P= 0.105], superficial wound infection [2 (4.44%) vs. 7 (12.7%); P= 0.18] and debridement with secondary suture [1 (2.2%) vs. 6 (10.9%); P= 0.125] were non-significantly lower in patients with subcutaneous drains. (Table 2)

Discussion

Sternal wound infection is a relatively uncommon but possibly fatal complication of

median sternotomy. The prevalence of DSWI has been estimated to be 0.2 – 3%. Identifying high-risk individuals and developing ways to reduce causes is critical to lowering its prevalence. Treatment of DSWI can be difficult, and it may necessitate the involvement of a multidisciplinary team [9]. Thus, our study aimed to evaluate how SC wound drainage affected surgical site infection (SSI) in obese subjects undergoing cardiac surgery through a midline sternotomy.

The present study was conducted on 100 obese patients undergoing sternotomy. Subjects consisted of 2 groups; the 1st group consisted of 45 patients who had prophylactic SC drainage after surgery, while the 2nd group consisted of 55 patients who did not have prophylactic subcutaneous drainage. Both groups were comparable regarding demographic data.

Our study showed that Hospital stay was significantly shorter in patients with SC drains. The need for VAC dressing, re-exploration with rewiring, superficial SSI, DSWI, prolonged oral antibiotics and/or healing by 2ry intention and debridement with 2ry suturing and/or IV antibiotics for SSI for a long time were not different between groups. Similarly, Shah and coworkers found that DSWI was more common in subjects without drains compared to those with drains. Furthermore, the need for oral antibiotics for a long time with wound healing by 2ry intention was similar in SSI patients with or without prophylactic SC drain. However, the percentage was higher in patients without drain, while DSWI was found to be higher in patients without drain [10]. Similar to our results, some researchers have found that drains may have less efficacy, be uncomfortable and cause prolonged hospital stay [11]. The disparity between our results and previous studies may be explained by different surgeons and patients' specific risk factors.

El Ashkar and Khallaf showed that case-related variables such as age, sex, increased weight, and DM were commonly related to an increased risk of sternal wound infection [12]. Previous studies observed that smoking and CKD were associated with DSWI [10]. Biancari and associates demonstrated that female gender, BMI of more than 30 kg/m2, glomerular filtration rate of more than 45 mL/min/1.73 m2, DM, chest disease, cardiac disease, the critical state before surgery, and the use of both internal mammary arteries were associated with increased risk of DSWI [13]. Robinson and coworkers showed that DM, dialysis before surgery, chest disease, obesity, and angina CCS Class 3 or 4 are all modifiable preoperative causes that may minimize the occurrence of DSWI [14]. Colombier and colleagues demonstrated that smoking, increased weight, and insulin-dependent DM were risk factors for postoperative sternal wound infections [15].

Study limitation and future prospects:

This study has some limitations, including a low number of cases. Further studies with a large number of cases would give better results about the role of drains in overweight subjects. Other factors that may influence wound healing should be taken into account.

Conclusion

Obese cases who received prophylactic subcutaneous wound drainage after sternotomy wound closure could have a lower incidence of wound complications. A larger randomized trial is recommended.

Conflict of interest: Authors declare no conflict of interest.

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