Retrospective Analysis of Flap Based Management in Deep Sternal Wound Infection in a Tertiary Care Centre –A Single Centre Study

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ABSTRACT

Aims: In this retrospective study we analyzed the outcomes of flap based management in deep sternal wound infection (DSWI).

Materials & Methods: Patients, who had undergone open heart surgery through median sternotomy between September 2017 and March 2020 and had developed deep sternal infections, were retrospectively analyzed in this study. Few patients found to have DSWI were managed only by Negative Pressure Wound Therapy (NPWT) and few were managed by NPWT and Bipectoral musculo fascial flap cover. The outcomes in terms of mortality and readmission in the postoperative course were obtained from the records during subsequent follow ups in OPD for six months.

Results: Out of 925 patients 11 patients (1.2%) had deep sternal wound infection. There were six patients (n=6, 54.55%) who received NPWT where as five patients (n=5, 45.45 %) received flap surgery following NPWT. The patient who underwent Flap surgery had a longer postoperative stay than NPWT group (46.2+/−22.21, C.I 95%) days Vs (25.5+/−14.41, C.I 95%) days. However, the readmission due to recurrence of infection was seen only in NPWT group (n=3, 50%) with in the period of six months following discharge. One patient out of the three readmitted patients expired due to sepsis.

Conclusion: NPWT followed by bipectoral muscle flap closure has a better surgical outcome than NPW alone in deep sternal wound infection in early postoperative period

INTRODUCTION

Cardiac surgeries are widely performed through median sternotomy. Sternal wound infection following the surgery is a well known complication. The superficial wound infections settle down after wound debridement and regular antiseptic dressings, whereas the deep sternal wound infection pose a significant challenge to the surgeons as it impacts significantly on prognosis of the patient and indirectly burden the patient economically with inflated hospital cost. The spectrum of management of such wounds varies from wound debridement to flap closure. In this retrospective study we analyzed the outcomes of flap based management in deep sternal wound infection.
the day of surgery the surgical sites were painted with Povidone
Iodine solution. Before the incision the surgical sites were
pared with iodoform impregnated adhesive plastic sheet. The
skin was incised with the scalpel, and electrocautery was used
for subcutaneous tissue. Sternal was opened with sternal saw.
In coronary artery bypass patients electrocautery was used for
harvesting left internal mammary artery.

The diagnosis of deep sternal wound infection was made
according to the guidelines of the centers for disease control
and prevention. Patients who met at least one of the following
criteria were included in this study: (1) Isolation of any organism
from the culture of mediastinum tissue or fluid. (2) Presence of
any evidence of mediastinitis seen during operation. (3)
Presence of one of the following: chest pain, sternal instability
(sternal dehiscence, gap between sternal halves) or fever (more
than 38 degree Celsius). (4) Presence of purulent discharge
from the mediastinum, necrotized tissue or isolation of any
organism from the blood culture or culture of the drainage of
mediastinal area.

Few patients found to have DSWI were managed only by
Negative Pressure Wound Therapy (NPWT) with a periodic
review of wounds after an interval of five to seven days and
few were managed by NPWT and Bipectoral musculo fascial
flap cover. During the course of NPWT, the decisions to
intervene for a flap surgery were jointly taken by the operating
team and the team of plastic surgeons, based on the

<table>
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<th>Characteristics</th>
<th>NPWT(n=6)</th>
<th>Flap Surgery(n=5)</th>
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<tbody>
<tr>
<td>Sex</td>
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<tr>
<td>Male</td>
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<td>Pre op. Infection</td>
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<tr>
<td>BMI (&gt; 25 Kg/m2)</td>
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<td>3</td>
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<tr>
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<td>Sepsis/Multi organ failure</td>
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Results
Out of 925 patients 11 patients (1.2%) had deep sternal wound
infection. The comparison of demography and the risk factors
in both the groups are discussed in Table -1.

There were six patients (n=6, 54.55%) who received NPWT
where as five patients (n=5, 45.45%) received flap surgery
following NPWT. The patient who underwent Flap surgery had
a longer postoperative stay than NPWT group (46.2 +/- 22.21,
C.I 95%) days Vs (25.5 +/- 14.41, C.I 95%) days. However, the
readmission due to recurrence of infection was seen only in
NPWT group (n=3, 50%) with in the period of six months
following discharge. One patient out of the three readmitted
patients expired due to sepsis.

Table 1: Characteristic of patients and the outcomes of
management in deep sternal wound infection patients
Discussion:

The incidence of DSWI varies from 0.4 to 5%. Seventy to eighty percent of patients of the wounds grow staphylococcus aureus and streptococcus epidermidis. Gardlund B et al in their study found predominantly coagulase negative staphylococci group in the patients who had sternal dehiscence related to obesity, Chronic Obstructive pulmonary disease, whereas staphylococcus aureus in patients who had perioperative contamination. In our study 1.2% of patients of 925 patients had developed DSWI and majority of our patients showed growth of Methicillin resistant staph aureus (MRSA) in the wound. In one study, Hollenbeak CS et al opined that the deep chest infections increase the length of postoperative stay, which in turn increases the cost of treatment. It had been also observed by the group that the patient who were obese, and had suffered from renal insufficiency, connective tissue disease; patient who underwent re exploration and timing of antibiotic prophylaxis more than sixty minutes before the incision, had a significant higher risk of developing deep chest infection. They mentioned a mortality rate of 22% within one year postoperatively. Similarly Tzepelous et al in their study on post operative mortality mentioned that the early mortality rate was not influenced by the presence of deep sternal wound, but the long term mortality was higher in the deep sternal wound infection (DSWI) group than non DSWI group. Their study established the role of diabetes in 75% of the patients and preoperative renal failure on dialysis in 7.5% of patients of DSWI. They also mentioned hemodynamic instability, use of bilateral internal mammary artery, sepsis, infective endocarditis after the surgery as the independent predictors of mediastinitis. In our study we had eight patients out of eleven (n=8, 72%) had diabetes, and deranged renal parameters in one patient (n=1, 9%) justifying the role of diabetes in DSWI. Tzserarin et al in a retrospective study on 62 patients found 70% of the patients of DSWI had Staphylococcus aureus and Coagulase negative staphylococci infection. During their long term follow up they studied 38.5% of patients showed recurrence and 13.4% of patients had mortality after closed suction drainage, where as 14 % patients showed recurrence and 14.7 % patients had mortality after flap based surgery. They declared the outcomes are favourable always with closed mediastinal drainage or flap closure. Vinayak Bapat et al in their study found 80% contraction of wound size after negative suction wound therapy, which satisfied their opinion of enhanced granulation and wound contraction responsible for wound healing. They could avoid muscle flap surgery in 64% of their patients and 28% of their patients did not require surgical reconstruction at all. Finally they concluded that the reduced reinfection rate was associated with vacuum assisted wound closure. Recently, Tuo Pan et al., in their comparative analysis between vacuum assisted closure versus Bilateral pectoralis major muscle flaps for deep sternal wound infection, commented a better survival rate (93.9% vs74.4%) and lesser hospital stay in flap group during their 24 months follow up. In another study by Eleftherios S et al during their follow up for 82 months they observed recurrence of infection only in 3 patients out of 55 patients who they had subjected to bilateral pectoral musculo fascial flap and opined that The functional and aesthetic outcomes are excellent with the surgery. Similar to the above studies, we observed a better surgical outcome in our 6 month follow up in Flap based surgery group.
Which showed no recurrence or readmission, and no mortality where as there was a 50% readmission and 9% mortality seen in NPWT group. Although our study the hospital stay of flap based surgery group was more than that of NPWT group because in one patient sternal wound changed from type 2a to 2b resulting in prolonged hospital stay.

Conclusion
NPWT followed by bipectoral muscle flap closure has a better surgical outcome than NPW alone in deep sternal wound infection in early postoperative periods.

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REFERENCES
8. Vacuum assisted closure Vs bilateral pectoralis major muscle flaps for deep sternal wound infection. Tuo Pan, Kai Li, Fu- Dong Fan, Yong -Shun Gao, Dong-Jin Wang , J Thorac Dis. 2020 Mar,12(3) : 866-875.

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