Reconstruction of Infected Mediastinal Wound with an Omental Flap Harvested Laparoscopically

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ABSTRACT
Background: Deep sternal wound infection and dehiscence are two serious complications after open cardiac surgery. Omental flap harvesting is recognized as one of the management options, with traditionally non-favorable outcomes due to laparotomy stress on patients. Objective: Herein, we report our experience with two patients who have developed a mediastinal wound infection following coronary artery bypass grafting and were reconstructed with omental flaps harvested laparoscopically. Case Presentation: Two 74-year-old females, who were known to have multiple comorbidities, developed a sternal wound infection after coronary artery bypass graft. Several operative trials and non-operative measures have been attempted to manage the infections and/or reconstruct the wound but failed. Both patients then underwent laparoscopic omental flap harvesting for reconstruction and exhibited significant clinical improvement postoperatively. Discussion: Omental flap is considered a feasible option for reconstruction of sternal wound dehiscence developing after open cardiac surgery because it is usually well-vascularized, contains a large number of immunologically active cells and has the ability to absorb wound secretions. The traditional method of harvesting is conventional laparotomy, but it carries high rates of morbidity. Therefore, laparoscopic harvesting can be utilized as an alternative with better outcomes. Conclusion: Laparoscopic omental flap harvesting is considered a feasible and safe procedure to manage sternal wound dehiscence after open cardiac surgery, with satisfactory surgical outcomes.

Keywords: Deep sternal wound infection, Omental flap, Laparoscopic harvesting, Coronary artery bypass grafting.

1. BACKGROUND

Deep sternal wound infection (DSWI) and dehiscence are two serious complications after open cardiac surgery (1). Despite the increasing number of cases reported in the literature addressing various options for management of DSWI, no ideal technique had been identified (2). Omental flap harvesting is among these documented options and has been recognized as a well-known procedure, with traditionally non-favorable outcomes due to laparotomy stress on patients (3).

2. OBJECTIVE

Herein, we report two cases of DSWI after cardiac surgery, reconstructed using laparoscopic omental flap harvesting technique, along with a review of pertinent literature.

3. CASE PRESENTATIONS

Case One
A 74-year-old female, with a body mass index (BMI) of 33 kg/m2, underwent a coronary artery bypass grafting (CABG), using the left internal mammary artery (IMA) and reversed saphenous vein, after being diagnosed with coronary artery disease (CAD). In addition to macromastia, her past medical history was significant for hypertension (HTN), uncontrolled diabetes mellitus (DM), dyslipidemia and smoking.
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The patient was started on antibiotics and VAC was applied to the wound. However, the patient developed DSWI and septic shock. She was transferred to coronary care unit with bilateral pleural effusion and renal impairment, requiring hemodialysis. Moreover, computed tomography (CT) scan of the chest revealed evidence of bilateral subpectoral hematoma. The patient was started on antibiotics and VAC was applied for two weeks until clinical improvement became evident.

The patient was taken back to the operating room for sternal reconstruction using laparoscopic omental flap. All surviving patients had excellent aesthetic result.
Postoperatively, the patient was placed on VAC again. Three days postoperatively, the wound showed signs of infection. After repeated debridement and intravenous antibiotics administration, all signs of infections subsided and the wound improved. The patient was discharged on postoperative day 24 after harvesting the omentum laparoscopically.

Case Two
A 74-year-old morbidly obese female, known case of uncontrolled DM, HTN and dyslipidemia, was diagnosed to have CAD. CABG using the left IMA and greater saphenous vein was performed. Similarly, this patient was considered to have macromastia.

Her postoperative course was complicated with sternal dehiscence, DSWI and multiple sternal fractures. Fifteen-days postoperatively, the patient was taken for sternal rewiring. The sternum was rewired after approximation of fragmented segments and clearance of all clots and sloughed tissues. Nevertheless, the wound failed to show any considerable improvement and continued to be non-healing.

The patient required a second surgical intervention. Laparoscopic omental flap harvesting with a similar technique to our first case was performed. The postoperative course was uneventful, and the patient was discharged home at postoperative day ten.

4. DISCUSSION
DSWI is defined as a positive fluid or tissue mediastinal culture, accompanied by sternal instability and presence of chest pain. The incidence of DSWI ranges from 0.4-6.9 % with mortality rate of 7-80%, depending on infection severity and patient’s general condition (2). In 1996, EL Oakley and Wright proposed a classification of DSWI and suggested a management approach for each class; both of our presented cases fall into class IVB (4).

Reconstruction of the chest wall after debridement of DSWI has been accomplished by a variety of methods. Interestingly, several studies have investigated a possible association between the flap type and mortality (5-7). Muscular flaps were commonly used, which include pectoralis major, latissimus dorsi, rectus abdominis, trapezius, serratus anterior and paraspinal muscle groups (3). However, they carry a risk of morbidity in the form of hematoma, seroma and abdominal wall hernias, each with significant percentages (8).

Omental flap, on the other hand, is considered a feasible option for reconstruction because it is usually well-vascularized, contains a large number of immunologically active cells and has the ability to absorb wound secretions (1). The traditional method of harvesting is conventional laparotomy, but it carries high rates of morbidity as it permits spread of infection to the abdominal cavity. Moreover, pain after laparotomy is not only associated with a significant reduction of quality of life but also can result in pulmonary function impairment and atelectasis (1, 9). Saltz and colleagues performed the first laparoscopic omental harvesting for DSWI, in 1993, which was a right gastroepiploic-dependent flap. In 1998, Domene et al. also performed the same operation but utilized the left gastroepiploic vessels (3).

There is an increasing number of cases reported in the literature for DSWI treatment but neither the best flap nor a definitive protocol have been identified yet. Table 1 illustrates a summary of previously published cases in English literature of laparoscopic omental flap for DSWI, a total of 24 cases have been extracted, in addition to our two cases (1-3, 8-10). The youngest patient was 54-year-old, most of the patients had comorbidities (especially, diabetes and hypertension). Moreover, based on EL Oakley and Wright classification of mediastinitis (4) all patients fall into class IIIA or higher. 50% of included patients had VAC before omental flap. Among the 26 patients, there were only two cases of mortality due to sepsis and pneumonia, both were complicated by multi-organ failure (1, 3).

Therefore, the demonstrated aesthetic result along with lower rates of mortality and morbidity of laparoscopically approached omental flap harvesting compared to the open approach in managing DSWI highlight the potential effectiveness and feasibility of this technique.

5. CONCLUSION
Laparoscopic omental flap is a feasible and safe procedure to manage DSWI, associated with satisfactory surgical outcomes. In this article, we shed light on a rarely discussed yet a potential approach to manage DSWI by reporting our experience with two patients and reviewing the previously published literature.

Abbreviations:
Deep Sternal wound infection (DSWI)
Coronary artery bypass grafting (CABG)
Body mass index (BMI)
Internal mammary artery (IMA)
Coronary artery disease (CAD)
Hypertension (HTN)
Diabetes mellitus (DM)
Vacuum-assisted closure (VAC)
Computed tomography (CT)

Patient consent form: The purpose of the case report was explained to the patients in detail and informed consent was obtained from them where anonymity is ensured.

Authors’ contributions: ZA and BD gave a substantial contribution to drafting the paper. AA, AA and AS reviewed the literature review. SA is the treating consultant who contributed significantly in writing the manuscript and finalizing it. All authors gave final approval of the version to be published and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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