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Median Sternotomy Wound Dehiscence Management

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Abstract

Background: The sternal wound infection
still carries high mortality. The treatment modalities for mediastinitis after sternotomy include conservative methods using open wet dressing, occlusive continuous irrigation or vacuum assisted closure **VAC,** and surgical treatment with muscle flap(pectoralis major, rectus abdominis, latissimusdorsi), or omental flap. In this paper, we started by debridement then covered the defect by the above mentioned flaps.

Methods: A total number of **13** cases ofpoststernotomy wound dehiscence treated in ShebinElkom Teaching Hospital and Sohag University Hospital from June **2013 to June 2016.** Eight cases were males and five cases were females. Thereage ranges from **39 to 63** years with mean age **57** years. After debridement, flap coverage by pectoralis major myocutaneous flap, rectus abdominis muscle flap or omental flap is done. Follow up for at least **6** months.

Results: Twelve flaps were survived with good therapeutic results and acceptable cosmetic appearance and one case died in the **3rd** postoperative day by mediastinitis.

Conclusion: Pectoralis major, rectus abdominis and omental flaps are effective methods in the reconstruction of the anterior chest wall defect caused by poststernotomymediastinitis. In addition to providingsufficient volume to fill the entire mediastinum, these flaps can control the wound infection with favorable outcome.

KEYWARDS: sternal wound dehiscence, mediastinitis,open heart complications.

Introduction

Median sternotomy is the most commonly used incision for open cardiac surgery. It provides excellent access to the heart and surrounding structures. Deep sternal wound infection is an infrequent but serious complication that is often a precursor to sternal dehiscence and mediastinitis and is usually associated with high morbidity and mortality. Median sternotomy complications occur in **0.5** to **5** percent of patients with about half of those patients **(0.2 to 3%)** developmediastinitis. The incidence of deep sternal wound infection **(DSWI)** is increased with advanced patient age, diabetes, obesity, smoking, steroid therapy, and **COPD.** Sternal wound complications after median sternotomy are a significant problem, particularly in immunosuppressed heart transplant recipients. Reported mediastinal and sternal infection rates after cardiac surgery range from **0.4% to 5.1% [1-2]** Unilateral or bilateral internal mammary artery grafts, diabetes, and immunosuppression may all predispose the patient to these infections **[3-4].** With the spread of sepsis to the mediastinum , there is a possibility of spread to the prosthetic valves, grafts, or suture lines withdisastrous and life-threatening

consequences. A variety of treatments have been proposed for sternal wound infections, including delayed closure, closed catheter irrigation, **[5]** and omental flaps to the mediastinum **[6].** Debridement followed by closure with muscle or myocutaneous flaps has been advocated more recently **[7-8].** The pectoralis major, rectus abdominis, and latissimusdorsi muscles have all been used for this purpose. The most commonly used flap is the pectoralis major muscle. The flap can be elevated on internal mammary artery perforators and used as a turnover flap **[9-10-11].** It can also be used as an advancement flap based on the thoracoacromial artery **[11].** By a separate lateral incision, the muscle may be divided from its humeral attachment to aid advancement. A rectus abdominis muscle flap may be included to cover the inferior segment of the wound**[9].**Omental flap has been used for long time alone or combined with other muscle flaps **[12].** In this report, we describe our experience with this single-stage procedure in median sternotomy dehiscence after open heart surgery.

Material & methods:

A total number of **13** cases of poststernotomy wound dehiscence treated in ShebinElkom Teaching Hospital and Sohag University Hospital from June **2013** to June **2016.** Eight cases were males and five cases were females. Thereage ranges from **39** to **63** years with mean age **57** years. Written informed consents were obtained from all cases preoperatively after discussing the problem and possible surgical options with the patients. Debridement and preoperative evaluation are done by plastic and cardiac surgeons. Flap coverage by pectoralis major myocutaneous flap for **6** cases, rectus abdominis muscle for **5** cases flap and omental flap for **2** cases has been done. Drain is inserted in **11** cases.All patients stayed **5** days in the intensive care unit with follow up provided by both plastic and cardiothoracic surgeons. Late follow up in outpatient clinic by both surgeons for at least **6** months.

Results

The drain was left for **4- 7** days and then removed when there is minimal output. The wound exposed at **3rd** day postoperative with daily dressing. Ten cases healed uneventfully. Two cases developed minor wound dehiscence(**3** cm in one case and **4** cm in the other) that healed conservatively. One patient who was treated by rectus abdominis flap developed extensive wound dehiscence and exposure of the mesh.In spite of aggressive antibiotic therapy and removal of infected mesh, patientdeveloped mediastinitis and died in the **3rd** postoperative day.The postoperative follow up for the other **12** patients was **6** months**.**

Case Examples:

Case 1 Pectoralis major myocutaneous flap

Case 2 Pectoralis major myocutaneous flap

Case 3 Omental flap

Case 4 Rectus abdominis muscle flap

Case 5 Rectus abdominis muscle flap

Discussion

Median sternotomy incision is the preferred method of exposure for the cardiovascular operations. One of the most serious complications of the cardiac surgery is sternal wound infection and or dehiscence **[13].** Postoperative infection incidence has decreased down to **0.8–8% [14,15]** and mortality rate decreased to **5–10% [16,17,18]** in recent publications.

The earliest treatment of the median sternotomy defects was serial debridements and secondary healing. Closed catheter irrigation and debridement followed by resuturing was attempted later **[19].** Finally, paralleling the development in flap surgery, wide debridement followed by omental transposition **[20]** and reconstruction with muscle flaps that was first carried out in **1976** has widely replaced the traditional methods. The muscle flaps that can be used in reconstruction of the presternal defects were pectoralis major muscle flap **[21],** rectus abdominis muscle flap **[22],** vertical rectus abdominis muscle flap **[23],** latissimusdorsi muscle flap with or

without skin island **[24],** bipedicledpectoralis-rectus muscle flap **[25],** and external oblique muscle flap **[26].** All of these muscle flaps can be used successfully for the reconstruction of post sternotomy defects **[23,25,27,28,28,30].** Pectoralis major muscle flap can be used either as bilateral or unilateral rotation advancement flap **[25,31],** island flap **[32],** turnover flap **[33],** split turnover flap or segmental muscle flap **[25].**

The most common flaps used to reconstruct deep sternal wounds arepectoralis major muscle, rectus abdominis muscle, and latissimusdorsi muscle flaps. Muscle flap is more suitable for treating deep infections or large defects of soft tissues with adequate blood supply and anti-infection property**[34].**

The pectoralis major muscle is the favored tissue flap for the treatment of postcardiotomymediastinitis in adults **[35-39].**

It is a broad flat muscle that provides adequate coverage after extensive debridement. It has dual blood supply, the thoracoacromial artery being dominant, and the internal mammary artery intercostal perforator branches that can be divided without sequel. The relative laxity of the thoracoarcomial pedicle and the proximity of the muscle to the sternal wound makes it an ideal choice as advancement or rotation flap**[40]**The advantage of the pectoralis major muscle flap lies in the ability to raise the flap from the existing edge of the opened wound. However, it sometimes falls short of filling the entire defect, especially in the lower third of the sternum**[31].**Greig et al proposed an anatomical classification to aid in flap selection using the location of infection: the upper half of the sternum, the lower half of the sternum, and the whole sternum. They recommended pectoralis major muscle flap for defects in the upper half of the sternum, and the combined pectoralis major and rectus abdominisbipedicled muscle flaps for defects in the lower half and the whole sternum. The omentum can also protectgrafts and obliterate dead sternal space, but the risk of opening the abdominal cavity makes the omentum flap a reserved choice **[41].**

According to Vlajčić et al, the importance of radical debridement as the dominant factor influencing the outcome of patients with poststernotomy wound infections. In patients with type **3** or **4** of sternal wound infection **(suppurativemediastinitis)** the omental flap is our first choice with direct skin closure. In patients with larger defects or insufficient skin for direct closure the omentum should be covered with muscle flaps **(pectoralis major advancement flap)** before closure or grafting of the skin**[42].**

In this paper, we present our experience with pectoralis major muscle, rectus abdominis muscle and omental flaps for the treatment of the post sternotomy defects.

Conclousion

Sternal wound reconstruction with postcardiotomymediastinitis can be done safely.We recommend conservative debridement of the sternum and necrotic tissue around followed by flap reconstruction. Pectoralis major myocutaneous flap is a good choice for upper sterna wound while rectus abdominis muscle flap and omental flap are better for lower and total sternal wounds.

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