Single-stage Chest Wall Reconstruction with Pectoralis Major Myocutaneous Advancement Flap

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Abstract

We present our results of single-stage reconstruction for sternal wound dehiscence post open heart surgeries with bilateral pectoralis major myocutaneous advancement flaps. A total of 22 chest wall reconstructions were performed in 2005-2011 at our institution. All of these patients had sternal wound infection and 20 (83%) of them had total sternal wound dehiscence. The combination of aggressive early debridement and chest wall reconstruction is the ideal procedure associated with a low morbidity and a short hospital stay for uncomplicated cases.

Keywords: pectoralis major myocutaneous advancement flap, chest wall reconstruction, mediastinitis, open heart surgery
Introduction

We present our experience of reconstruction for sternal wound dehiscence post open heart surgeries with single-stage bilateral pectoralis major myocutaneous advancement flaps after aggressive debridement.

Case Study

A total of 22 chest wall reconstructions were performed in 2005-2011 at our institution. The indication for one of the patients aged 1 year old was mesocardia with patent foramen ovale and ventricular septal defect (VSD). Another patient, aged 56 year old were mediastinitis after aortic valve replacement (AVR). The indication for the rest 20 (91%) of the patients was sternal wound dehiscence after coronary artery bypass graft (CABG). All of the patients had sternal wound infection and 18 (82%) of them had total sternal wound dehiscence. Seventeen (72%) of the patients had at least one surgical debridement by cardiothoracic surgeons followed by attempted closure that was unsuccessful prior to referral to plastic surgeons. Two (9%) of the patients had negative pressure wound therapy done.

Results after single-stage bilateral pectoralis major myocutaneous advancement flap
Mean age of the 22 patients was 63 years old (1-76). Majority (85%) of the patients were male while 4 (15%) were females. Most or 19 of the 22 patients (86%) had co-morbidities with 15 (60%) had diabetes mellitus while 7 (32%) had end-stage renal failure.

Four (18%) out of the 22 patients died between 5 to 74 days post reconstruction due to sepsis and multi-organ failure. Four (18%) patients developed postoperative haematoma requiring evacuation. One (4.5%) patient had wound infection but resolved with conservative treatment. For 13 uncomplicated cases (59%), they had short time on ventilator (1 day) and short length of stay in intensive care unit (1 to 4 days) and were well on follow-up.

Figure 4 showed one of the patients with total sternal dehiscence 7 weeks after coronary artery bypass graft. Figure 5 and 6 showed the wound closure using bilateral pectoralis major myocutaneous advancement flap. Figure 7 showed the wound healed on 2 months follow-up.
Discussion

Patients with mediastinitis after sternotomy had high mortality rates between 6.7-39.4% as reported in the literature. Our case series with mortality of 20% after chest wall reconstruction is consistent with other previously published rates\(^1\). In our series of patients, 86% had co-morbidities such as diabetes mellitus and end-stage renal failure. Therefore, patients with underlying co-morbidities needed to be treated more aggressively to reduce the mortality.

Following aggressive debridement, a well-vascularized tissue is needed to cover the chest wall defect. The antibiotic treatment can be effectively delivered through well-vascularized tissue to combat the infection. The reconstruction needs to be stable as well to allow early spontaneous breathing with acceptable aesthetic and functional result.

There are a number of options for chest wall reconstruction in patients with chest wall dehiscence after open heart surgery either utilizing vascularised pedicle flaps or free flaps or in combinations. The commonly used flaps today include the omentum, rectus abdominis, pectoralis major and latissimus dorsi muscle or myocutaneous flaps\(^2\).
The rectus abdominis muscle flap based on the superior epigastric vessels is useful for reconstruction of lower half of sternal defect. However, its blood supply is unreliable when the ipsilateral internal mammary artery has been used for coronary artery bypass grafting. The increased use of the internal mammary artery for grafting means that the pectoralis major flap is a safer option. Besides that, rectus abdominis flap has the risk of abdominal hernia³.

Latissimus dorsi flap, which is based on thoracodorsal artery, is reliable and easy to harvest. However, it requires large incision, has significant donor site morbidity, width limitation and necessitates change of position intra-operatively³. Therefore, it is currently less preferred compared to other muscle flaps.

Free vastus lateralis muscle flap with secondary skin graft or fasciocutaneous anterolateral thigh flap is the last choice in the reconstruction ladder and is indicated in patients having a large tissue defect which cannot be treated with other local flaps. The vascular anatomy of the flap, based on the descending branch of the lateral circumflex femoral artery, is well described and reliable. However, the disadvantages are it requires prolonged operation time in a high risk patient, skin grafting and microsurgical expertise and equipments⁴.

In 1979, Jurkiewicz et al. of Emory University described the initial experience of using pectoralis muscle flaps for the treatment of an infected sternal wound⁵. The pectoralis major muscle flap can either be transposed into the mediastinum
based on either the thoracoacromial pedicle as an advancement flap or as a turnover flap based on perforators of the internal mammary artery. The turnover flap based on the internal mammary artery perforators also has unpredictable blood supply if internal mammary artery has been used for coronary artery bypass graft. Besides that, resection of the humeral insertion of the pectoralis major muscle to facilitate flap advancement results in loss of the anterior axillary fold. Other disadvantages are limitation of shoulder motion, weakening of muscle strength, pain, and paresthesia.

Therefore, bilateral pectoralis major myocutaneous advancement flap based on the thoracoacromial pedicle were chosen for most of our patients (88%) because of its several advantages. It does not require laparotomy and do not depend on internal mammary arteries which could have been harvested for coronary grafts. The functional and aesthetic outcomes are improved, as the humeral insertion of the pectoralis major muscle is not disturbed and the anterior axillary fold is not altered. The flap provides good chest stability, sufficient muscle bulk and managed to close the wounds without extensive reconstructive surgery. However, the set back is shorter nipple-areolar distance.

**Conclusion**

The combination of appropriate antibiotic, aggressive early debridement and chest wall reconstruction is the ideal procedure associated with a low morbidity
and a short hospital stay for uncomplicated cases. Proper selection and optimization of patients ensure a good outcome for patients with sternal wound dehiscence and mediastinitis. Bilateral pectoralis major myocutaneous advancement flap has been shown to be reliable, stable, durable and provide good aesthetic result in our chest wall reconstruction patients.
References


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