

## Modified Pectoralis Major Flap Repair of Sternal Necrosis after Median Sternotomy

(#2001-02889 ... October 31, 2001)

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### ABSTRACT

Median sternotomy is complicated by sternal dehiscence in 1-5% of cases [Belcher 1990]. Rewiring of the dehiscenced sternum can be done in most instances if the sternal margins are viable. The dehiscenced unstable sternum can be stabilized using tissue transfer if viable sternum is absent. This is usually performed by reconstructive surgeons using either pectoralis major flap [Pairolero 1991], omentum [Weinzweig 1995] or prosthetic material [Deschamps 1999]. We describe a simple method of repair using a modified bilateral pectoralis major flap with good results.

### INTRODUCTION

Between May 1998 and December 2000, out of a total of 810 patients who underwent median sternotomy for coronary artery bypass grafting, 6 patients (0.74%) developed sternal dehiscence. The clinical details of these patients are given in Table 1 (●). Microbiological swabs of the infected sternum grew *Staphylococcus epidermidis* in two patients and *Staphylococcus aureus* in one patient. Cultures were sterile in three patients. All six patients underwent repair of the sternal defect using modified bilateral pectoralis major flaps.

### MATERIALS AND METHOD

#### *Preoperative preparation of patients*

Mediastinitis should be treated using appropriate antibiotics and when necessary mediastinal lavage to clear infection. It is often necessary to debride the wound prior to muscle transposition. Repeated sternal wound cultures should be performed to confirm that the wound is sterile before the repair is attempted. Diabetes mellitus should be strictly controlled using intravenous insulin and respiratory problems with bronchodilators, physiotherapy and appropriate antibiotics.

Submitted October 22, 2001; accepted October 31, 2001.

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#### *Surgical technique*

General anesthesia with good muscle relaxation is essential. The non-viable, necrotic bone should be debrided and sternal wires removed taking care not to damage underlying vital structures (Figure 1, ●). The pleurae may be opened to drain any effusions. The necrotic margins of the sternum are debrided to reach healthy bone or so far laterally as the internal mammary vessels or their perforators would allow. If contamination is severe and pus is present, the muscle transfer should be performed later as a staged procedure. The sternal origin of pectoralis major is identified on either side of the tissue defect. The sternal origin of pectoralis major is released along the entire length of the body of sternum on both sides. Blunt dissection and diathermy are used to expose a plane laterally between the pectoral fascia and the subcutaneous fat plane of the chest wall (Figure 2, ●). Similar dissection is performed deep to pectoralis major and superficial to the intercostal muscle layer to mobilise the pectoralis major muscle. On both sides, the muscle flap is released inferiorly by dividing its attachments to the lower margin of the chest wall and the interdigitating fibres of external obliquus abdominis muscle. The superolateral limit of dissection of the flap is the anterior axillary fold. The tendon of pectoralis major is not divided in this technique, unlike the method described previously [Pairolero 1991]. Perfect hemostasis is achieved at this stage.

The pectoralis major muscle flaps, thus raised, are swung across medially over the sternal defect where their anterior margins overlap. The overlapping medial margins of both pectoralis major flaps are sutured together with 2-0 vicryl sutures using horizontal mattress sutures (Figure 3, ●). Multiple suction drains are placed both superficial and deep to the muscle flaps. The subcutaneous tissue is closed over the muscle flaps. Skin is closed by interrupted simple sutures (Figure 4, ●).

#### *Postoperative care*

The suction drains are left in situ at least five days and patients receive broad-spectrum antibiotic cover. It is important that hematomas are avoided. Patients are advised that lifting heavy objects and contact sports should be avoided for at least 3 months.

### RESULTS

We obtained good functional and cosmetic results with all 6 patients. The complications include seroma formation in

Table 1. Clinical details of patients

Patient	Age	Sex	Predisposing factors	Hospital stay after repair	Complications	Sternal stability	Shoulder Joint & chest wall function	Cosmetic result
1	59	M	Diabetes, Renal failure	7 days	Nil	Good	Normal	Good
2	72	M	Diabetes, Obesity	7 days	Nil	Good	Normal	Good
3	69	M	Nil	6 days	Nil	Good	Normal	Good
4	67	M	Nil	12 days	Superficial infection	Good	Normal	Good
5	73	M	Diabetes, Chronic airway disease	13 days	Seroma that was aspirated	Good	Normal	Satisfactory
6	69	M	Nil	8 days	Nil	Good	Dysfunction which resolved completely	Good

one patient and superficial infection in another patient. One patient complained of functional disability of the shoulder joint or upper arm. Objective assessment of the function of shoulder joints in all the six patients at the time of discharge from hospital and during subsequent clinic visits at six weeks time did not reveal any restriction of range of movements. Clinical examination proved stability of the anterior chest wall with normal mechanics of respiration and no pain.

## DISCUSSION

Sternal dehiscence following median sternotomy is a dreaded complication, which occurs in 1-5% of cases [Belcher 1990]. Obesity, diabetes, chronic respiratory diseases, steroid therapy and harvest of internal mammary artery grafts are predisposing factors for sternal dehiscence [Belcher 1990]. A simple sternal breakdown without loss of viability of the sternal margins can be repaired at an early stage by rewiring of the sternum. However, when it is accompanied by mediastinitis, the prognosis is worse and in 20-30% of instances, sternal necrosis invariably sets in [Belcher 1990]. The result is a painful, unstable chest wall which needs repair to optimize the mechanics of respiration and to relieve symptoms.

The methods of repair of sternal defects widely practised include the use of pectoralis major muscle flap [Pairolero 1991], omental transposition [Weinzweig 1995], and rectus abdominis muscle flap [Castello 1999]. Reconstructive surgeons commonly perform these operations. We describe a

simple method of using the pectoralis major flap without dividing its attachment to the humerus with good results.

## CONCLUSION

An adequately trained cardiothoracic surgical team can perform modified bilateral pectoralis major flap repair of unstable, dehisced sterni. It does not appear to increase morbidity and offers good functional and cosmetic results.

## REFERENCE

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Figure Legends:



Figure 1: Completely dehiscenced sternum with necrotic sternal margins.

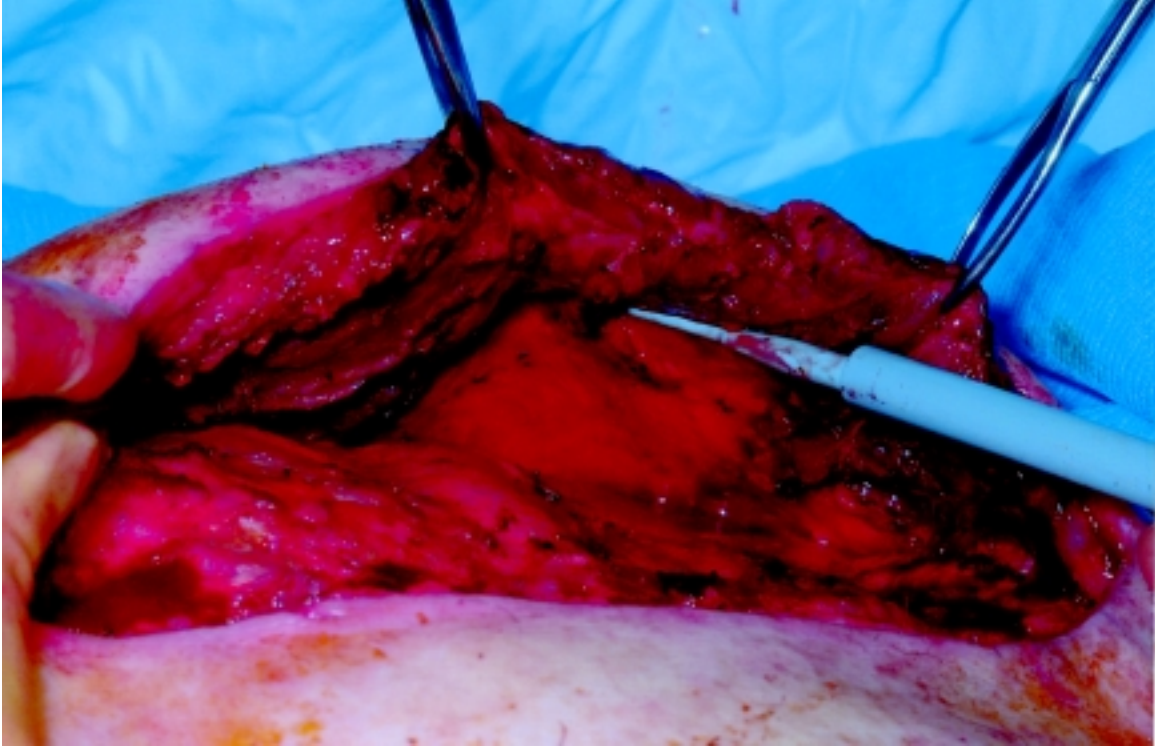


Figure 2: Mobilization of pectoral flaps laterally.



Figure 3: Bilateral pectoral flaps swung medially across the median plane and sutured over the tissue defect.





Figure 4: Final appearance of the repair with multiple suction drains in situ.