



Case Report

Pectoralis Major Muscle Flap in the Treatment of Post CABG Sternal Defects

Vijay Yashpal Bhatia^{1*}, Pramod Achuthan Menon¹, Susant Mishra¹ and Sukumar H Mehta¹

Abstract

Objectives: The incidence of infected sternotomy wounds after median sternotomy for cardiovascular surgery is about (0.5% to 5%) and it is associated with significant morbidity and a long period of treatment. Today, muscle flaps, such as the Pectoralis major, are widely accepted as a mainstay of reconstructive options. A wide variety of modifications of the Pectoralis muscle flap for coverage of sternal defects are available depending upon the location of defect use of internal mammary artery. We would like to share our experience with Pectoralis major muscle flaps to cover the sternal defects.

Methods: The sternal defects were thoroughly debrided and the defects were covered with Pectoralis major flap. Depending on the location of the defect the Pectoralis major flaps were elevated and coverage of defects done.

Results: The study of 25 patients with Pectoralis major flaps for sternal defects done from July 2010 to January 2012 followed up for 6 months. There were no recurrences. 1 patient developed a hematoma which required evacuation and 2 patients had suture line skin necrosis which was managed conservatively with dressings.

Conclusions: The Pectoralis major flap is a practical and effective method in the reconstruction of the Sternal defect caused CABG. It not only provides sufficient volume to fill the entire mediastinum but also affords resolution of the infected wound with favorable outcomes.

Keywords

Pectoralis major muscle flap; Chest wall defects; Post CABG sternal defects

Introduction

The treatment modalities for sternal defects following CABG include conservative methods of open wet dressing, occlusive continuous irrigation or vacuum-assisted closure etc and surgical treatment with flaps of the Pectoralis major, Rectus abdominis, Latissimus dorsi muscle or Omentum [1-17]. However, the general consensus is still valid that muscle flap obliteration of dead space resulting from debridement of potentially infected tissue is essential in obtaining wound closure in a significant number of cases [9,13-15,18].

*Corresponding author: Dr Vijay Yashpal Bhatia, MS MCh, HOU and Professor Department of Plastic Surgery, Vadilal Sarabhai Hospital, Ahmedabad, India, E-mail: bhatia101@gmail.com

Received: December 12, 2012 Accepted: January 03, 2013 Published: January 21, 2013

The wound dehiscence following CABG is combined result of decreased vascularity following the usage of internal mammary artery, Diabetes and wound infection in presence of sternal wires which mandates strict glycemic control, debridement and removal of wires as well as good coverage in its treatment [19-21]. These patients are mostly diabetics and have other medical morbidities and on anti coagulant therapy, which needs to be stopped for the surgery [3,5,22].

These cases are often referred to us after the conservative approaches have failed, and frequently after attempts of incomplete debridement and secondary closure in an effort to retain the sternal wires [12,13].

The use of muscle flaps for coverage of these defects give the advantage of stable coverage, increase the vascularity of the wound and also in case of breakdown of the wound prevents the exposure of vital structures [13,15].

Pectoralis muscle has stood the test of time in the coverage of these defects [14]. Its blood supply from the thoraco acromial vessels allow it to be advanced to the sternal defect in its upper third, especially on the side of usage of the Internal Mammary Artery. The segmental vessels that supply it along its medial border allow the muscle to be turned over to cover the middle and part of lower third sternal defect. The distal most part of the defect was covered with adipofascial flaps based on the epigastric arcade [23].

Materials and Methods

Twenty-five patients of CABG who developed sternal dehiscence and defect from July 2010 to January 2012, treated with Pectoralis major muscle flap procedure were studied. All patients were managed conservatively with regular dressings, antibiotics according to culture and sensitivity and the patients were referred 10 days to 2 months after CABG to the plastic surgery department. In 10 patients several surgical debridement or attempts at closure were performed before the definitive operation. All patients underwent routine pre operative evaluation and swabs for culture sensitivity. Antibiotics were started accordingly and patients were posted for surgery. CT scans of thorax were performed to see for the extent of the infection. In all patients single stage debridement, with definitive flap surgery was performed through the CABG incision, after all wirings and infected osseocartilaginous debris were removed, which was more on the left side, but complete sternectomy was not viewed as essential in all cases. At the completion of debridement and thorough irrigation, the resulting defect was reassessed for the flap selection (Figure 1).

From the edge of the sternal defect, the skin and subcutaneous flap was elevated, extending to the clavicle, anterior axillary line, and inferior intercostal margin, thus exposing the anterior surface of the Pectoralis muscle. The undersurface of the Pectoralis major muscle was then freed from the rib cage and its costal insertions in its entirety on the side of the used internal mammary artery (left side). Superiorly, half to two thirds of the clavicular origin was detached medial to the thoracoacromial pedicle and advanced without resection of the humeral insertion. This flap was used to cover the upper sternal defect. The Pectoralis muscle on the side of intact Internal Mammary Artery (right side) was cut proximally and turned over to cover the

mid sternal and part of the lower sternal defects. To cover the most caudal part of the sternal defect, adipofascial turnover flaps from the rectus sheath were used. The flaps were sutured securely with absorbable sutures, and a chest tube was inserted into the pleural space whenever needed by the cardiothoracic surgeon. Suction drains were inserted below the muscle flaps and skin flaps (Figures 2-4).

Results

Of the 25 patients, were 21 males and 4 females, with the mean ages were 60.3 years and 61.2 years, respectively. All underwent left internal mammary artery usage for CABG. The average duration between the sternotomy and the occurrence of dehiscence was 18.3 days, and the interval from the diagnosis of dehiscence to the flap operation was, on average, 1.1 months. The average follow-up period after the flap operation was 6 months. With regard to the bacterial organisms cultured from the wounds, methicillin-resistant *Staphylococcus aureus* (MRSA) was found in 6 patients, *S aureus* was found in 3 patients, *pseudomonas* was found in 4, *klebsiella* were cultured in 5 and *acinetobacter* in 5 patients, and no organisms were detected in 3 patients. In the above patients an advancement Pectoralis

muscle only was used in 1 patient, only turnover flap used in 6, the Pectoralis muscle advancement with turnover done in 11 patients, the Pectoralis muscle advancement with turnover and adipofascial flaps were done in 4, turnover and advancement with adipofascial flaps in 2. The Pectoralis major myocutaneous advancement was done in 1 patient who had previous debridement and the right IMA patency was doubtful. All these patients who were followed up for 6 months none of them developed recurrence. Skin necrosis was seen in two patients and both were treated conservatively with dressings and they healed without any additional surgical procedure. One patient developed hematoma on 5th postoperative day which had to be drained surgically but no bleeding vessel was identified.

Discussion

The post CABG sternal defect is a potentially devastating occurrence and is associated with diabetes, the local ischemia following utilization of the Internal Mammary Artery and complicated by wound infection. The Internal Mammary Artery used for bypass lies in this infected milieu and potentiates the urgent coverage of these defects. Though various techniques have been described for these defects the Pectoralis major muscle remains the choice as it may be explored through the same incision, doesn't need change of position and provides a robust and reliable cover [10,11].

The sternal wounds are infected with a wide variety of organisms, bacterial and fungal. The MRSA infections of these wounds are devastating. The use of antibiotics according to the sensitivity and thorough debridement is critical to reduce the infective counts [19-21].

The sternal dehiscence may be managed conservatively by regular dressings antibiotics and use of vacuum assisted closure [1,2]. The surgical management is often preferred as the sternal defect post CABG requires early coverage. There are often previous attempts to close these defects secondarily or attempts to mobilize the Pectoralis muscles to midline, these attempts may damage the parasternal perforators of the Internal Mammary Artery on the intact side. This was the case in one case who had repeated attempts of closure which had given way resulting in a huge defect. This patient required removal of wires thorough debridement and robotic wiring to stabilize the chest wall followed by a Pectoralis myocutaneous advancement [1,6,7,10-12].

The lower most part of the sternal defect is most difficult to cover, which may further be made difficult by debridement of the left lower cartilages. These defects were covered by omental flaps [16,17], Rectus abdominis flaps and bipedicle rectus abdominis and Pectoralis major flap but they cause significant morbidity [10,11, 23]. We have devised a new technique by using the adipofascial turnover flaps elevated over the rectus sheath based on the epigastric arcade [8,23].

The most common complication we encountered was necrosis of the skin at suture line which was managed conservatively. The hemostasis was strictly maintained throughout the surgery to avoid hematoma. One patient developed hematoma on 5th day and was evacuated and fresh drains were placed though no bleeder was identified on the re exploration.

Conclusion

The Pectoralis major muscle flap is the work horse flap for the reconstruction of Post CABG sternal defects. The key to success is early and appropriate diagnosis of the problem, proper debridement



Figure 1: Debridement specimen of the costal cartilages and sternum.

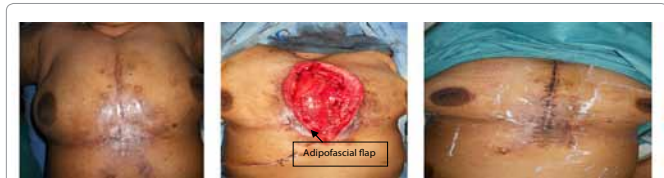


Figure 2: Pre and post operative photographs of Right turn over Pectoralis major flap with adipofascial flap.



Figure 3: Pre and post operative photographs of left advancement and Right turn over Pectoralis major flaps with adipofascial flap.



Figure 4: Pre and post operative photographs of bilateral Pectoralis major myocutaneous advancement flaps.

of all devitalized tissue and coverage by vascularized tissue. The Flap elevation is easy and fast, and the flap may be modified based on the need and extent of the defect. Moreover, the adipofascial turnover flaps have proved to be very effective in the lower sternal defect coverage.

References


1. Sjogren J, Nilsson J, Gustafsson R, Malmsjo M, Ingemansson R (2005) The impact of vacuum-assisted closure on long-term survival after post-sternotomy mediastinitis. *Ann Thorac Surg* 80: 1270–1275.
2. Cowan KN, Teague L, Sue SC, Mahoney JL (2005) Vacuum-assisted wound closure of deep sternal infection in high-risk patients after cardiac surgery. *Ann Thorac Surg* 80: 2205–2212.
3. Oakley PM EI, Wright JE (1996) Postoperative mediastinitis: classification and management. *Ann Thorac Surg* 61:1030–1036.
4. Robicsek F (2000) Postoperative sterno-mediastinitis. *Am Surg* 66: 184–192.
5. Shabat S, Gur E, Weiss J, Shafir R (1998) Chest wall reconstruction for sternal wound infection after internal mammary and gastroepiploic coronary artery bypass. *Plast Reconstr Surg* 102: 1771–1772.
6. Jones G, Jurkiewicz MJ, Bostwick J, Wood R, Bried JT, et al. (1997) Management of the infected median sternotomy wound with muscle flaps. The Emory 20-year experience. *Ann Surg* 225: 766–776.
7. Ringelman PR, Vander Kolk CA, Cameron D, Baumgartner WA, Manson PN (1994) Long-term results of flap reconstruction in median sternotomy wound infections. *Plast Reconstr Surg* 93: 1208–1214.
8. Netscher DT, Eladoumikdachi F, Goodman CM (2001) Rectus abdominis muscle flaps used successfully for median sternotomy wounds after ipsilateral internal mammary artery ligation. *Ann Plast Surg* 47: 223–228.
9. Domkowski PW, Smith ML, Gonyon DL Jr, Drye C, Wooten MK, et al. (2003) Evaluation of vacuum-assisted closure in the treatment of poststernotomy mediastinitis. *J Thorac Cardiovasc Surg* 126: 386–390.
10. Russell RC, Feller AM, Elliott LF, Kucan JO, Zook EG (1991) The extended Pectoralis major myocutaneous flap: uses and indications. *Plast Reconstr Surg* 88: 814–823.
11. Solomon MP, Granick MS (1998) Bipedicle muscle flaps in sternal wound repair. *Plast Reconstr Surg* 101: 356–360.
12. Jeevanandam V, Smith CR, Rose EA, Malm JR, Hugo NE (1990) Single-stage management of sternal wound infections. *J Thorac Cardiovasc Surg* 99: 256–262.
13. Brandt C, Alvarez JM (2002) First-line treatment of deep sternal infection by a plastic surgical approach: superior results compared with conventional cardiac surgical orthodoxy. *Plast Reconstr Surg* 109: 2231–2237.
14. Pairolero PC, Arnold PG, Harris JB (1991) Long-term results of Pectoralis major muscle transposition for infected sternotomy wounds. *Ann Surg* 213: 583–589.
15. Yoo YC, Chung SI, Yang WY, Park J (2003) Treatment of acute sterno-mediastinitis using regional muscle flaps. *J Korean Soc Plast Reconstr Surg* 30: 345–351.
16. Weinzwieg N, Yetman R (1995) Transposition of the greater omentum for recalcitrant median sternotomy wound infections. *Ann Plast Surg* 34: 471–477.
17. López-Monjardin H, de-la-Peña-Salcedo A, Mendoza-Muñoz M, López-Yañez-de-la-Peña A, Palacio-López E, et al. (1998) Omentum flap versus Pectoralis major flap in the treatment of mediastinitis. *Plast Reconstr Surg* 101: 1481–1485.
18. Pasaoglu I, Arsan S, Yorgancioglu AC, Yüksel Bozer A (1995) A simple management of mediastinitis. *Int Surg* 80: 239–241.
19. Mekontso-Dessap A, Kirsch M, Brun-Buisson C, Loisançe D (2001) Poststernotomy mediastinitis due to *Staphylococcus aureus*: comparison of methicillin-resistant and methicillin-susceptible cases. *Clin Infect Dis* 32: 877–883.
20. Hirata N, Hatsuoka S, Amemiya A, Ueno T, Kosakai Y (2003) New strategy for treatment of MRSA mediastinitis: one-stage procedure for omental transposition and closed irrigation. *Ann Thorac Surg* 76: 2104–2106.
21. Mangram AJ, Horan TC, Pearson ML, Silver LC, Jarvis WR (1999) Guideline for prevention of surgical site infection, 1999. Hospital Infection Control Practices Advisory Committee. *Infect Control Hosp Epidemiol* 20: 250–278.
22. Sakamoto H, Fukuda I, Oosaka M, Nakata H (2003) Risk factors and treatment of deep sternal wound infection after cardiac operation. *Ann Thorac Cardiovasc Surg* 9: 226–232.
23. Taylor GI, Minabe T (1992) The angiosomes of the mammals and other vertebrates. *Plast Reconstr Surg* 89: 181–215.

Author Affiliations

Top

¹Department of Plastic Surgery, Vadilal Sarabhai Hospital, Ahmedabad, India

Submit your next manuscript and get advantages of SciTechnol submissions

- ❖ 50 Journals
- ❖ 21 Day rapid review process
- ❖ 1000 Editorial team
- ❖ 2 Million readers
- ❖ More than 5000 
- ❖ Publication immediately after acceptance
- ❖ Quality and quick editorial, review processing

Submit your next manuscript at • www.scitechnol.com/submission