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Original Research Article

A Review of 50 Cases for the Management of the Sternal Dehiscence with the Pectoralis Major Flap

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Abstract:

Aim: The main motive of the study is to give details of the management of the sternal wound dehiscence with the help of the pectoralis major flap.

Methods and Materials: A retrospective study of 50 patients who were subjected to a pectoralis major flap was carried out for the surgery of aortocoronary bypass and other diseases present since birth for two years at Patna Medical College and Hospital, Bihar, India. A double breasting technique using rectus extension was used for the unilateral or bilateral pectoralis major flap. The success of the surgery was accomplishing wound healing helps in the evaluation of the result. The patients were followed up from 4 months to 3 years.

Result: 50 patients underwent pectoralis flap surgery. The patients were admitted to the hospital from 7-50 days after the flap surgery. The majority of the patients are released from the health care center by the complete closure of the wound. Due to sclerosing mediastinitis, 2 patients died right after the surgery. Shoulder joint movement was normal in all the patients.

Conclusion: Treatment should include removing dead tissue from the wound and covering it with well-vascularized tissue. The double breast technique using rectus extension covers the entire defect without hampering the shoulder movement.

Keywords: Pectoralis Major Flaps, Sterna Dehiscence, Surgical Flaps.

Introduction

Shumacker and Lurie found the Median sternotomy in the 1950s to evaluate ways for heart surgery including open heart surgery [1, 2]. 0.3% to .10% cases of dehiscence were reported since the introduction of this treatment [3]. Sternal wound dehiscence may cause many other problems like deformity in the chest wall and it may uncover many cardiovascular tissues and heart prosthesis. Respiratory functions may get damaged due to chest wall instability. Those patients needed long ventilation time and tissue healing time increased [4].

The vulnerability for sterna dehiscence post sternotomy is diabetes [5], surgery duration was long [6] any history of surgery [7], smoking, obesity, etc.

The possibilities of treatment for sternal dehiscence comprise of

- A lot of cleansing
- Pectoralis muscle to cover the flap.
- Patients who came before time resuturing was done.

Shifting of vascularized tissue to the affected area especially caused by infection in a great chest wound which helps to balance the chest wall also reduces the healing and increases the healing process [8].

Mediastinitis is one of the most damaging difficulties that can happen in patients with sternal dehiscence. The prevalence was 45%. The death rate can be as high as 50% [9-12]. Rectus abdominis muscle or omentum are usually used as amalgamation with the pectoralis major flap for better results.

Materials and Methods

This is a retrospective study of 50 patients managed by bilateral pectoralis muscle flap. Patients were examined postoperatively after surgery at Patna Medical College and Hospital, Bihar, India. Data of patients were analyzed the symptoms when the patient appeared in the hospital, at what time the patient appeared, flap technique, the positive result after surgery, the patient stay in the hospital, and microbes of the injury. The follow-up period is from 4 months to 24 months. It occurs more in males than females, the male-female ratio was 25:10.

Laboratory investigations were done like collection of fluid for examination, biopsies of the Sternal

bone, swabs for deep injuries, complete blood count, and blood cultures. Imaging studies were done with a computed tomography scan thorax for precise observation of sterna bone derangement or damage, abscess, and widening of mediastinum.

Surgical Technique

The non-operable, dead bone and costal cartilage were cleaned. Wirings of the sternum were separated. Cleansing is done till end up at healthy bone bleeds of the sternum. A-VAC device was put in after the careful cleansing. VAC was composed of a suction pipe, sterilized foam, and iodine-embodied sterile transparent adhesive dressing. Constantly VAC dressings were changed as per the release of fluid from the wound.

The sternal origination of the pectoralis can seen on both sides of the injury. The incision was done on the pectoralis major throughout the length of the body of the sternum on both sides. Disconnection of pectoralis muscle from skin and other underlying pectoralis minor was done by diathermy and blunt dissection.

The pectoralis flap can be extended by gathering in the connective tissue over the rectus. The cavity present in the lower part of the defect was filled without using other flaps like omentum or rectus obdiminis muscle. If the flap extended adequately across the midline, there was no need for the division from its attachment from the humerus to the pectoralis tendons. Another incision in the axillary crease from the humeral attachment of the pectoralis major when more reach was required. Then the lifted-up pectoralis major swayed across medially over the sternal defect and double breasted. Many suction tubes were used deeply and superficially on the wound.

Antibiotics were prescribed to the patients as per their sensitivity. It is prescribed for at least 3 months. Physiotherapy started after some time. The surgery was done in around 2 hours by one surgeon and three assistants. The patient was hospitalized for around 2 weeks in the hospital.

Results

This investigation evaluated the result of the experience with bilateral pectoralis major flaps with a double-breasting technique for the management of sterna dehiscence. 50 patients underwent the surgery of the pectoralis major flap and patients were followed up for 3 years.

The result was based on the diabetic level before the operation, preoperative culture, and sensitivity, span of movement of the shoulder joint after surgery. 46 (92%) patients had total wound cessation and were discharged from the hospital. 2 patients showed wound dehiscence after flap surgery. One patient who had mediastinitis died right after the surgery. 49 patients did not have any recurrence of sternum infection. Regular dressings were done on the patient who had wound dehiscence after the surgery. The healing was attained by secondary intention. Shoulder movements were checked during the follow-up period which was also fine.

Bilateral pectoralis flap was used in 46 cases out of 50 patients. 23 patients underwent for rectus extension in which the detachment of the flap on the lower part of the defect was circumvented. Unilateral pectoralis flap and omentum were applied on four patients where the bottom of the injury was broad and huge.

Table 1: Percentage of microorganisms found in culture and sensitivity

Microorganism	No. of patients	Percentage
Coagulase-negative staphylococci	8	16
Klebsiella pneumoniae	6	12
Candida albicans	6	12
Methicillin-resistant Staphylococcus aureus	4	8
Escherichia coli	2	4
Pseudomonas aeroginosa	2	4
Staphylococci aureus	2	4
Enterococcus faecalis	2	4
Multiple organisms	4	8
No organisms	14	28

In this study, the observation was the average time of Coronary artery bypass graft (CABG) and time of presentation to be 3 months as the patient was delayed reference to the plastic surgery department. The mean period between the patient's admission to the hospital and the pectoralis major flap with the double breasting technique was 1 week. For midway evaluation, VAC therapy was applied between cleansing and final flap cover for the closure of the wound and restriction of paradoxical movement of the shoulder. VAC therapy was used in 40 patients for a mean period of 12 days. After the flap surgery, the patient was hospitalized for an average period of 14 days.

Discussion

Sternal wound dehiscence was a complicated wound, and its surgery was one of the most difficult

tasks for the doctors [13, 14]. Immediate and proper treatment should be done to prevent the growth or formation of sterna osteomyelitis and systemic sepsis. Many other surgical options were suggested for the sternal wound dehiscence which were, incorporating metal wires, titanium plates, and sterna reconstruction using muscle or omental flaps. The bilateral pectoralis major was preferable to sterna reconstruction with metal wires because the wall of the chest was better balanced. The thorough cleansing and advanced tension-free flap cover with vascular tissue are the fundamentals of reconstruction. The dead space should extirpate completely.

There has been signification development in the treatment of sterna wound infections over the years [15-21]. The perfect choice of treatment exists because so many options are there for the treatment of sterna dehiscence. Occasionally a combination of more than one flap was needed, specifically to deal with complicated areas like the inferior third of the sternum [22, 23].

A fasciocutaneous flap was also used for the reconstruction of these defects formed on perforator vessels from the internal thoracic artery, as explained by Koulaxouzidis et al [24]. It is a less hostile therapeutic alternative. The coverage of the inferior sternotomy wound had an important drawback of the pectoralis major flap. After the flap surgery, the lower parts of the wound had the most common site of dehiscence. To deal with this issue tripedicle pectoralis major myocutaneous flap was operated.

Timely diagnosis and mediation help a lot in decreasing the degree of tissue damage. The pectoralis major muscle flap is the best option for the reconstruction of defects among the other flaps.

Left and right mammary vessels were used in 46 patients. Omentum was used in four patients to fill the cavity in the lower half of the wound. Rectus sheath extension of the pectoralis muscle was adequate to fill lower-end dead space which in turn did not need another flap for the lower part of the wound.

The benefits of double breasting technique were:

- Double breasting provides steadiness to the sternum and stops the inconsistent movement of the sternum.
- It eliminates the cavity and stops the hematoma.
- In double breasting, if one suture breaks the other suture next to it helps to prevent disruption.

For those patients who went through CABG, the double-breasting technique can be applied to these patients using both thoracic internal arteries. The cleansing of the wound is very important in these cases.

The risk factors in these cases were diabetes, infection, and internal mammary arteries.

Conclusion

The treatment requires well cleansing of dead tissue and total coverage with vascularised tissue. Pectoralis major flap with rectus extension on one side and double breasting them on midline was suggested. As both the mammary arteries were used during the surgery the option for using rectus muscle was not available.

References

1. Shumacker HB Jr, Lurie PR. Pulmonary valvulotomy; description of a new operative approach with comments about diagnostic characteristics of pulmonic valvular stenosis. J Thorac Surg. 1953;25(2):173-86.
2. Bagheri R, Tashnizi MA, Haghi SZ, Salehi M, Rajabnejad A, Safa MH, et al. Therapeutic outcomes of pectoralis major muscle turnover flap in mediastinitis. Korean J Thorac Cardiovasc Surg. 2015;48(4):258-64.
3. Kaláb M, Karkoška J, Kamínek M, Matějková E, Slaměníková Z, Klváček A, et al. Reconstruction of massive post-sternotomy defects with allogeneic bone graft: four-year results and experience using the method. Interact Cardiovasc Thorac Surg. 2016;22(3):305-13.
4. Kaláb M, Karkoška J, Kamínek M, Matějková E, Slaměníková Z, Klváček A, et al. Reconstruction of massive post-sternotomy defects with allogeneic bone graft: four-year results and experience using the method. Interact Cardiovasc Thorac Surg. 2016;22(3):305-13.
5. Jungheim C, Isgro F, Werling C, Sloot N, Saggau W. Analysis of infections after cardiac surgery. J Thorac Cardiovasc Surg 2000;48(Suppl 1):50.
6. Engelmann RM, Williams CD, Gouge TH. Mediastinitis following open-heart surgery: Review of two year's experience. Arch Surg. 1973; 107: 772-6.
7. Belcher P, McLean N, Breach N, Paneth M. Omental transfer in acute and chronic sternotomy wound breakdown. J Thorac Cardiovasc Surg. 1990; 38:186-91.
8. El Oakley RM, Wright JE. Postoperative mediastinitis: classification and management. Ann Thorac Surg. 1996;61(3):1030-6.
9. Malani P, Dyke D, Pagani F, Armstrong W, Chenoweth C. Successful treatment of vancomycin-resistant enterococcus faecium mediastinitis associated with left ventricular assist device. Ann Thorac Surg. 2003;76:1719-21.
10. . de Feo M, de Santo L, Romano G, Renzulli A, Della Corte A, Utili R. Treatment of recurrent staphylococcal mediastinitis: Still a controversial issue. Ann Thorac Surg. 2003;75:538-42.

11. Kirsch M, Mekontso-Dessap A, Houel R, Giroud E, Hillion M, Loisance D. Closed drainage using Redon catheters for post sternotomy mediastinitis: Results and risk factors for adverse outcome. Ann Thorac Surg. 2001; 71: 1580-6.
12. Ridderstolpe L, Gill H, Ahlfeldt H, Rutberg H. Superficial and deep sternal wound complications: Incidence, risk factors, and mortality. Eur J Cardiothorac Surg. 2001; 20:1168-75.
13. Lee CH, Hsien JH, Tang YB, Chen HC. Reconstruction of sternal osteomyelitis at the lower third of the sternum. J Plast Reconstr Aesthet Surg. 2010; 63:633-41.
14. Coltro PS, Ferreira MC, Batista BP, Nakamoto HA, Milcheski DA, Tuma Júnior P. Role of plastic surgery on the treatment complex wounds. Rev Col Bras Cir. 2011;38(6):381-6.
15. Thurer RJ, Bognolo D, Vargas A. The management of mediastinal infection following cardiac surgery: An experience utilizing continuous irrigation with povidone-iodine. J Thorac Cardiovasc Surg. 1974; 68:962-8.
16. Prevosti LG, Subramainian VA, Rothaus KO. A comparison of the open and closed methods in the initial treatment of sternal wound infections. J Cardiovasc Surg. 1989; 30:757-63.
17. Jimenez-Martinez M, Arguero-Sanchez R, Perez-Alvarez JJ. Anterior mediastinitis as a complication of median sternotomy incisions: Diagnostic and surgical considerations. Surgery. 1970; 67:929-34.
18. Shumacker HB Jr, Mandelbaum I. Continuous antibiotic irrigation in the treatment of infection. Arch Surg. 1963; 86:384-7.
19. Lee AB Jr, Schimert G, Shatkin S. Total excision of the sternum and thoracic pedicle transposition of the greater omentum: Useful stratagems in managing severe mediastinal infection following open-heart surgery. Surgery. 1976; 80: 433-6. 1
20. Pearl SN, Weiner MA, Dibbell DG. Sternal infection after cardiac transplantation: Successful salvage utilizing a variety of techniques. J Thorac Cardiovasc Surg. 1982; 83:632-4.
21. Herrera HR, Ginsburg ME. The pectoralis major myocutaneous flap and omental transposition for closure of infected median sternotomy wounds. Plast Reconstr Surg. 1982; 70:465-70.
22. Seguin JR, Loisance DY. Omental transposition for closure of median sternotomy following severe mediastinal and vascular infection. Chest. 1985; 88:684-90.
23. Loose R, Birekandt S, Mo¨ller F. Deep sternal wound complications after CABG with unilateral and bilateral internal thoracic artery grafts in diabetic patients. J Thorac Cardiovasc Surg. 2000;48(Suppl 1):48.
24. Koulaxouzidis G, Orhun A, Stavrakis T, Witzel C. Second intercostal internal mammary artery perforator (IMAP) fasciocutaneous flap as a choice for the treatment of deep sternal wound infections (DSWI). J Plast Reconstr Aesthet Surg. 2015;68(9):1262-7.