Chronic Sternal Wound Fistula after Coronary Artery Bypass Surgery: A Case Series

Abstract
Chronic extensive infection of the sternal wound may be a serious problem in patients undergoing sternotomy, especially those who have been operated for coronary artery bypass grafts. We report and evaluate the outcomes of five cases involved in chronic sternal osteomyelitis who were treated with two different strategies as follows: (1) debridement and secondary healing (conventional treatment), and (2) debridement and omental flap transfer for primary wound closure. All of the patients had acceptable results after treatment, but those who were managed by omental flap and primary wound closure had better cosmetic results and a shorter hospital stay.

Keywords: Coronary artery bypass surgery, osteomyelitis, sternum, wound infection

Introduction
Chronic sternotomy wound infection is rare; yet, a devastating complication which is manifested by chronic fistula formation and purulent costochondritis. This form of infection may be a presentation of recurrent infection, presenting a long time after an acute mediastinitis, and may be due to microorganisms which might have invaded the wound previously in an early postoperative wound infection; however, sometimes, this may be the first manifestation of a new onset of infections some of which are caused by slow-growing microorganisms or fungi.

Case Report
Among 430 patients who have been operated for coronary artery bypass graft (CABG) from January 2009 to February 2001 in our center (Imam Khomeini Hospital, Ahwaz, Iran), and were followed for at least 8 months after operation, we found five cases who developed a delayed chronic fistula at the site of sternal incisions. All of them had been operated for CABG using left internal mammary artery and greater saphenous vein. The method of sternal closure was the same, and bone wax was used for hemostasis of bone marrow in all of the patients. The minimum time of presentation of chronic infection (in all of the patients, fistula formation with purulent drainage) was 1 month [Table 1], but one patient was involved 6 months after CABG. Except one, in others, there was not any history of early postoperative acute superficial or deep sternal infection. In all of the patients, there was at least one orifice [Figure 1a], but one case (case 2) had multiple orifices with purulent drainage for several days. All of the patients had been treated at first by other physicians (general physicians or general surgeon) with empirical antibiotic therapy without any benefit. Two patients were suffering from pain radiating into their lateral part of hemithoraces (case 1 and 3). Most of the patients had diabetes mellitus (DM) with uncontrolled blood sugar at the time of admission, and nearly all of them had a negative culture of drainage (only one patient had positive culture: pseudomonas aeruginosa).

All of the patients were managed by surgical removal of scar and necrotic tissue. In all of the cases, evaluation of deep tissue revealed one or more draining orifices in the body of sternum. In two patients (cases 1 and 3) who had complained of radiating pains, cartilages were involved and destructed to the costochondral junction, compatible with the side of pain sensation. An aggressive debridement of hemisternum and involved cartilages was performed on them [Figure 1b-d]. In others, an aggressive local debridement of the sternum and removal of wires were performed. Then, the site was...
managed with one of the two methods including: (1) leaving the wound open allowing it to be healed secondarily, and (2) Omental flap transferrin and primary closure of the wound [Figure 2]. We did not randomize patients for selection of the method of treatment and omental flap used for the management of large defects after debridement. All of the patients were discharged in good condition and acceptable results, but those who were managed with primary closure and omental flap had better cosmetic results [Figure 3] and shorter hospital stay [Table 1]. One patient who was managed by omental flap developed recurrent fistula that was managed by local exploration of the wound. No epigastric hernia was found during follow-up.

Discussion

Median sternotomy may be complicated by deep infection in 1%–5% of patients during the 1 month after surgery. These patients have reported mortality up to 10% despite prompt treatment.[3]

There are many strategies for the management of this complication, that is vacuum-assisted closure (VAC) therapy,[4-10] omental flap transferrin, pectoralis major, and other muscle flaps[1,11] and sometimes by primary closure and irrigation.[12,13] Leaving the wound open and changing wound dressing are other approaches which had been used previously with high mortality compared to other methods.[14] VAC is a very popular method for treating early or late sternal wound infection, but it needs some materials and equipment which are not available in all institutes. Greater omentum has a capacity of filling defects produced by sternal debridement and due to its antimicrobial capacity, may be an acceptable choice in selected cases.[3] Muscle flaps (especially pectoral muscles) can be used for reconstruction but may be associated with some disabilities.[15,16] Recurrent infections may occur in 4.6% of patients who are treated by greater omentum transferring,[1] 6.6% after VAC, and 5% after conservative therapy.[8] Chronic osteomyelitis after mid-sternotomy may represent in patients with or without previous osteomyelitis [Table 1]. This complication may be managed by debridement of the involved bone, removal of wires, and then, conservative treatment or VAC therapy.[8] In our series, we had five patients of 430 cases operated for CABGs who developed chronic fistula formation (1.1%). There is no data about incidence of this complication in the literature. Most of the patients in this series had DM (75%), and the onset of presentation was 1–6 months after CABG. In one report, fistula developed 11 months after the primary surgery,[15] and if left treated, it may last even 24 years.[21] The onset

| Number | Age (year) | Sex | DM | Time of the first presentation (month) | Wound culture | Cartilage involvement | Treatment | Time for healing (day) |
|--------|------------|-----|----|--------------------------------------|---------------|-----------------------|-----------|-----------------------|
| 1      | 74         | Male | +  | 1                                    | Pseudomonas   | +                     | Omental flap | 15                    |
| 2      | 53         | Male | -  | 3                                    | Negative      | -                     | Conventional** | 35                    |
| 3***   | 68         | Female | - | 2                                    | Negative      | +                     | Omental flap | 15                    |
| 4      | 60         | Male | +  | 6                                    | Negative      | -                     | Conventional | 40                    |
| 5      | 78         | Female | + | 2                                    | Negative      | -                     | Omental flap | 20                    |

**Conventional treatment: Debridement and change dressing for secondary healing, ***This patient had a previous history of mediastinitis 7 days after CABG. CABG: Coronary artery bypass graft, DM: Diabetes mellitus, Positive (+), Negative (-)

![Figure 1: Orifice with purulent drainage in healed surgical scar (a), destructed cartilages debrided extensively (b), in some patients, even costochondral junctions were involved (c), a large dead space after debridement of hemisternum and cartilages (d)]](image1)

![Figure 2: Omentum released (a), transferred to the wound (b), and used for filling of dead space (c)](image2)
of presentation was, in all of our patients, with at least one draining orifice in the scar of sternotomy. All of the patients were treated by a local physician with empirical antibiotic therapy without any response. Except one case, routine microbiological culture was negative that might be due to slow-growing microorganisms, fungi (which could not be diagnosed in our setting), or empirical antibiotic therapy.

Two patients complained of pain radiating to one of their hemithoraces without fever and toxicity. In all patients, extensive debridement of the skin, infected sternal bone, and cartilage (if involved) were performed. Then, the wound was managed with one of the two methods as follows: (1) conventional method with open packing and changing it twice daily, and (2) omental flap transferring and closing the wound immediately after complete extensive debridement. The skin was closed after debridement and limited undermining. We did not use skin graft or flap for wound closure (the equipment for VAC was not available in our institute). The method of management was dependent on the size of defect, created by debridement. We did not randomize patients due to ethical reasons. In one case (number, 5), where the cartilages were not involved, the method of omental flap was used for prevention of recurrent infection. Of three cases who were managed with omental flap, one patient developed recurrence of infected fistula which may be due to retained necrotic tissues or very thin omentum which could not fill the defect completely. This patient was treated by opening the site of drainage and leaving the wound opened for secondary closure.

Conclusion

Reports about chronic fistula formation in sternotomy scar tissue are very rare in the literature. Our experience with chronic fistula formation from chronic osteomyelitis of sternal wound revealed that the absence of facilities such as VAC, the omental flap is a safe and effective method for management of large defects after extensive debridement. Prevention of recurrence and primary closure of the wound for shortening the duration of hospital admission, with acceptable cosmetic results are the advantages of this method.

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Conflicts of interest

There are no conflicts of interest.

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