Scholars Journal of Medical Case Reports
Abbreviated Key Title: Sch J Med Case Rep
ISSN 2347-9507 (Print) | ISSN 2347-6559 (Online)
Journal homepage: https://saspublishers.com

OPEN ACCESS

Cardiothoracic Surgery

Case Series: Sternal Wound Breakdown Post CABG, Benefit of Vacuum Dressing with Instillation

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DOI: https://doi.org/10.36347/sjmcr.2026.v14i05.025 | **Received:** 18.03.2026 | **Accepted:** 03.05.2026 | **Published:** 07.05.2026

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Abstract **Case Report**

Sternal wound breakdown poses a serious and challenging complication for patients undergoing cardiac surgery. In the context of patients undergoing a conventional coronary artery bypass grafting via primary median sternotomy, the occurrence of sternal wound breakdown is a serious and costly complication resulting in prolonged hospitalisation and increasing risk of mortality. The role of negative pressure wound therapy[NPWT] in promoting granulation has been well established, however, more recent implementation of a NPWT with instillation therapy has shown to improve infection control and promote quicker wound healing. We describe the use of NPWT with instillation therapy, using the Lifotronic NPWT system[NP-800/600]. Dermasyn was used as instillation fluid. Instillation time was set at 15 minutes every 4 hourly for both patients.

Keywords: Sternal wound breakdown, Mediastinitis, Negative pressure wound therapy with instillation (NPWT-i), Sternal osteomyelitis, Coronary artery bypass grafting (CABG), Wound healing efficacy.

INTRODUCTION

Sternal wound infection and subsequent mediastinitis is a dreaded complication following patients undergoing cardiac surgery via conventional sternotomy. Despite advancements in minimally invasive cardiac surgeries, majority of cardiac surgeries are still performed via median sternotomy. This condition not only prolongs hospital stays but also increases the risk of mortality, making management both critical and challenging. Traditional negative pressure wound therapy (NPWT) has been widely used to encourage the formation of healthy granulation tissue and support wound healing. More recently, advances in NPWT that incorporate instillation therapy have demonstrated improved infection control and faster wound recovery. In this report, we present the application of NPWT with instillation therapy to treat sternal wound breakdown in two patients

CASE PRESENTATION

Patient A

71 years old male with triple vessel disease, non-diabetic. Electively admitted to the ward for coronary artery bypass grafting. During admission, it was noted that he was having upper respiratory tract infection, and was empirically treated with antibiotics. Despite infection, urgent inpatient coronary artery bypass grafting was performed as patient was symptomatic with critical coronary stenosis.

His hospitalisation was complicated with deep seated surgical site infection over sternum. Culprit organism identified as methicillin-resistant staphylococcus aureus[MRSA]. A ct scan revealed radiological evidence of sternal osteomyelitis and collection.

Wound debrided and daily dressing done and conventional NPWT was initiated. Despite multiple cycles of NPWT, intraoperative cultures persistently grew MRSA. Despite NPWT, only minimal granulation tissue progression noted each week. At this point, decision was made for aggressive debridement of osteomyelitic sternum, removal of sternal wires and unhealthy costal cartilages.

Post debridement, NPWT with instillation therapy initiated. Weekly dressing change done.

After 4 cycles of vacuum dressing, complete clearance of MRSA achieved, with adequate granulation tissue. Patient was able to achieve closure of the sternal

wound via a pectoralis major advancement flap and was discharge.

Patient B

59 years old diabetic and obese male with triple vessel disease. Electively admitted for coronary artery bypass grafting.

He underwent an uneventful surgery and was discharged within a week of the surgery. Three weeks post op, he returned to the outpatient unit with a complaint of pus discharge from the sternum. He was admitted for wound debridement and intravenous antibiotics.

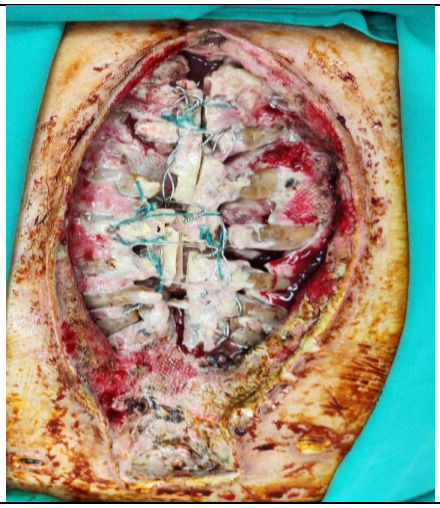
During wound debridement, it was noted that the sternal wires had cut through both the outer and inner table of the sternum and a Robicsek sternal closure was performed.

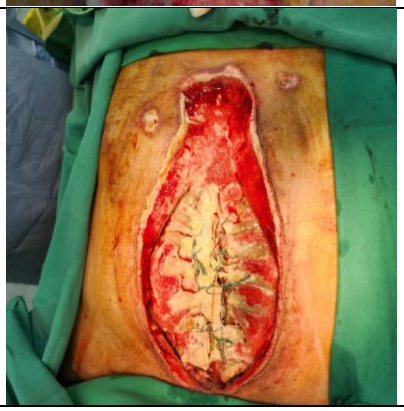
Despite targeted antibiotics, he still had active pus discharge from the sternal wound requiring re-debridement of the wound.

During subsequent debridement, it was noted that the bone appeared osteomyelytic with unhealthy costal cartilages. Unhealthy sternum was debrided and costal cartilages removed. Patient was observed for a day and vacuum dressing with irrigation was applied after a day of wound debridement.

He made an uneventful recovery and weekly dressing change commenced. He made a remarkable improvement over the span of 5 weeks and with the aid by the plastic and reconstruction team, he underwent a pectoralis muscle advancement flap.

	PATIENT A	**PATIENT B**
PUS SWAB	31/07/25 Bulkholderia cepacia 18/09/25 NO GROWTH	06/10/2025 MRSA 24/10/2025 MRSA 13/11/2025 Pseudomonas Aeruginosa, MRSA 04/12/2025 Pseudomonas Aeruginosa 11/12/2025 Pseudomonas Aeruginosa
TISSUE SWAB	07/08/25 Bulkholderia cepacia 13/08/25 Bulkholderia cepacia 20/08/25 Bulkholderia cepacia 27/08/25 Bulkholderia cepacia 04/09/25 Burkholderia cepacia 18/09/25 NO GROWTH	29/09/2025 MRSA 06/10/2025 MRSA 13/10/2025 Pseudomonas Aeruginosa 24/10/2025 MRSA 30/10/2025 MRSA 13/11/2025 Pseudomonas Aeruginosa, MRSA 01/12/2025 Pseudomonas Aeruginosa 18/12/2025 Pseudomonas Aeruginosa

	PATIENT A	PATIENT B
Prior to NPWT-i		

After 1 week of NPWT-i		
After 3 weeks of NPWT-i		
	PATIENT A	PATIENT B
After 4 weeks of NPWT-i		
		

DISCUSSION

Sternal wound breakdown remains a significant cause of morbidity and mortality in patients undergoing a conventional open-heart surgery via sternotomy. Despite advancements in management, treatment of wound breakdown and subsequent mediastinitis and osteomyelitis remains a surgical challenge, affecting length of hospitalisation, treatment costs, infection and patient quality of life.

Incidence of deep-seated sternal infections and mediastinitis post cardiac surgery have an incidence of 1-3%. The definition of mediastinis is excerpted from the criterias outlined by the US Centers for Disease Control and Prevention [CDC].

Mediastinitis must meet at least ***one*** of the following criteria:

1. Patient has organism(s) identified from mediastinal tissue or mediastinal fluid by a culture or non-culture based microbiologic testing method which is performed for purposes of clinical diagnosis or treatment, for example, not Active Surveillance Culture/Testing (ASC/AST).
2. Patient has evidence of mediastinitis on gross anatomic or histopathologic exam.
3. Patient has at least ***one*** of the following signs or symptoms: fever (>38.0°C), chest pain*, or sternal instability*.
   And at least *one* of the following:
   a. purulent drainage from mediastinal area
   b. mediastinal widening on imaging test
4. Patient ≤1 year of age has at least ***one*** of the following signs or symptoms: fever (>38.0°C), hypothermia (<36.0°C), apnea*, bradycardia*, or sternal instability*
   And at least *one* of the following:
   a. purulent drainage from mediastinal area.
   b. mediastinal widening on imaging test.

Patients undergoing open heart surgery, namely coronary artery bypass grafting are at risk of mediastinitis due to multiple factors such as, male gender, diabetes, obesity, COPD and elderly age population [3]. Usage of internal mammary arteries as a conduit possesses a significant risk for the development of mediastinitis, especially in cases where bilateral internal mammary arteries are harvested [4].

Treatment of mediastinitis ranges from extended antibiotics, wound irrigation, aggressive debridements, sternal reconstructions and skin coverage via reconstructive surgeries [5]. Vacuum-assisted closure or Negative Pressure Wound Therapy [NPWT] has been introduced as a new treatment modality for the treatment of mediastinitis post operatively. The usage of NPWT establishes an airtight wound, that allows continuous vacuum to drain excess fluid and debris, removal of wound edema, reducing bacterial counts and promoting granulation tissue formation to improve sternal stability. Studies have shown the benefits of NPWT for post-sternotomy mediastinitis by reduction in mortality, sternal re-infection rate and shorter length of hospital stay [6,7].

This case report is directed towards the efficacy of NPWT with instillation. On top of the benefits provided by NPWT alone, the instillation allows facilitated removal of microorganisms, dilution of inflammatory and cytotoxic macromolecules, wound hydration and enhanced angiogenesis [8]. The instillation fluid allows even distribution of the solution over the wound and helps to effectively remove debris at the level of the wound and in the foam. Chronic wounds are generally characterised by elevated levels of MMP and inflammatory cytokines that inhibits the enhancement of wound healing. Instillation fluid allows the dilution of these inflammatory cytokines and the NPWT aids with the removal of the protease rich fluid from the wound bed [9].

Moist wound environments are able to facilitate the healing process by preventing dehydration, promotes angiogenesis and collagen synthesis while increasing the breakdown of dead tissue and fibrin [10]. Moist wound beds are also associated with lesser pain [10]. The availability of the instillation NPWT allows the maintenance of a moist wound bed to facilitate healing. The ability of a conventional NPWT to achieve angiogenesis has been well established, however the use of instillation with intermittent suction promotes more robust granulation tissue and is able to achieve faster wound closure.

This retrospective assessment of the role of NPWT with instillation could stand as a basis for future prospective case studies to study its benefits. In the setting of mediastinitis with wound breakdown, NPWT with instillation, aggressive wound debridement and comanagement of the reconstructive team definitely plays an important role in improving the quality of treatment provided for patients, ensuring patient satisfaction and reducing the length of hospital stay.

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