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How to do it? / Nasıl yapılır?

Shoelace technique for the management of deep sternal wound infection

Derin sternal yara enfeksiyonuna yaklaşımda ayakkabı bağı tekniği

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ABSTRACT

In this article, we describe a practical technique of managing deep sternal wound infection by combining two dynamic wound closure methods, namely gradual approximation of the wound edges using vessel loops: the shoelace technique and the vacuum-assisted closure system.

Keywords: Infection, sternal wound, vacuum-assisted closure system.

ÖZ

Bu makalede, derin sternal yara enfeksiyonlarına yaklaşımda uygulanabilecek iki dinamik yara kapatma yönteminin pratik tekniği sunuldu: yara kenarlarının ayakkabı bağı tekniği ile kademeli olarak yaklaştırılması ve vakum yardımlı yara kapama sistemi.

Anahtar sözcükler: Enfeksiyon, sternal yara, vakum yardımlı yara kapama.

Deep sternal wound infection (DSWI), which is defined by the Disease Control and Prevention as infection involving incisional deep soft tissue within 30 days after the initial operation, is a potential life-threatening complication of cardiothoracic surgery.[1] Its incidence varies from 1 to 5% after median sternotomy.[1-3] Treatment strategies include debridement, antibiotic irrigation, delayed closure, negative pressure wound therapy (NPWT), and plastic reconstruction with muscle and omental flaps.[2,3]

The NPWT is the most frequently utilized therapy by vacuum-assisted closure (VAC) system. Application of a constant and negative pressure to the infected wound through a porous foam reduces extravascular pressure, increases arteriolar dilatation which leads to improved circulation, and initiates granulation tissue formation and approximation of wound edges.[4] The VAC therapy is often used as a bridging step for infected and large defects, until primary or reconstructive closure is feasible.

The shoelace technique was first described for delayed closure of open fasciotomy wounds.[5] This technique involves approximation of wound edges using vessel loops by taking advantage of elastic property of skin. Gradual tensioning of the vessel loops, which are anchored to the wound edges by skin staples, provide a continuous pull on the skin edges and yields a dynamic wound closure.[6,7]

In this article, we describe a practical technique of managing DSWI by combining two dynamic wound closure methods, namely the VAC system and the shoelace technique.

SURGICAL TECHNIQUE

The first step of the treatment is the exploration of the infected wound and debridement of all necrotic and infected tissues. Cultures are sent for identification of the causative organism. Then, the wound is irrigated with antibiotic solution. Application of the VAC system starts with trimming of the polyurethan foam dressing (Exsudex® Black foam, thickness: 3×3 cm, pore size 400-600 μm) according to the geometry of the wound. The shoelace technique involves anchoring skin staples along the wound edge, parallel to each other at intervals of about 2 to 3 cm. The vessel loop is crossed from the top staples and threaded in shoelace fashion passing through the staples down to the last staples at the inferior border of the wound edge. Next, the black foam is passed under the vessel

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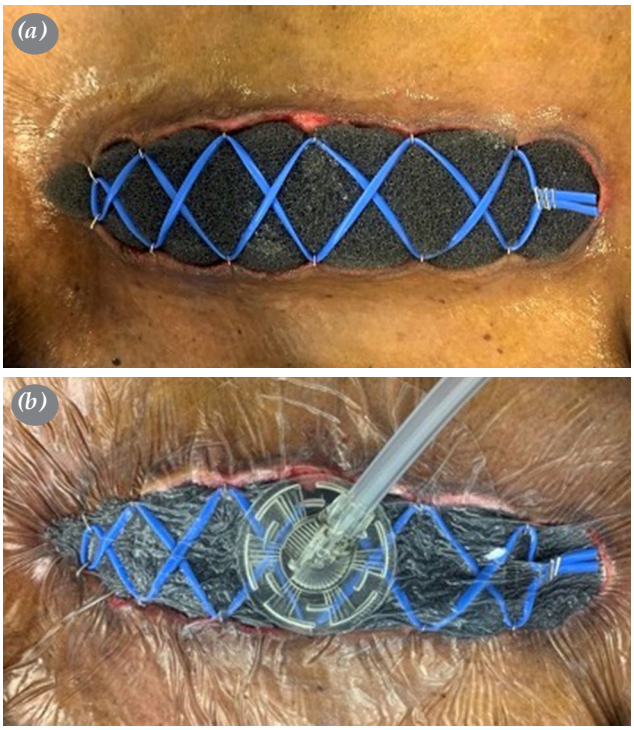

Figure 1. (a) The vessel loop threaded in shoelace fashion. **(b)** Implantation of the vacuum-assisted closure system over the vessel loop.

loops and placed into the wound. The vessel loop is, then, tensioned and fixed by tying or using a metal clip. A layer of transparent foil is placed over the defect, completely covering the foam and the vessel loop. A 2-cm opening is created in the middle of the foil, and the suction port is placed over the opening (Figure 1). The port is connected to the cannister and a negative pressure of -125 mmHg is applied to the VAC system.

The VAC system is changed and wound assessed every 48 h, preferably in the operating room, under sedation and administration of local anesthetic. Vessel loop is tightened by pulling each end of the vessel loop and re-tied or clipped at each wound inspection. As the wound heals, the foam is trimmed to fit to the shrinking cavity and the vessel loop is tightened more. This process is repeated, until healing completes and the wound gets ready for surgical reconstruction.

DISCUSSION

Since its first description by Morykwas in 1997, the VAC system has gained popularity within surgeons, particularly in reconstructive surgery.[4] Ever since, application of this system for treatment of DSWI in cardiac surgery has also gradually risen.[2,3,8] Utilization of this simple system lessens the bacterial load of the wound, downstage surgical reconstruction, reduces hospitalization and costs, and improves quality of life in patients with DSWI.[3]

In the method described above, we added a practical and cost-effective step of the shoelace technique to the VAC insertion. We aim to enhance the aforementioned advantages of the VAC system by adding this simple step to the dynamic healing process. One of the major disadvantages with wound VAC system is that the edges of the wound remain apart, while the deeper portion heals creating a gaped wound which makes it difficult to bring the two wound edges together. The shoelace technique prevents this. This is particularly the case, when the weight of the breast tissue tends to pull the wound ashes apart and keep them apart.

The potential disadvantages of this technique include skin tear, marginal necrosis, and pain during tightening the loop. Thus, the patients should be examined for skin tears and signs of necrosis. Utilizing local anesthetics may help lessening pain during the procedure. In addition, premature closure of the skin edges can lead to a deeper pocket and, therefore, care should be taken as tensioning and approximation proceeds.

In conclusion, we describe a technique for treatment of deep sternal wound infection after median sternotomy incision, which consists of combination of the vacuum-assisted closure system and the shoelace technique. The main advantages of this technique include accelerated dynamic wound healing, simplicity, and cost-effectiveness.

Data Sharing Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

Author Contributions: Idea/concept, control/supervision, critical review: P.B.; Design, data collection and/or processing, analysis and/or interpretation, literature review, writing the article, references and fundings, materials: U.K.

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