

Vacuum sealing drainage therapy in the presence of an external fixation device

A case report

Dahui Sun, MD^a, Weina Ju, MD^b, Tiejun Wang, MD^a, Tiecheng Yu, MD^a, Baochang Qi, MM^{a,*}

Abstract

Rationale: Vacuum sealing drainage (VSD) is widely utilized for treating traumatic wounds.

Patient concerns: It is particularly difficult and time consuming to use in combination with an external fixator.

Diagnoses: This is because the hardware or pins used for fixation interfere with maintaining a seal, resulting in poor adhesion and subsequent air leakage.

Interventions: To resolve this problem, we have devised a new method for sealing the wound dressing, while maintaining the required vacuum. When using this technique, a rubber strip is wrapped around each pin in 3 circles outside the plastic drape, and then tightly tied.

Outcomes: After completing this procedure, a vacuum is obtained, and any air leakage stops. We employed this technique to treat a cohort of patients in our department over a period of two years, and obtained good healing of soft tissue without air leakage, as well as good clinical outcomes.

Lessons: We have observed that patients treated with this method experienced good clinical outcomes without air leakage, and we recommend its use in treating cases where an external fixation device is present.

Abbreviations: VSD = vacuum sealing drainage.

Keywords: air leakage, external fixation device, rubber strip, vacuum sealing drainage (VSD)

1. Introduction

Vacuum sealing drainage (VSD) has been widely utilized in treatment of traumatic wounds for >17 years.^[1] A VSD device facilitates complete wound drainage and eliminates dead space, resulting in a decreased wound area, and enhanced formation of granulation tissue.^[2–4] However, it is particularly difficult and time consuming to utilize a VSD device in the presence of an external fixator, because the hardware or pins used for fixation disturb the seal, leading to poor adhesion, and subsequent air

leakage. To address this problem, some surgeons^[5] use a plastic drape to completely seal the external fixator, whereas others^[6] surround the fixation hardware or pins with a hydrocolloid gel. Alternatively, Bulla et al^[7] suggested using bone wax to seal the pins. Although several different methods have been suggested to solve this air leakage problem, they all have numerous disadvantages, including increasing both the cost and time required to perform surgery.

To solve this problem, we devised the novel technique described below and tested its effectiveness in treating wound patients over a period of 2 years.

2. Case report

This technique was developed specifically to solve the problem of air leakage which occurs when using an external fixation device in conjunction with VSD therapy. Our new technique requires the use of rubber strips, which are easily obtained from sterile gloves and can be performed without additional instruments in the operation room. This study is approved by the ethics committee of the local hospital.

After carefully cleaning the wound edges and bed, foam from the VSD device is cut to the dimensions of the wound and applied directly onto the wound and around the pins used for fixation (Fig. 1). Next, an adhesive plastic drape is wrapped around the pins to cover the foam without creating tension (Fig. 2). The tubing on the VSD device is then attached to a vacuum-assisted closure pump used to assess the dressing for air leakage after the wound is fully covered. In most cases, some amount of air is detected around the pins. Next, a rubber strip is wrapped 3 times around each pin outside the plastic drape, and tightly tied (Fig. 3).

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^a Division of Orthopedic Traumatology, The First Hospital of Jilin University,

^b Department of Neurology, The First Hospital of Jilin University, Changchun, China.

* Correspondence: Baochang Qi, Division of Orthopedic Traumatology, The First Hospital of Jilin University, Changchun, China (e-mail: qibaochang1@163.com).

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Figure 1. After carefully cleaning the wound edges and bed, foam from the VSD device is cut to the dimensions of the wound and applied directly onto the wound and around the pins used for fixation. VSD = vacuum sealing drainage.



Figure 2. An adhesive plastic drape is wrapped around the pins to cover the foam without creating tension.

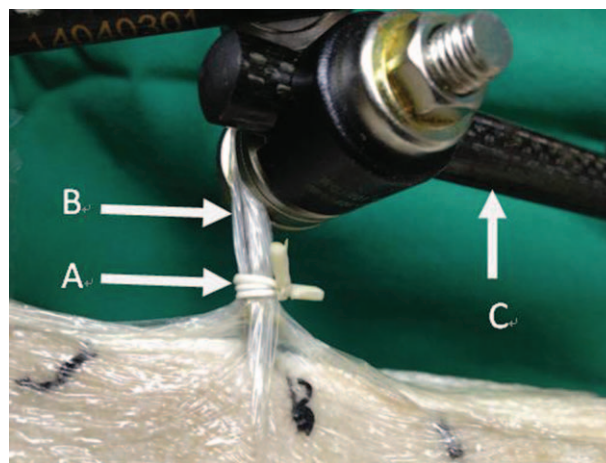


Figure 3. A rubber strip is wrapped 3 times around each pin outside the plastic drape, and tied tightly: (A) rubber strip, (B) pin wrapped with adhesive plastic drape, (C) rod of the fixation device.

After completing this procedure, a vacuum is obtained, and any air leakage stops.

We have found this technique can be efficiently used for preventing air leakage caused by the presence of an external fixation device. Moreover, the procedure only requires about an extra 2 minutes to add the rubber strip around each pin.

Between June 2012 and October 2014, a total of 18 patients who had sustained an open fracture (13 cases of open tibial fracture and 5 cases of open femoral shaft fracture) were treated using our new VSD technique. In all cases, we closed the wound, covered it with the VSD device (Wuhan VSD Medical Science and Technology Co. Ltd., Wuhan, China), and then temporarily repaired the fracture with an external fixation device (Suzhou AND Science & Technology Development Co. Ltd., Jinfeng Town, Zhangjiagang City, China). When the wound had healed 10 to 14 days later, and if there was no sign of infection, we removed the external fixation and VSD devices, and repaired the fracture using an internal fixator. All wounds treated with our new technique healed well, and there was no air leakage while using the VSD device. Moreover, all patients displayed a good recovery, without evidence of infection.

3. Discussion

Vacuum-assisted wound closure was first described by Argenta and Morykwas^[1] and Morykwas et al^[3] in 1997. Since that time, VSD devices have been widely used in general surgery and orthopedic surgery, as well as for closing wounds resulting from burns and wound healing disorders.^[6–9] A VSD device comprises a flexible foam dressing which can be cut to any size or shape, plus an adhesive plastic drape, tubing, and a suction device. Several studies have demonstrated that use of a VSD device is advantageous by providing continuous negative pressure to force drainage of secretions and saliva, and also for maintaining wound cleanliness, and stimulating the proliferation of granulation tissue.^[2,4]

Due to poor adhesion between the drape and pins, a VSD device can be cumbersome and difficult to operate in conjunction with an external fixation device. Although several studies have explored different methods to solve this problem and prevent air leakage around the pins, some air leakage usually remained, and procedures performed to eliminate the leakage often increased the

cost of treatment. In contrast, we used rubber strips obtained from sterile gloves to tie the pins and stop the leakage of air. We have successfully used this technique to prevent air leakage when treating several cases in our department.

The technique described has a learning curve and may initially increase the surgical time required for some cases. However, it is easy for a physician to wrap the pins with rubber strips and tie them using fingers, because the rods on the external fixation device are located in close proximity (~2 cm) to the patient's soft tissue. Additionally, a forceps can be used to help wrap and tie the strip in difficult cases. Based on our satisfactory experience, we feel this newly described technique warrants widespread use in treating wounds.

4. Conclusion

In conclusion, the patients we have treated using this technique for eliminating air leakage experienced good clinical outcomes, and we recommend its use in treating cases where an external fixation device is present.

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