

V.A.C. RX-4 Deployment for Soft Tissue Coverage for the Trauma Patient: A Case Report

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Abstract

Fasciotomies are commonly performed in the treatment of compartment syndrome to upper and lower extremities. Such operations improve distal soft tissue perfusion to the surrounding muscles and nerves negating amputations. Negative pressure wound therapy (NPWT) application to the open fasciotomy sites utilizes macro- and microstrain to promote granulation tissue. Having multiple NPWT Ultra devices (Solventum, San Antonio, TX) connected to each of the four fasciotomy sites in the same patient is cumbersome to manage and takes up a large quantity of space. The V.A.C. RX-4 (Solventum, San Antonio, TX) is a single unit, multichannel device that can deliver NPWT and has a lower physical profile. This case report demonstrates the utility of the V.A.C. RX-4 in a trauma patient with four separate fasciotomy wounds.

Keywords

V.A.C. RX-4, Negative Pressure Wound Therapy, Wounds, V.A.C. Ultra, Footprint, Trauma

1. Background

Fasciotomies are commonly performed in the treatment of compartment syn-

drome, to relieve elevated muscle compartment pressure thereby improving distal circulation and soft tissue perfusion to the surrounding muscles and nerves. While fasciotomies are necessary in the acute management of compartment syndrome, the resulting wounds can be difficult to manage. Typically, these wounds are either left open to be dressed with wet to dry gauze dressings, or managed with NPWT (Negative Pressure Wound Therapy) until swelling has reduced and incisions can be primarily closed, whether that be by primary or delayed primary closure or by secondary wound healing.

NPWT is commonly used for the management of acute surgical wounds, including fasciotomy incisions. NPWT works by applying macro- and microstrain to promote granulation tissue formation, remove infectious material plus inflammatory mediators, and manage edema hastening wound healing [1]-[4]. Typical use of wound vacuum therapy limits application to one wound or body area per device. Although this limitation may be mitigated with the use of a “Y” connector to deliver therapy to an additional area or by “bridging” with a vacuum sponge to a nearby wound, there is still considerable barrier to delivering effective NPWT with the use of a single channel device. The development of the RX4 effectively overcomes this barrier by providing a multichannel vacuum device that can allow for easy delivery of NPWT across multiple wounds over multiple different body regions with a single device [5] [6]. This may be especially beneficial in 4-compartment fasciotomies or fasciotomies to more than one extremity. The RX4 unit is also compatible with existing beneficial NPWT modalities, including the Prevena™ Incision Dressing (Solventum, San Antonio, TX) [7]-[9].

Previously, Kindal *et al.*, “The Use of the RX4 for Multiple Soft Tissue Wound Application in the Single Patient: A Case Report” demonstrated the RX4 VAC device was safe and effective application of NPWT for extensive, multiple site, burn injuries [10].

2. Aim

This case report aims to demonstrate the importance of the utility of the RX4 device in NPWT for surgical wounds.

3. Case Presentation

A 46-year-old male with a past medical history of diabetes and hypertension presenting after a motorcycle crash was found to have a thrombosed right common femoral and superficial femoral artery. The patient underwent thrombectomy and femoral-popliteal artery bypass with PTFE graft (W.L. Gore, Newark, Delaware). Within eight hours post-operatively the patient’s course was complicated by the development of right lower extremity compartment syndrome and subsequently underwent right thigh and lower leg fasciotomies. The mechanism of the patient’s compartment syndrome was secondary to a right lower extremity reperfusion injury. The V.A.C. RX-4 device was utilized for delivery of NPWT to all fasciotomy sites (**Figure 1, Figure 2**). Once the four fasciotomies had been created, black pol-

yurethane foam (V.A.C. VERAFLOR[™], Solventum, San Antonio, TX) were applied to each open site. Next, each fasciotomy site was covered with an acrylic drape thereby sealing the black foam and fasciotomy wound beds. A hole was cut onto the surface of each acrylic drape and a Sensittract pad (Solventum, San Antonio, TX) applied to allow for negative pressure application at -125 mmHg. With this multi-chambered RX-4 device, multiple wounds were individually managed (**Figure 3**) including daily drain output assessments. The patient spent 7 days in the ICU intubated and sedated but once extubated was subsequently transferred to the surgical floor. The black foam dressings were exchanged to the four fasciotomy wounds every three days until the wounds had developed healthy granulation tissue. On post-operative day 10 the patient underwent delayed primary closure of his four fasciotomy sites. On post-operative day 20 he was discharged home and his follow-up care was uncomplicated.



Figure 1. Photograph of NPWT application to medial right lower extremity compartments with black foam covered with acrylic drapes.



Figure 2. Photograph of NPWT application to lateral right lower extremity compartments with black foam covered with acrylic drapes.



Figure 3. Photograph of the use of single device, RX4, to deliver NPWT across multiple fasciotomy sites. Note that all four chambers are in use with -125 mmHg negative pressure.

4. Conclusion

NPWT is commonly used to address soft tissue wounds, however, its use is frequently limited to a single wound bed per wound vac device. If multiple devices are needed to treat multiple wounds, this takes up a tremendous amount of physical space which can be cumbersome for both the nursing staff and the patient to manage. The RX4 allows for a single multichannel device that can easily deliver NPWT to multiple wounds at different body regions. Originally developed for the US military in transporting wounded military personnel [6], the RX4 physically occupies much less space than four separate VAC devices. The RX4 measures $9.125\text{ cm} \times 14.5\text{ cm}$ while four VAC Ultra Devices measure $15.75\text{ cm} \times 17\text{ cm}$ (**Figure 4** and **Figure 5**).



Figure 4. Photograph of the footprint of four VAC Ultra devices.



Figure 5. Photograph of footprint of one RX4.

5. Limitations

The more common beneficial aspects of case reports include detecting novel events or applications, developing new hypotheses, and providing educational value to the clinical reader. Case reports, such as this one, have certain limitations (e.g. the lack of the ability to generalize the data presented, establish cause-effect relationship, publication bias, and their retrospective design, among others) [11]. The authors recommend additional robust studies that may further clarify the utility of the RX4 system in the complex wound patient. There was a signed patient consent for permission to use clinical data and photographs for training, education, and research.

6. Institutional Review Board

This case report, containing only de-identified data, does not produce generalizable knowledge, is not generalizable knowledge, nor is it an investigation of an FDA regulated product. A case report is an educational activity and exempt from IRB review based on the Code of Federal Regulations and the Common Rule [12]. The manuscript was found to be exempt by the institutional review board at Valleywise Medical Center (formerly Maricopa Integrated Health Systems) protocol number CR2022-001 according to 45CFR46.104(9). Regulations (CFRs) Title 45, Part 46—Protection of Human Subjects.

7. Summary

NPWT has proven to be beneficial in management of acute surgical wounds, including fasciotomy sites. The use of the RX4 allows for the application of NPWT across multiple body areas and wounds without the burden of multiple devices. It occupies a physically smaller footprint allowing for easier management by both

patients and healthcare staff. This case report serves as an additional reference to bolster support for this clinically useful device.

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Conflicts of Interest

Marc M. Matthews, MD, FACS: Surgical Consultant for Solventum Corporation; **Luis G. Fernandez, MD, FACS:** Surgical Consultant for both Solventum and Urgo North America/SteadMed Medical, LLC; **Mr. Sean O’Keefe** is an executive representative for Miach Orthopaedics Area Sales Manager; **Andria M. Lassiter** is a former Senior Director, Marketing, Solventum.

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