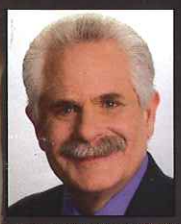
Round Table: Osteomyelitis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Wound Management

APWCA Case #3: Pneumatic Medicine: Advanced Treatment of Peripheral Vascular Disorders

This modality presents an effective option for treating PVD.

By Laura F. Jacobs, M.D., Ph.D

Peripheral vascular disease (PVD) includes disorders of the arteries (e.g., peripheral arterial disease or PAD), veins (e.g., venous insufficiency), and lymphatic system (e.g., lymphedema). These disorders can cause severe morbidity such as non-healing wounds leading to amputation, and claudication, resulting in significant limitations with ambulation, and is often also associated with a high incidence of mortality. The elderly and those with diabetes are especially at risk for PVD.

Figure 1: Model patient, demonstrating the use of the NormaTec PCD.

Recently, there has been considerable interest in recognizing patients with PVD because its signs and symptoms are often the earliest indication that the patient may also be at great risk for cardiac and cerebrovascular diseases.

More than any other medical specialist, the podiatrist may be the first, if not the only, clinician to carefully examine the lower extremities. He or she brings a unique perspective to the diagnosis and treatment of conditions affecting the lower extremities and can be instrumental in recommending further cardiac and carotid assessment.

PAD alone, or in combination with venous and/or lymphatic disease, can result in a constellation of physical findings. The clinician examining a patient's lower extremity should be alert for evidence of PVD including edema, decreased sensation, chronic dermal disruption-type ulceration, cellulitis, hair loss, and decreased or absent peripheral pulses.[1,2] One other symptom of PAD is also well-recognized: dystrophic toenails,[3] usually seen as thickening, vertical ridging and cracking of the nail, with or without fungal infections.

Case Presentation

The case study presented here is of an 82 year old male with severe PVD including PAD, diabetes, congestive heart failure, chronic venous insufficiency edema with non-healing wounds, chronic cellulitis, loss of hair on his legs, diminished peripheral pulses, and marked dystrophic changes of the toenails. He was re-

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New Concepts and Studies

"New Concepts" is a forum for the presentation of (1) new technologies and products which have been the subject of clinical study, and (2) new studies involving existing products. Readers should be aware that Podiatry Management does not specifically endorse any of the technologies, concepts, or products being discussed.

APWCA #3...

ferred for Pneumatic Medicine to reduce his peripheral edema and heal his chronic wounds.

Pneumatic Medicine

Simply defined, pneumatic medicine is the use of external, dynamic pneumatic compression to treat a wide array of peripheral vascular diseases, including venous insufficiency, lymphedema and chronic wounds. It is considered a welcomed adjunct to other treatment options, including surgery, gradient compression stockings, and medications.

Its core component is the use of the NormaTec PCD, a new, state-of-the-art pneumatic compression device (Figure 1). Although pneumatic compression devices, formerly called "lymphedema pumps," have been available for over 40 years for treating lymphedema, venous stasis ulceration, and arterial insufficiency, they routinely offer disappointing clinical results. Most are inadequately bioengineered and are difficult to use and prescribe. Moreover, their inflation/deflation patterns, or pneumatic waveforms, produce physiologically undesirable static pressure.

The NormaTec PCD modernizes the entire approach to pneumatic compression devices. Its patented Peristaltic Pulse dynamic compression waveform is designed to simulate normal physiology. The waveform's pulse-gradient hold-release sequential action incorporates the dynamic compression of both the muscle pump and peristalsis to effectively promote microcirculation and aid wound healing. This new waveform goes far beyond the intermittent sequential compression used in lymphedema pumps.

A typical wound care patient uses the device approximately one hour per day in a home treatment program until the wound is completely healed. To prevent the reoccurrence of wounds, it is usually recommended that the patient continue to use the device for one hour every two to three days. The NormaTec PCD is FDA-cleared for the treatment of venous stasis ulceration and chronic wounds, venous insufficiency, lymphedema and other edematous conditions, and the prevention of deep venous thrombosis.

Treatment Program

The patient was prescribed the NormaTec PCD and was instructed to use it an hour daily at home. Additionally, he was prescribed an oral antibiotic for his cellulitis, and an over-the counter antibiotic ointment was recommended as a moisturizer for his wounds.

Figure 2: After two months of pneumatic medicine treatment; note the changes to the dystrophic toenails on the proximal third of the great toe.

He was instructed to shower daily, washing his wounds with a fragrance-free liquid soap, and to leave the wounds open to air as much as possible. When he wore pants, he was instructed to place a small gauze pad over the wounds, secured with paper tape for protection.

Over the next two months, he was seen for routine follow-up and his use of the device was discreetly tracked by the device's internal compliance monitor. The following clinical outcomes were noted:

1) The patient's lower extremity edema totally resolved and he was able to discontinue the diuretics he was taking for his history of CHF.

2) His cellulitis resolved completely.

3) His wounds healed completely.

4) He began to see hair growth once again on his legs.

Equally dramatic, the dystrophic changes in his toenails began to disappear (Figure 2). These pictures were taken two months after the patient began home treatment with the NormaTec PCD. The proximal third of his right great toenail is no longer dystrophic, and the same striking outcome can be seen on all his other toenails.

Discussion

Wound care specialists often struggle to heal wounds that stubbornly persist for months, if not years. Often, little real improvement is seen, and at times the wounds actually worsen, despite dedicated healthcare practitioners and time-consuming and expensive treatments.

Today's modern wound care centers focus primarily on the importance of maximizing the wound microenvironment in order to promote healing. Dirty wounds are cleaned, necrotic tissue is debrided, infections are treated with antibiotics, weight-bearing surfaces are off-loaded, and advanced wound dressings, ointments, and growth factors are liberally employed.

Almost all patients with non-healing wounds, however, have some clinically significant degree of underlying circulatory compromise caused by arterial, venous, or lymphatic insufficiency. Often, there is pathology in two or even all three of these vascular systems. Even those with "normal" vascular studies may have poor microcirculation because of such comorbidities as diabetes, obesity, and atherosclerotic disease.

Additionally, there may be very high tissue pressure in the wound area due to indolent cellulitis, lymphatic engorgement, induration, fibrosis, or edema. The excessive tissue pressure further inhibits adequate arterial, venous and lymphatic microcirculation, resulting in chronic, non-healing lesions, even after achieving a favorable microenvironment.

These patients often have additional signs and symptoms of PVD, including claudication, diminished pulses, loss of hair, and dystrophic toenails.[4]

Recently, pneumatic medicine was developed to address peripheral microcirculatory compromise. It sharply highlights the vast physiological difference between static pressure and dynamic compression to improve peripheral microcirculation. Normal physiology uses several dynamic compression mechanisms, such as the muscle pump of the legs and peristalsis, to aid circulation and fluid flow.

Accordingly, wound healing treatments should move away from non-physiological static pressure techniques to the more dynamic compression strategies that promote

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and enhance microcirculation.

The pneumatic medicine home treatment program used in this patient case study not only effectively treated the patient's peripheral edema and healed his chronic wounds, but the other signs and symptoms of his PVD, including hair loss and dystrophic toenails, which significantly improved. Further research to assess the effectiveness of pneumatic medicine on PAD is presently underway. ■

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Dr. Laura Jacobs holds a Ph.D in Bioengineering, an M.D. from Temple University School of Medicine, and is Board-certified in Physical Medicine and Rehabilitation (PM&R). Before founding NormaTec, Dr. Jacobs was medical director of in-patient PM&R at Temple University Hospital. She also served five years as Chief of Physical Medicine and Rehabilitation at Cooper Hospital/University Medical Center. Dr. Jacobs currently serves as NormaTec's President & CEO; under her direction, the company manufactures and distributes the NormaTec PCD, an advanced Pneumatic Compression Device prescribed by licensed healthcare practitioners throughout the country. She is a Fellow of the American Professional Wound Care Association.