Case Studies

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Case No. 1
This 53-year-old woman underwent a modified radical mastectomy and lymph node dissection for cancer in the left breast (10/20 nodes were positive). The patient’s past medical history was positive for adult onset diabetes, high blood pressure and severe obesity. Lymphedema of the arm onset immediately after surgery. The surgical wound separated partially a few days after surgery at the axilla (armpit) and across the anterior chest, but appeared to be healing until radiation began.

During radiotherapy, all wounds increased in size. Three months after completing radiotherapy, the patient was referred for treatment of left arm lymphedema and, at that time, the wounds showed no evidence of healing. Since the wounds were in the irradiated field, skin oxygen levels were measured with transcutaneous oximetry. Values of 59mm/Hg and 77mm/Hg were within a range usually associated with healing. (See below for further discussion of radiation and low tissue oxygen levels.) The two wounds on the anterior chest were painful and covered with yellow fibrin. A less painful but larger wound persisted along the suture line at the axilla.

After over twelve weeks of MLD and bandaging, the left arm volume decreased 1000 cc. The two anterior chest wall wounds were treated with Accuzyme, an enzymatic debriding agent, to remove the yellow fibrous material. With this regimen, the anterior chest wall wounds closed after approximately 12 weeks.

For the deeper and less painful axillary wound, treatment with negative pressure wound therapy was instituted (the V.A.C., Kinetic Concepts Inc., San Antonio, TX). With this technique, a small sterile sponge is placed into the wound bed and sealed air-tight with a transparent film. A small tube penetrates the sponge and extends to a machine which pulls a gentle suction, on the wound bed 24 hours a day. The axillary wound granulated after 10 days of V.A.C. therapy. At that point the wound was too small to contain the sponge material and the remaining wound defect was filled with Duoderm paste (Convatec) and covered with a Duoderm hydrocolloid pad. Gradual epithelialization followed and the wound was completely healed six weeks after the V.A.C. was discontinued.

DISCUSSION

The treatment of a chronic wound in the setting of lymphedema is a complex problem. Optimal therapy requires that the needs of each wound be assessed individually and treatment directed appropriately. If the wound is under the compression bandages, then it is vital to choose a dressing product that can be changed with frequent CDT treatments.

Negative pressure wound therapy is an exciting new technology which was created initially to manage highly exudative, large post-operative wounds. However, the benefits of negative pressure (“suction”) in wound healing also can be extended to smaller wounds. The approximately 125 mm/Hg suction creates a number of beneficial effects on the wound. Local tissue edema fluid is removed, along with wound drainage, into a disposable canister.

The removal of edema fluid raises tissue oxygen levels and rids the wound
of inhibitory growth factors. The continuous removal of wound drainage also decreases the bacterial load of the wound, perhaps by as much as 1000 times when compared to control wounds. Most importantly, the mechanical suction stimulates cells in the wound bed to release large amounts of growth factors. This results in the formation of new capillaries and "granulation tissue." In animal trials, the V.A.C. increased the formation of granulation tissue by 63% compared to saline dressings. Once complete granulation is achieved, the V.A.C. is discontinued so that skin can grow over the wound.

**DISCUSSION**

Draining wounds in a patient with elephantiasis can be a frustrating and challenging problem for both patient and caregiver. We have had patients come in to the clinic wearing garbage bags to contain the amount of fluid draining from lower extremity wounds. The key to wound management is control of edema. When compression is initiated, drainage may actually increase as fluid takes the path of least resistance and exudes from the wound. As edema comes under better control, drainage diminishes. Patients with venous stasis often have stasis dermatitis and cellulitis and have many challenges with regard to skin care. Topical steroids, topical moisturizers and, sometimes, systemic antibiotics are necessary.

While not all patients with venous stasis have lymphedema, some patients with longstanding venous insufficiency do develop secondary lymphedema. When edema is limited to areas below the knee, prepackaged "kits" such as Profore and Dynaflex can be useful. However, in those patients with more extensive lymphedema, a more aggressive approach to bandaging in conjunction with MLD is necessary. Naturally, in patients who are morbidly obese, weight loss is the most helpful thing patients can do for edema control, but usually the most difficult.

**Case No. 3**

This 75-year-old white male developed left leg lymphedema after treatment for a Merkel's cell carcinoma on the skin on the left lateral knee. After local excision of the cancer, he underwent radiation therapy to leg and groin, and surgical dissection of multiple inguinal lymph nodes on the left. The wound (which was the original skin cancer excision site) had been present for six months at the time of his initial evaluation and had no evidence of granulation tissue. The periwound skin was tender and red.

On the unaffected leg, erythematous areas consistent with eczema were noted as well. Since the wound was in an irradiated field, transcutaneous oximetry studies were performed. This non-invasive test allows measurement of the number of oxygen molecules diffusing to a heated electrode placed adjacent to the wound. Tissue oxygen levels adjacent to the wound were only 4 mmHg and 21 mm/Hg (normal values should approach 60 mm/Hg or more). The minimum tissue oxygen levels associated with healing are felt to be approximately 30 mmHg, the healing potential for this wound was poor. Therefore, the patient underwent a course of 30 hyperbaric oxygen therapy treatments. Duoderm, a hydrocolloid dressing, was changed every three days.

Upon completion of Hyperbaric oxygen therapy, the wound was fully granulated. The patient was then begun with longstanding venous insufficiency and development of lymphedema. When edema is limited to areas below the knee, prepackaged "kits" such as Profore and Dynaflex can be useful. However, in those patients with more extensive lymphedema, a more aggressive approach to bandaging in conjunction with MLD is necessary. Naturally, in patients who are morbidly obese, weight loss is the most helpful thing patients can do for edema control, but usually the most difficult.

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on daily applications of Regranex® gel (Becalpermin), a prescription platelet derived growth factor (PDGF) created from gene cloning technology (Ortho-McNeil). The radiation skin changes were treated with Biafine, and the eczema was treated with Protopic ointment. MLD and bandaging to manage the lymphedema were continued throughout the course of hyperbaric treatment and the subsequent wound care. The wound healed approximately five months after initial treatment was begun.

**DISCUSSION**

Clearly this represents an unusual case in which multiple therapies were necessary to heal a wound compromised by lymphedema and local radiation. However, general wound care principles were used throughout 1) Correct hypoxia if possible, 2) maintain a moist wound bed, 3) control edema, and 4) treat underlying skin conditions.

Radiation therapy can injure normal tissue, leading to a progressive obliterative endarteritis with resultant tissue ischemia and fibrosis. Hyperbaric oxygen for radiation-damaged tissue was first introduced in the 1970s. The entire body is placed in a pressure vessel or chamber, and patients breathe oxygen under increased atmospheric pressures, usually about 2 to 2.4 times sea level. The increase in atmospheric pressure causes increased levels of oxygen to be carried by the blood plasma, and this dramatically increases tissue oxygen levels. Several well-defined protocols based on human trials have been developed over the years. The daily increase of oxygen tensions in soft tissue has been shown to stimulate growth of functioning capillaries (angiogenesis), fibroblast proliferation, and collagen synthesis. No other technology which has been proven to encourage blood vessel growth in irradiated fields and therefore HBO₂ may be the only option for many patients with soft tissue radionecrosis.

PDGF created by recombinant technology (rhPDGF or Regranex®) has been shown to be beneficial in accelerating the healing of chronic wounds including pressure ulcers, venous stasis ulcers and diabetic foot ulcers. Applying exogenous growth factors does not alter the normal healing sequence, but augments the rate of matrix deposition, resulting in more rapid wound closure. Clinical trials utilizing rhPDGF have also demonstrated the importance of debridement in wound healing. Surgical debridement improved healing rates in both control and Regranex® patients. Regranex®.01% gel is applied once per day in a thin film over the wound bed and covered with a moist dressing. A second dressing change with only a moist dressing 12 hours later is recommended in the prescribing guidelines, but we have not found this to be absolutely necessary. If the wound has not decreased in size by >30% over 8 weeks, it is unlikely that Regranex® will be of further benefit.

Regranex® should be stored in the refrigerator. Regranex® is currently FDA approved for diabetic neuropathic foot ulcerations which have an adequate blood supply. Its use here was “off-label” but still appropriate under the circumstances. A well healed wound was the result. This case also emphasizes the need for patience in treating chronic wounds. In a wound compromised by lymphedema and local radiotherapy, many weeks may be necessary to achieve a healed wound, even with the latest technology.

References are available upon request; to receive a copy via fax or email, call 510-208-3200, or email nln@lymphnet.org.

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