Case Report

Measured improvement in rate of healing of venous ulceration

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In Western countries nearly 1% of the population is affected by venous stasis disease, a disorder of impaired venous blood flow to the heart, owing to, for example, a clot, obstruction or obesity. Obstruction of venous blood causes oedema, pigmentation and lipodermatosclerosis (hardening of the skin). People with venous stasis disease are at risk of developing venous stasis ulcers (Falanga, 1993).

Venous stasis ulcers can be recognized by their irregular shape and ragged borders, which help distinguish them from the 'punched out' lesions caused by arterial disease. Beyond arterial and neuropathic ulceration, other diagnoses (such as pyoderma gangrenosum, vasculitis, cutaneous lymphoma, squamous cell carcinoma and basal cell carcinoma) are relatively rare and are excluded by biopsy after compression therapy does not lead to positive healing rate. Systemic conditions that induce ulcers that look like venous stasis ulcers include vasculitis, cryoglobulinaemia and coagulopathy (Falanga, 1993).

The venous congestion that initially predisposes an affected limb to ulceration also impedes healing by compromising microcirculation and reducing oxygen delivery to the extent that venous return is obstructed, excess fluid accumulates extracellularly and creates highly exudative wounds that can compromise patient fluid and electrolyte balance. Copious exudate can also become a culture medium for bacterial colonization, which interferes with the epithelization and granulation required for healing (Salcido and Goldman, 2000).

Most wounds that present as venous stasis are treated successfully with compression alone. Compression, however, might be limited by pain. Pain is frequently associated with venous stasis ulceration (Lippmann et al, 1994).

Vacutex

Vacutex, manufactured by Protex Capillary Dressings, is a non-invasive wound dressing, made of cotton and polyester fibres with a proprietary weave technique. Vacutex capillary action is a non-woven, three-layer non-adherent dressing which consists of a 65% polyester and 35% cotton-fibre layer sandwiched between two opposing 100% polyester outer layers.

The materials themselves are the vehicles for the efficacy primarily owing to the construction or weave: the non-woven outer layer draws fluid and debris away from the wound and into the central zone, where fibres are laid out orthogonal to the outer layer fibres. This weave technique claims to absorb protein and bacterial debris by capillary action, enabling debridement of wounds with necrotic eschar to a granulating base more rapidly than standard dressings (Russell et al, 2001).

Vacutex carries a low risk of medical complications because it is a non-invasive dressing consisting of material very often found in clothing: polyester and cotton. As might be expected, Vacutex has been found to be completely benign to living systems in a series of in vivo and in vitro tests (North American Medical Science Associates, 2000).

The following case study demonstrates how Vacutex, when added to standard compression, might have contributed to wound healing.

Abstract

This case study describes a pivotal intervention associated with improved wound appearance and healing rate in a young, active woman with extensive venous stasis ulcers. These extensive ulcerations were heavily exudative and covered by a layer of yellow eschar. Yellow eschar and drainage were successfully managed with a capillary dressing (Vacutex), which promoted therapeutic compression as applied by standard dressings. This case provides data in favour of wound care protocols featuring Vacutex, specifically designed to address the consequences that wound drainage and eschar have in dramatically large venous stasis ulcers.

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Accepted for publication: January 2003

British Journal of Nursing, 2003, Vol 12, No 3
CASE PRESENTATION

The following case is of a 29-year-old Caucasian female, patient A, who experienced extensive lower extremity venous stasis disease and ulceration following the birth of her second child.

Two years before her presentation at a tertiary wound care referral clinic, patient A had given birth to a healthy second child after an uncomplicated pregnancy. Her past medical history was non-contributory except for a previous episode of left lower extremity deep vein thrombosis and the use of oral contraceptives (associated with an increased risk of deep vein thrombosis) between the ages of 20 and 25 years.

However, following the birth of her second child, patient A developed severe lower extremity oedema and extensive stasis ulcerations involving the left leg.

Laboratory and clinical testing, including multiple skin biopsies, failed to identify a specific aetiology for her condition, but she received a course of corticosteroids one year after presentation for presumed vasculitis. Skin grafting was subsequently attempted for her left lower extremity ulcerations but the grafts dislodged after 2 weeks.

In the meantime, the young mother continued to be troubled by recurrent cellulitis and bacteraemia, requiring at least one hospitalization for the intravenous administration of antibiotics. Patient A presented to our clinic 18 months after wound onset.

The ulcers on the left leg of patient A were particularly painful, regardless of activity. The patient reported very severe pain both at rest and with dressing changes. By the time of referral to our tertiary wound care centre, she required morphine sulphate controlled-release, 90 mg thrice daily, and morphine sulphate immediate-release, 45 mg every 2 hours for effective pain control. She had been amenorrhoeic (missing her menstrual cycle) for 2 years. She was unable to return to work and frequently required her mother’s help to watch her children while their father was at work. The extensive ulceration had induced a condition of chronic pain that interfered with her mobility and activities of living.

At the time of her first evaluation in our wound care clinic, her venous stasis ulcers covered 1000 cm² of her left leg, almost half the entire area of the leg from ankle to knee. These multiple wounds were in large part covered with a tenacious yellow eschar.

Four foci of care were identified during the initial consultation (Table 1).

In addition to encouraging elevation, and along with effective pain management, the clinic instituted ‘high-level’ long-stretch elastic compression (e.g. use of two rolls of self-adhesive elastic dressing, Coban, manufactured by 3M, applied in a spiral pattern with more than 50% overlap from toe to knee). In addition to a daily visiting nurse, we instructed the patient and a family member in compression bandage wrapping. Their involvement permitted a significant change in the patient’s wound care as dressing changes could now be done once daily.

The wounds were determined to be infected three times throughout the course of treatment, and in each case they were treated with antibiotics. Silver sulfadiazine was applied directly to the wound to reduce bacterial count and soften eschar (Monaco and West, 1990). With the eschar softened, we were able to remove eschar every 2 weeks with sharp debridement preceded by viscous lidocaine application. Over this, non-adherent gauze and heavy gauze was placed to collect copious exudates, and over this,

Table 1. The four foci of care for patient A

1. Pain issues had created significant barriers to functional recovery and local wound care. Cooperative management with an affiliated pain clinic was needed. The patient’s baseline analgesia was initially consolidated and somewhat reduced, and very short-acting topical and systemic agents were introduced at the time of dressing (such as oxycodone hydrochloride immediate-release).

2. Nutrition had been an ongoing problem with the patient, with a continuing loss of highly proteinaceous exudate. Albumin was checked during the initial consultation and was 3.6 g/dL; this dropped to 2.9 mg/dL 4 months after the initial evaluation. An albumin less than 3.5 g/mL indicates poor nutrition. The patient was started on vitamins A and C, as well as zinc. The patient was able to improve her nutritional status with protein supplements. Good nutrition is key to the management of chronic wounds as evidenced by clinical practice guidelines (Bergstrom et al, 1994; McGuckin et al, 1996).

3. Oedema management typically includes use of diuretics. However, this patient was hospitalized with pre-renal azotemia (with creatinine of 2.5 mg/dL) 2 months after the initial evaluation, indicating intravascular fluid depletion. Copious drainage from these extremely large wounds contributed to fluid loss and limited the use of diuretics. As coexisting metabolic and nutritional derangements precluded the use of systemic diuretics in this patient, external compression became the primary means of combating oedema.

4. The patient’s leg pain defeated previous attempts to apply compression dressing with enough pressure to reduce oedema.
bulky rolled gauze, unrolled and applied toe to knee was placed. Over the bulky gauze self-adhesive long-stretch compression dressing was placed (Cohan).

This regimen, carried out over 7 months, stabilized the wound area and limited (but did not prevent) the build-up of eschar. However, during this time we were unable to effect a significant improvement in wound appearance or reduction in size.

Vacutex was introduced 7 months into our treatment course. The dressing was initially applied on day 211 of treatment, at which time total wound surface area was stagnant and had a persistent tenacious yellow eschar component (Figure 1).

The patient’s pain medication at the start of the Vacutex regimen included controlled-release morphine sulphate 160 mg and immediate-release morphine sulphate capsules 45 mg with dressing changes.

Two months later (40 days after start of treatment with Vacutex), there was clear epithelization noted above midleg, evidenced by new, hypopigmented epidermis (Figure 2). Additionally, below midleg there was a resolution of heavy yellow exudate. All wounds had a granulating base (Figure 3). These illustrations underscore in this setting the ability of Vacutex capillary dressing to remove tenacious ‘sloughy’ eschar.

After 4.5 months (130 days) of treatment with Vacutex, the wounds above midleg were almost healed, and by 30 days the wounds had completely closed. At this time, Vacutex was discontinued (11.5 months after initial evaluation).

Healing rate is graphed in Figure 4. After an additional 2 months (430 days after initial evaluation), the wounds below midleg additionally progressed towards complete closure.

Unfortunately, the patient became non-compliant with keeping appointments and wearing a compression stocking on the non-wounded leg and resumed smoking. Smoking may reduce microcirculation (Leow and Stineman, 1998). Hypoxia is also present at the edges of venous stasis wounds, so the combination could have made these wounds more hypoxic. As a result of non-adherence with treatment, the patient was referred to another wound clinic and was lost to follow-up.

**DISCUSSION**

Despite problems with achieving complete wound closure, Vacutex was associated with a ‘turnaround’ in the course of healing at a point where wounds were so large that amputation of the limb was considered. What appears to be the success of Vacutex might be a result of superior absorptive
capacity of inflammatory exudate from the wound, coupled with the thinness of the dressing (i.e. less than 2 mm). This thin dressing replaced thick bulky combined pads, substantially increasing effectiveness of compression dressings, while at the same time wicking up copious exudate.

This capillary dressing might serve to maintain a moist environment, auto-debride 'sloughly' wounds without maceration and shear of fragile skin. Removal of digested slough quickly and efficiently might promote healing. It is hypothesized that proteases within exudate of chronic wounds digest growth factors so these factors are unavailable to stimulate healing activity (Palanga, 2002).

For patient A, eschar auto-debridement, protease removal and re-establishing moisture balance might all have contributed to the positive results obtained.

Positive results in terms of improved wound appearance with less 'slough' was the result of a randomized multicentre clinical trial conducted by Russell et al (2001), who compared Vacutex with other dressings, and concluded through visual assessment that 76% of wounds treated with Vacutex improved, compared to 35% conventionally.

**CONCLUSION**

Several features of venous stasis ulcers, including pain, oedema, inflammatory exudate and tenacious eschar, make the design of effective treatment protocols especially challenging for a patient such as the patient described in this case study.

Vacutex provides a practical solution by addressing both significant oedema and tenacious eschar. Excess interstitial fluid was controlled by a combination of effective compression and capillary action of the Vacutex dressing. Vacutex, in addition to absorbing exudate, may auto-debride wounds, reducing the opportunity for ulcer-sustaining infection. Eschar as non-viable proteinaceous material serves as excellent bacterial growth media. A high bacterial count perpetuates inflammation, pain drainage and chronicity. Copious drainage and pain were hallmarks of the presentation of patient A, which decreased markedly after application of Vacutex. As inflammation subsides, pain resolves and wounds progress towards healing.
MEASURED IMPROVEMENT IN RATE OF HEALING OF VENOUS ULCERATION


KEY POINTS

- The positive outcome of a single case, even if dramatic, cannot prove or disprove the effectiveness of a technique or product.

- The hallmark for treatment of venous stasis ulceration is compression.

- Vacutex is a capillary dressing which can absorb significant exudate and auto-debride eschar while maintaining therapeutic compression.

- Pain management is a critical component of care in venous stasis ulcers, and may be a barrier to applying therapeutic levels of compression.

- Proteinaceous eschar is a nidus for bacterial colonization and infection, and debridement of this eschar is essential to prepare the wound bed for healing.

- Wound tracings are a good way to follow the week-by-week progress of a chronic wound towards healing (and if the outcome is negative make timely corrections in technique).