CASE REPORT

Methacrylate dressing on refractory venous leg ulcers

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SUMMARY

Chronic leg ulcers can have a major impact on the quality of life of patients. These wounds can be complex and hard to heal, as several factors may affect the outcome. Underlying conditions, bacterial growth and excess moisture may prevent wounds from healing. We describe the case of a patient with known chronic venous disease, who was admitted to our hospital for several complex, irregular and infected chronic venous ulcers in his lower legs. The management was frustrating for several months, until we began to use methacrylate powder dressing for his hard-to-heal wounds.

BACKGROUND

The management of venous leg ulcers, also known as insufficiency or varicose ulcers, can be frustrating. They become chronic if the presence of wounds along the lower leg persists for more than 4 weeks. These wounds are strongly associated with venous disease (heart failure, varicose veins and deep vein thrombosis).¹ Flow obstruction contributes to the risk of venous ulceration. In areas that are susceptible to small traumas, such as the lower leg and toes, vascular congestion prevents these wounds from healing. According to some studies, these wounds may take 24 weeks to heal, and 15% never heal. The rate of recurrence can be as high as 40%.²

Debridement, whether surgical or chemical, moisture and infection control and regular dressing replacement are the cornerstone of the management of chronic leg ulcers. Also, treating some underlying causes, such as high pressure in the leg veins, or controlling factors contributing to poor healing, such as anaemia, hypoproteinaemia or malnutrition, is key to managing venous ulcers. However, despite proper handling, the standard management may fail, and other therapies, such as negative-pressure wound therapy, skin grafts and novel dressings, may be considered as an alternative option.¹

CASE PRESENTATION

A 47-year-old man was admitted to our hospital with skin ulcers on his legs. The patient was referred by his general practitioner because of a high degree of suspicion of bacterial infection. According to his medical history, he had experienced several episodes of deep vein thrombosis in both legs since the age of 17 and had developed post-thrombotic syndrome. He had hyperhomocysteinaemia and protein S deficiency. Due to these conditions, he was on acenocoumarol (a vitamin K antagonist) and folate 5 mg

a day. The skin ulcers appeared approximately 20 years before the patient sought medical care. Our patient acknowledged apathy and idleness. He eventually sought additional medical help because of the large amount of exudate. He had unsuccessfully treated himself with compression bandages and moist gauzes.

On examination, there were two ulcers on the left leg. The first ulcer, on the medial malleolus, measured 5×4 cm and was 1 cm deep (figure 1, slide B). The surrounding skin was fragile and scaly, with signs of inflammation, and the borders were erythematous and necrotic. The wound bed was exudative.

The second wound was L-shaped, spreading from the tibial medial surface to the anterior surface. It measured 12×10 cm and was 1 cm deep, with irregular, erythematous and macerated borders (figure 1A). The bed was covered with slough and was highly exudative.

The right leg had a wound that measured 15×10 cm and was 1 cm deep, with erythematous, exudative borders, with slough covering the bed and very fragile skin surrounding it (figure 1C). Overall, the physical examination drew our attention to the extensive loss of soft tissue.

INVESTIGATIONS

The patient underwent ultrasound of both lower limbs, which ruled out deep vein thrombosis. A vascular surgeon evaluated the wounds, ruled out significant peripheral arterial disease in both legs and proposed a diagnosis of chronic venous insufficiency ulcers. He considered the wounds to be candidates for non-surgical treatment.

Diagnosis of osteomyelitis should begin with plain radiographs, but they have poor sensitivity and specificity and they do not rule out the diagnosis of osteomyelitis, especially in acute infection. CT could not be performed because of the chronic kidney disease (creatinine 2.4 mg/dL, estimated glomerular filtration rate 31 mL/min/1.73 m²). MRI was selected because of great value in the diagnosis and evaluation of osteomyelitis, for it shows anatomic detail, including cortical destruction and soft tissue extension. We therefore decided to perform an MRI of both legs to assess the extension of the wounds, which also ruled out bacterial osteomyelitis (figure 2).

The wound cultures confirmed the polymicrobial colonisation. *Pseudomonas aeruginosa*, *Stenotrophomonas maltophilia*, *Enterobacter cloacae*, *Corynebacterium striatum* and *Staphylococcus*

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Figure 1 (A) Wound spreading from the medial tibial surface to the anterior surface in the left leg. (B) Wound on the medial malleolus. (C) Wound on the anterior tibial surface of the right leg. All these ulcers showed necrotic tissue on their bed and erythematous, exudative borders.

aureus were some of the isolated strains during the follow-up. We considered the ulcers were infected if redness or swelling of the skin around the ulcer, foul smell or greenish exudate were present. Several antibiotic regimens were therefore initiated when appropriate: ceftazidime, linezolid, piperacillin/tazobactam, meropenem and ciprofloxacin.

TREATMENT, OUTCOME AND FOLLOW-UP

First of all, we initiated an appropriate antibiotic therapy, along with regular wound care, debridement and dressing changes.

In terms of wound care, clostridiopeptidase A (Irujol Mono Ointment) was used for enzymatic debridement of necrotic tissue and slough in the bed and borders of the wounds. The wounds were then treated with collagen and silver dressing (Promogran Prisma Matrix) to promote granulation. Over these layers, we used a contact layer with silicone (Mepitel One). When the wounds were moderately to heavily exuding, Promogran Prisma was replaced by a highly absorbent alginate dressing (Biatain

Alginate). The bandages were replaced three times a week, or daily in the case of highly exudative wounds.

Over the weeks that followed, the wounds were improving, both the bed and the borders were clean, and granulation tissue was appearing in the bed of the wounds. However, every time the antibiotic treatment was withdrawn, the wounds worsened, with erythematous and fragile borders, sloughing in their bed and development of a foul smell and exudate.

Antibiotic therapy was repeatedly restarted, and new therapies were proposed, such as the treatment with an endothelin receptor antagonist, Tracleer, a drug for pulmonary arterial hypertension, which is also indicated to reduce the number of new or ongoing digital ulcers in patients with systemic sclerosis.³

Platelet-rich plasma (PRP) was also proposed, as this concentrated source of blood plasma and autologous conditioned plasma may contain growth factors and cytokines that can stimulate the healing of soft tissue. However, none of the aforementioned therapies were approved by our hospital.^{4,5} Skin grafts performed by dermatologists or plastics surgeons were not approved, either.

We then used negative-pressure wound therapy, but the wounds worsened. The patient also underwent 40 sessions of hyperbaric oxygen therapy chamber, as may be indicated in non-healing ulcers in diabetes mellitus,⁶ with no success.

In November 2015, we proposed Altrazeal, a lyophilised powder of methacrylate derivatives. This powder was poured over the entire bed and borders of the wound, then mixed with Prontosan or physiological saline solution before being covered with Mepitel One dressing. An adhesive sterile dressing (Mepore) was fixed to the healthy skin. The whole dressing was replaced three times a week for the first 2 weeks, then weekly. After 20 weeks, we observed an almost complete re-epithelisation of both the bed and the borders of the wounds (figure 3).

DISCUSSION

Venous leg ulcers are very common and can represent a major cause of morbidity among the susceptible population. As a chronic recurring condition, their management can be frustrating. In our patient, the first steps consisted of a well-known algorithm¹: debridement of the wound, control of the exudate and moisture, infection control and addressing any underlying conditions.

Tests for venous and arterial diseases are essential to rule out associated aetiologies that could prevent the wounds from

Figure 2 (A) Shows the coronal plane of the T1-weighted image of the right leg, with extensive and severe ulceration of the skin and loss of subcutaneous tissue (arrow), with no signs of osteomyelitis. (B) Shows the left leg, with the same findings as the right leg but with remarkable diffuse muscular atrophy (arrow).

Figure 3 A (left leg), B (medial malleolus of the left leg) and C (right leg) show the improvement and the almost re-epithelised surfaces of the ulcers when compared with the images in figure 1.

improving.¹ Despite our patient's prothrombotic state, both deep vein thrombosis and arterial disease were ruled out.

However, the standard management with multilayer dressing was not effective. We observed improvement periods alternating with exudative, sloughing and infected wounds. The fact that we were unable to achieve long-term improvements led us to come up with new alternatives, such as skin grafts, Tracleer therapy and PRP, which were not approved for our patient and negative-pressure wound therapy and hyperbaric oxygen therapy chamber, which showed no improvement.

The treatment with methacrylate dressing has been used for surgical wounds, slow-healing wounds, venous leg ulcers and exuding ulcers.⁷ The powder, when applied to the exudative wound bed, interacts with the moisture, aggregates and forms a porous, healing surface environment. Positive results have been reported with this therapy when used for diabetic foot⁷ and skin graft donor sites in patients with burn.⁸ Infection control has also been reported when using this methacrylate dressing.⁹

Some other publications have reported positive outcomes when using this lyophilised powder of methacrylate.¹⁰

By describing our patient's case, we would like to highlight the good clinical outcome after using Altrazeal, while other treatments had failed or were unsuccessful.

Learning points

- ▶ Venous leg ulcers may represent a problem among the susceptible population, such as patients with chronic venous disease or heart failure, in terms of the impact on quality of life, economic burden and morbidity.
- ▶ A multidisciplinary approach is essential to address these chronic wounds: surgical or enzymatic debridement, infection control, moisture control and regular dressing replacement.
- ▶ Methacrylate powder dressing may form a protective barrier to control moisture and prevent further bacterial growth. Our experience with Altrazeal was positive after other therapies had failed.
- ▶ We would like to emphasise that although this case report has been focused on the methacrylate dressing, the diagnosis and management of leg ulcers involve a multidisciplinary team, such as nurses, dermatologists, surgeons and internists. The target should therefore be the management of factors that contribute to avoid or slow down the healing rather than a specific dressing.

Finally, a word must be said about allergic contact dermatitis caused by methacrylates. This kind of adverse reactions is often seen in dentists, nail technicians, printers and fibreglass workers. Clinical manifestations related to allergic contact dermatitis include hand eczema and pulpitis. Physicians should therefore be aware of symptoms suggestive of contact dermatitis related to the use of methacrylates. In such cases, patch test for diagnosis could be useful to assess contact sensitisation if eczematous reactions appear in the application site of these dressings.^{11 12}

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