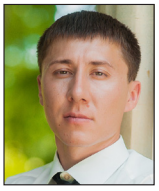
Use of a bioplastic material containing hyaluronic acid on a chronic leg ulcer



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Chronic leg ulcers of various aetiologies are commonly seen in a regional dermatology unit in Russia and patients are treated with a range of surgical and therapeutic techniques. An important trend in the modern treatment of patients with complex chronic ulcers is the adjunctive use of a new group of dressings made of bioplastic materials. These dressings can stimulate tissue repair and regeneration. This case report describes the successful use of G-Derm® (G-Groupp) — a polymer of hydrocolloid hyaluronic acid and peptide complex — in the management of a large, long-standing leg ulcer.

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The Burn Centre at Leningrad Regional Hospital is located 10km from St Petersburg, Russia. It provides specialised care for patients with burns of various aetiologies, area and depth (53%), as well as frostbite (17%), chronic leg ulcers, non-healing wounds and pressure ulcers (14%), as well as the consequences of burns, such as scar deformities and contractures (16%). Between 450 and 500 patients are hospitalised annually, with 80% requiring surgery.

Alongside pharmacotherapy and surgical correction, the local stimulation of regenerative processes with new wound dressings based on natural and synthetic polymers, including living skin cells (keratinocytes and fibroblasts), growth factors and cytokines, as well as biotechnological methods for restoring the skin[1-3], has become a key trend in modern treatment of patients with complex chronic ulcers.

A new group of bioplastic materials[4-6] is now available for use as a wound covering. One such material is G-Derm — a product of polymerisation of hydrocolloid hyaluronic acid and peptide complex *[Figure 1]*.

Case report

A 65-year-old woman (Mrs C) was treated at the Leningrad Regional Hospital's burn centre in 2013 for an extensive chronic venous ulcer (170cm^2) on the right tibia.

On presentation, she complained of pain, muscle cramps and constant heaviness and swelling in her legs and feet, which intensified after work and decreased after sleep. She had varicose veins on both legs.

The patient was obese (BMI = 43). She worked as a train conductor for 40 years so was standing all day and she occasionally carried out heavy lifting. Her diet over the past 30 years was poor. At the age of 35, Mrs C first noticed fatigue in the lower extremities and the emergence of a venous skin pattern in her legs. She did not see a doctor, however. The chronic ulcer of the right shin first appeared just over a decade previously (2003), after a minor injury at home. For 5 years, she self-medicated and during this time, the ulcer area tripled in size.

In 2010, she suffered dermabrasion and dermoplasty was performed on the right shin, however, the patient was non concordant with the surgeon's recommendations. Mrs C later refused surgical correction of venous blood flow and the ulcer recurred.

The patient was a non-smoker with no known family history of venous disease. She was not diabetic and had no known allergies.

Wound assessment

The ulcer was on the posterior-medial side of the right shin. On assessment, it had an area of 170 cm^2, with purulent discharge, medium levels of exudate, some evidence of granulation and some areas of necrosis. The ulcer surface was uneven with jagged recesses and dense, puffy edges. *Staphylococcus aureus* (10^6 microbial cells per 1g of tissue) was present on swabbing *[Figure 2]*.

According to the patient, the ulcer reduced her quality of life due to motor activity limitations and reduced the possibility of self-care. The presence of a fetid smell and exudate caused discomfort in Mrs C's everyday life.

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***All references translated from Russian**

Figure 4. The wound on day six with evidence of improvement.

Figure 5. View of the healed ulcer, 11 months after discharge.

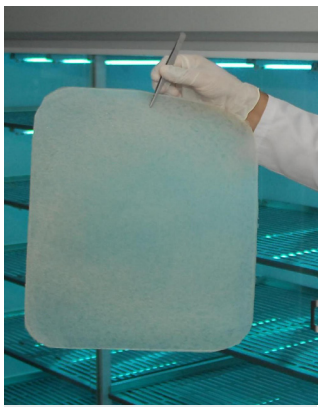

Figure 1. Bioplastic material.

Figure 2. View of ulcer on admission to hospital.

Figure 3. Day one after bioplastics application.

The patient was assigned complex conservative therapy involving antimicrobial cleansing, simple dressings and compression therapy. On the fifth day after the start of treatment, after relieving the local inflammatory reaction and seeing signs of improvement, Mrs C was offered surgical correction of venous blood flow, which she refused.

Rationale for planned intervention

Due to Mrs C's categorical refusal of surgery, it was decided to use a bioplastic wound covering based on hyaluronic acid on the sixth day of her hospitalisation. In order to use the bioplastic material, the following steps were followed:

1. The wound surface was cleaned with gauze and an antiseptic solution. Nonviable tissue and wound detritus was removed.
2. The ulcer surface was cleaned with a Volkmann spoon. Dense callous ulcer edges were excised with a scalpel.
3. From the excision of wound edges, rounded epidermis fragments 1–2mm in diameter were taken. These were placed in sterile saline solution at 36–37˚C.
4. The plate of bioplastic material (hyaluronic acid film) was cut to the size and shape of the ulcer to cover the entire wound.
5. After application to the wound, the material tightly fixed to the surface. Rounded pieces of skin (1-2 mm in diameter) were removed from the saline and placed in holes on the surface of the material. After filling all of the holes with pieces of tissue, they were covered with a second layer of bioplastic material, which was replaced daily.

On the second day after the procedure, the patient reported significant pain reduction in the ulcer area. The biomaterial was tightly fixed to the ulcer, had a dark colour, and there were no signs of inflammatory changes in the wound or surrounding tissue *[Figure 3]*.

On the sixth day following the procedure, a partial biodegradation of the bottom plate of material, located on the wound, could be observed. There was marginal epithelialisation of the wound surface (areas of rounded transplanted skin grafts), and a decrease in the ulcer area *[Figure 4]*.

On days 7–14, the wound was covered with two additional layers of bioplastic material with 1-2 mm autografts. Epithelialisation was observed on day 15. The patient was discharged from hospital on day 21.

There was no relapse over the follow-up period and the leg was healed after 11 months *[Figure 5]*. The patient has an active lifestyle and was encouraged to continue wearing compression stockings, take phlebotropic drugs and undergo physiotherapy.

Conclusion

The bioplastic method is a simple and effective way to restore skin in chronic ulcers of various aetiologies. The technique has proved to be effective in the surgical treatment of long-standing ulcers in patients who are opposed to traditional therapy. Bioplastics has been shown to reduce the healing time by 13–16 days, and the amount of exudate by 16–23% ($P \leq 0.01$)[7]. There were no reported side-effects or allergic reactions to the bioplastics at any stage of observation in this case. The method allows clinicians to reduce the duration of treatment and improves patients' quality of life.