



Regenerative Surgery for the Definitive Repair of a Vasculitic Nonhealing Ulcer Using Platelet-derived Growth Factors and Noncultured Autologous Cell Suspension

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Summary: Vasculitic ulcers are caused by numerous disorders and may be chronic if not well treated. Various modalities of treatment, both medical and surgical, are available. We describe the case of a 63-year-old patient with a vasculitic ulcer treated with platelet-derived growth factors and noncultured autologous cell suspension collected by an innovative single-use device (ReCell). (*PRS GO 2013;1:e19; doi:10.1097/GOX.0b013e318295a2be; Published online 23 May 2013.*)

Vasculitic ulcers are a highly heterogeneous group of diseases caused by numerous disorders including rheumatoid arthritis, autoimmune diseases, and cryoglobulinemia.

The common denominator is constituted by an inflammatory process that affects the blood vessels, both arterial and venous, of small caliber. The inflammation is usually immune-mediated with a massive deposition of fibrin; this causes the so-called plug or fibrin thrombus that occludes the vessel, leading to ischemia downstream.^{1,2}

Vasculitic ulcers can be single or multiple and present necrosis and fibrin congestion.

These lesions tend to be chronic if not well treated; they may cause extreme pain that often leads to worsening of the patient's quality of life with depression, loss of self-confidence, anxiety, and irritability.³

Various modalities of treatment, both medical and surgical, are available.

Full-thickness skin grafting is an effective advanced therapy that is easy, safe, and inexpensive; however, it is difficult for ulcers of large areas and requires a well-cleaned wound bed rich in granulating tissue.

Tissue engineering approaches were developed in the 1970s and allowed the reconstruction of the epidermis from cultured autologous cell populations isolated from small autologous skin biopsies.²⁻⁴ However, the use of cultured cells is not always suitable for a one-step procedure because it may require many hours or even overnight incubations for cell separation and delaying surgery for optimal culturing may compromise the results.⁴⁻⁶

Recently, in Australia, an innovative single-use device (ReCell) allows the collection of autologous cells processed from a split-thickness skin biopsy. The resulting cell suspension is a mixed population containing keratinocytes, melanocytes, and fibroblasts that promotes re-epithelialization with a faster healing outcome in particular if compared to cultured cells.⁷ Use of the ReCell kit permits the preparation of cells from a skin donor site without the use of a specialized laboratory or laboratory staff.⁷⁻⁹

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We decided to treat a vasculitic ulcer with platelet-derived growth factors that are involved in tissue remodeling by mesenchymal cell recruitment and extracellular matrix synthesis with a noncultured autologous cell suspension collected by ReCell.

METHODS AND RESULTS

We describe the case of a 63-year-old patient with peripheral polyneuropathy who came to our attention presenting a leg vasculitic ulcer.

The lesion was characterized by exposure of the tendon that seemed necrotic (Fig. 1). An antibiotic therapy was started after microbiological examination positive for *Pseudomonas aeruginosa* and *Staphylococcus aureus*.

We performed surgical curettage and hydrogel dressings for 2 weeks. Successively we applied continuous Vac Therapy on wound bed for 3 weeks with a change of the sponge every 3 days.

The wound bed appeared cleaned for which we decided to accelerate the formation of granulation tissue by applying platelet gel and hyaluronic acid dressing which were held in place for 10 days. Afterward, the patient underwent noncultured autologous cell suspension graft associated to infiltration with platelet lysate.

The right inguinal region was selected as the preferred donor site. After local anesthesia by infiltration, we performed a skin levy (1 cm²) which was then processed by the enzymatic dissociation and release solutions supplied with the ReCell system to obtain a mixed cell population (keratinocytes basal cells, fibroblasts, melanocytes, and Langerhans cells) (Fig. 2).



Fig. 1. Leg vasculitic ulcer characterized by exposure of the tendon that seemed necrotic.

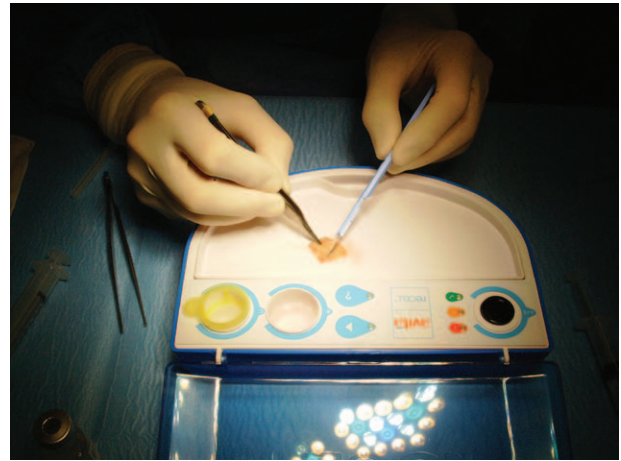


Fig. 2. The skin levy was processed by the enzymatic dissociation and release solutions supplied with the ReCell system.

The platelet lysate was infiltrated into the edges of the wound and then it was mixed with the cell suspension that was applied by dripping to cover all over the ulcer bed previously anesthetized (Fig. 3).

Figure 4 shows the result after 20 days.

DISCUSSION AND CONCLUSIONS

The cultures of autologous epidermal cells that are also effective in the treatment of chronic ulcers require a highly qualified laboratory and staff and incur high costs.

A recently developed procedure using a stand-alone system permits the preparation of a suspension of autologous cells. This medical device allows coverage of large areas of ulcerated skin using a small skin flap. In fact, with a levy of 1 cm² of skin,



Fig. 3. The platelet lysate was mixed with the cell suspension that was applied by dripping to cover all over the ulcer bed.

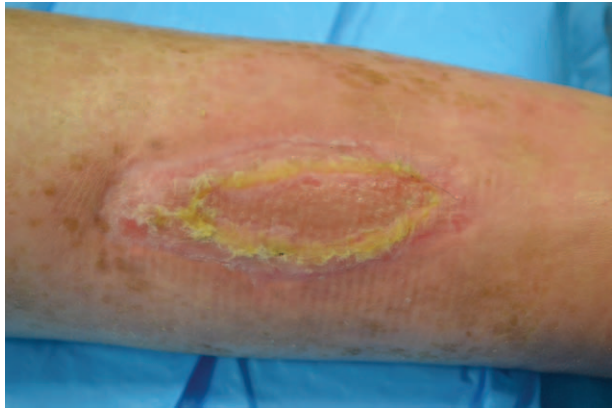


Fig. 4. The picture shows the complete closure of the ulcer after 20 days.

you get enough matrix to cover an ulcerated area of 80 cm².³

A single ReCell suspension may contain approximately 1.7×10^6 viable cells per cm² harvested tissue from the dermal epidermal junction.⁷

This one-step process is simple to apply clinically, without the need for a cultured cell population. Compared to the epidermal cell cultures, it has the advantages of making cells immediately in the same operative session and it is less expensive. Homologous growth factors, found in the platelet lysate and infiltrated in and around the lesion, in addition to recruit and differentiate stem cells, favor the engraftment of cells in suspension, keeping them viable and increasing their proliferation.

Our innovative procedure can be compared to a “low cost” culture of keratinocytes and allows to obtain, in a very short time, a skin coverage of the treated surface.

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