Brief report

The use of plasma rich in growth factors (PRGF-Endoret) in the treatment of a severe mal perforant ulcer in the foot of a person with diabetes

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1. Introduction

In some people with diabetes injuries caused by weight bearing remain painless due to the presence of poor vascularity and impaired sensation resulting from sensory neuropathy. Continued weight bearing and pressure of keratotic lesions on the underlying dermis eventually cause necrosis and ulceration [1]. Approximately 15–20% of people with diabetes may develop a foot ulcer during their lifetime [2]. Ulcers are the leading cause of amputation in the United States and the second leading cause of hospitalization of people with diabetes [3].

The management of a mal perforant ulcer is difficult, time-consuming, expensive and resource intensive requiring wound care treatments, offloading, and dedicated monitoring [4].

We report the use of autologous proteins and fibrin material obtained from plasma rich in growth factors (PRGF-Endoret) technology as a novel approach for the management of mal perforant ulcers. PRGF consists of a limited volume of plasma enriched in platelets that is easily obtained from the patient and which has potent wound healing and tissue regenerative potential together with an anti-inflammatory activity [5–7]. Apart from releasing a wide range of biologically active proteins, PRGF enables the development of a biocompatible fibrin material, which acts as a biological membrane.
and as a growth factor slow delivery scaffold to regenerate soft tissues.

2. History and examination

Our patient was a 71 year old woman with type 2 diabetes, insulin treated since 2002 with microangiopathy and diabetic polyneuropathy. From 2002 to March 2009, the patient had amputations of the 1st, 2nd and 3rd toes of right foot due to persistent ulcers. In October 2009, she was admitted to the unit of vascular surgery of Santiago Apostol Hospital (Vitoria, Spain) due to a severe mal perforant ulcer on the right foot. An infection in the 4th toe caused an ulcer with bone exposed, which finally resulted in amputation of the toe. The mal perforant ulcer persisted, was associated with edema, and became deeper and approached the dorsal aspect of the foot. Mal perforant ulcer is an easy portal of entry for bacteria, increasing the risk of soft tissue and bone infection. On November 12th, 2009, the patient underwent a dorsal incision at the foot to insert a drain to prevent ulcer infection (Fig. 1A). At that time, the perforant ulcer occupied a wide volume of the foot tissue, and a stiletto was easily introduced thought it. After drainage, a sample was taken to test the presence of infection, but this was negative.

On November 20th, 2009, 48 mL of blood were drawn from the patient and was centrifuged in order to obtain the PRGF formulation. The PRGF volume was drawn off in three consecutive fractions: fraction 1 (F1): the 2 mL volume of plasma located at the top of the tubes; fraction 2 (F2), the next milliliter of plasma below F1; and fraction 3 (F3) the milliliter of plasma located just above the sedimented red cells, avoiding collection of the buffy coat. Platelet enrichment of each plasma fraction (F1, F2, and F3) was 1.13, 1.56 and 1.72-fold, respectively.
To treat the mal perforant ulcer, F3 was activated with calcium chloride and collected with a 5 mL syringe. The syringe was connected to a sterile cannula and introduced into the mal perforant ulcer from the dorsum to the sole of the foot. The perforant ulcer was filled with the activated F3. The fibrin membrane obtained from the activation of half-volume of F1 was plug in the plantar ulcer to avoid the loss of F3. After that, the activated F2 was infiltrated around the borders of both exterior ulcers (Fig. 1B). Two fibrin membranes obtained from the rest of F1 were placed over external ulcers as a dressing (Fig. 1C). Throughout treatment, off-loading was also placed over the sole to reduce the load on the ulcer. Forty-eight hours after the treatment, there was some impediment to insertion of the stiletto in perforating ulcer, indicating that the tissue regeneration process had been initiated.

By December 12th, 2009, the mal perforant ulcer was completely healed and dural ulcers were only present at the dorsum and sole of the foot (Fig. 1D). A second treatment with PRGF (prepared from 18 mL of blood) was applied. The remaining superficial ulcers were treated by border infiltrations with F3 and topically using a fibrin membrane from F1 as a dressing.

By February 1st, 2010, the ulcers were completely healed (Fig. 1E and F) and the patient could return to her normal life.

3. Discussion

The optimal wound healing of foot ulcers includes debridement, control of possible infection, and maintenance of a moist environment [4]. However, when these actions fail and ulcer healing is impaired, additional therapies, such as cellular therapies, complementary therapies, dermal matrix equivalents, and exogenous growth factors may be considered [8–12].

In recent years, several studies have reported the effects of different platelet rich products in diabetic ulcers, obtaining successful results in ulcer healing [13–17]. However, none of these have reported the treatment of severe ulcers, such as mal perforant ulcers.

To our knowledge, this is the first report in the literature where autologous proteins from a platelet enrichment system were applied to heal a severe mal perforant ulcer. Although preliminary, this case report may shed light on the potential of PRGF for accelerating the healing of severe mal perforant ulcers.

Conflict of interest

The authors have a competing interest to declare. E.A., F.M. and G.O. are involved in a foundation that investigates the potential of plasma rich in growth factors in regenerative medicine.

REFERENCES