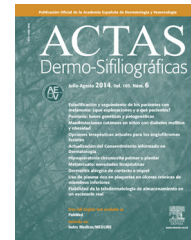




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## ORIGINAL ARTICLE

# Use of Platelet-Rich Plasma in the Healing of Chronic Ulcers of the Lower Extremity<sup>☆</sup>



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Received 6 August 2013; accepted 21 December 2013

Available online 17 June 2014

### KEYWORDS

Platelet-rich plasma;  
Chronic ulcer;  
Lower extremity

### Abstract

**Introduction and objectives:** Platelet-rich plasma (PRP) is used as an adjuvant in the treatment of chronic ulcers of the lower extremity and has shown particularly promising results in the case of neuropathic ulcers. There has been less research, however, into its use in venous and hypertensive ulcers. Our aim was to assess the safety and feasibility of using PRP in the treatment of chronic ulcers of the lower extremity and to evaluate its potential benefits in directed healing. **Material and methods:** We prospectively selected 11 patients with nonischemic ulcers of the lower extremity that had been present for at least 6 weeks. PRP was injected subcutaneously into the perilesional tissue and applied topically in 4 sessions held at 1-week intervals. We assessed quality of life (SF-12 questionnaire), pain (visual analog scale), and the circumference of the ulcer before and after treatment.

**Results:** There was a predominance of women (8/11, 73%), and venous ulcers (7/11, 64%) were more common than hypertensive ulcers (4/11, 36%). The median age of the patients was 79 years and the median time since onset of the ulcer was 17 months (range, 6-108 months). We observed a significant reduction in pain ( $P < .05$ ) and a significant improvement in the physical and mental components of the SF-12 ( $P < .05$ ). The mean reduction in ulcer size was 60%, and complete healing was achieved in 5 cases. No adverse effects were observed.

**Conclusion:** The local application of PRP is a valuable and practical procedure that promotes the healing of chronic ulcers of the lower extremity; it can improve patient quality of life and is particularly effective in local pain relief.

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<sup>☆</sup> Please cite this article as: Salazar-Álvarez AE, Riera-del-Moral LF, García-Arranz M, Álvarez-García J, Concepción-Rodríguez NA, Riera-de-Cubas L. Uso de plasma rico en plaquetas para cicatrización de úlceras crónicas de miembros inferiores. Actas Dermosifiliogr. 2014;105:597–604.

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**PALABRAS CLAVE**

Plasma rico en plaquetas;  
Úlcera crónica;  
Miembros inferiores

## Uso de plasma rico en plaquetas para cicatrización de úlceras crónicas de miembros inferiores

### Resumen

**Introducción y objetivos:** El plasma rico en factores plaquetarios (PRP) ha sido utilizado como terapia adyuvante en el tratamiento de úlceras crónicas de miembros inferiores (UCMI), con resultados particularmente esperanzadores en las úlceras neuropáticas. Sin embargo, su uso en úlceras venosas e hipertensivas ha sido menos estudiado. Nuestro objetivo es valorar la seguridad y factibilidad del uso del PRP en UCMI y estimar sus beneficios en la cicatrización dirigida.

**Material y métodos:** Se trata de un estudio prospectivo. Fueron seleccionados 11 pacientes con úlceras en miembros inferiores de más de 6 semanas de evolución, de etiología no isquémica. Se administró PRP en inyección subcutánea perilesional y aplicación tópica, en 4 sesiones separadas por una semana. Se suministraron cuestionarios de calidad de vida (SF-12), se registró el dolor (escala visual analógica) y el perímetro de la úlcera antes y después de su aplicación.

**Resultados:** Hubo predominancia de mujeres (8/11 = 73%) y de úlceras venosas (7/11 = 64%) sobre las hipertensivas (4/11 = 36%). La mediana de edad fue de 79 años y el tiempo medio de evolución de la úlcera de 17 meses (6-108 meses). Se evidenció una disminución estadísticamente significativa del dolor ( $p < 0,05$ ) y mejoría mental y física de la calidad de vida ( $p < 0,05$ ). Se evidenció una reducción media en el área de las úlceras del 60%, con 5 cicatrizaciones completas. No se registraron eventos adversos.

**Conclusión:** La aplicación local de PRP en úlceras crónicas de miembros inferiores representa una herramienta válida, de uso práctico en la cicatrización dirigida, que puede mejorar la calidad de vida de estos pacientes, siendo particularmente útil en el control del dolor local.

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## Introduction

Chronic ulceration of the lower extremities refers to a group of diseases that, through different pathophysiological mechanisms that alter the normal physiological healing process, have the common outcome of the appearance and tendency to progression of a solution of continuity of the skin below the level of the knees for a period of 6 weeks or longer.<sup>1</sup>

The treatment of chronic leg ulcers, whatever their etiology, consists fundamentally of the treatment of the primary cause (arterial or venous disease, neuropathy, etc.) and simultaneous local treatment of the ulcer, with the application of dressings, drugs, or factors that together promote restoration of the normal physiological healing process.

Platelet-rich plasma (PRP) is the plasma fraction derived from autologous blood that, after processing, has a higher platelet concentration than at baseline.<sup>2</sup> PRP has been used as adjuvant therapy for the treatment of chronic leg ulcers, and the results in neuropathic ulcers in diabetic patients have been very promising.<sup>3-5</sup>

It serves both as a sealant and as a medium for drug delivery.<sup>6</sup> In addition to its notable anti-inflammatory effect,<sup>2,3</sup> the contents of the  $\alpha$  granules are released to act locally to stimulate the initiation of healing (platelet-derived growth factors, transforming growth factor  $\beta$ , platelet factor 4, interleukin-1, platelet-derived angiogenic factor, vascular endothelial growth factor, epidermal growth factor, platelet-derived endothelial growth factor, epithelial cell growth factor, insulin-like growth factor, osteocalcin, osteonectin, fibrinogen, vitronectin, thrombospondin-1).<sup>7</sup> Furthermore, some studies have shown

that PRP has antimicrobial activity against *Escherichia coli*, *Staphylococcus aureus*, *Candida albicans* and *Cryptococcus neoformans*.<sup>8,9</sup>

The objective of this prospective study was to describe an outpatient protocol for the use of plasma rich in platelet-derived growth factors for the topical treatment of chronic leg ulcers of nonischemic etiology in order to evaluate the feasibility and viability of its routine use and to estimate its potential benefit in targeted healing.

As we describe a protocol for outpatient use, ulcers of ischemic etiology were excluded as those patients are admitted for semi-urgent revascularization procedures.

## Materials and Methods

Patients were selected from the targeted-healing outpatient clinic between December 2011 and January 2013.

Patients included in the study were those who, after at least 6 weeks of supervised treatment at our center, presented no clinical improvement or reduction in the surface area of the ulcer (determined photographically). Prestudy outpatient treatment consisted of the application of occlusive moist dressings, as long as the attending physician considered the risk of infection to be sufficiently low.

After checking that patients satisfied the inclusion criteria and presented none of the exclusion criteria (Table 1), a maximum of 4 local applications of PRP were performed at 1-week intervals (Table 2). Preparation of the autologous plasma to obtain the fraction rich in platelet-derived factors to be employed in the treatment was the accepted method standardized by the scientific research committee

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