Dermatology Practical & Conceptual

Line-Field Confocal OCT and Clinical Correlation in Plaque Psoriasis Treated with Calcipotriol/Betamethasone Dipropionate and Polyaphron Dispersion Technology

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Introduction

Psoriasis (PsO) is a chronic inflammatory skin condition driven by inflammation, leading to keratinocyte hyperproliferation and abnormal differentiation, with both innate and adaptive immune responses playing key roles. PsO presents as well-demarcated erythematous plaques covered with white or silvery scales, varying in size and thickness [1]. Histologically, PsO is characterized by acanthosis, inflammatory infiltration, and neovascularization. Mild psoriasis is defined as body surface area (BSA) ≤10% or a psoriasis area and severity index (PASI) ≤10. Topical treatments, used alone or in combination with systemic therapies, must overcome challenges such as plaque thickness and drug pharmacokinetics. Effective topical treatments require an optimal combination of formulation and active ingredients. Line-field optical coherence tomography (LC-OCT) is a non-invasive imaging technique providing detailed in vivo visualization of skin architecture, facilitating the diagnosis and monitoring of inflammatory skin diseases [2,3]. Polyaphron dispersion (PAD) technology is a novel drug delivery system that enhances drug penetration through a nonpolar solvent core encapsulated in a multilayered structure of surfactants, oil, and water, forming a three-dimensional architecture around the oil droplet. In vitro studies have demonstrated significantly higher drug flux through human epidermis with a calcipotriene/betamethasone dipropionate (CAL/BDP) PAD-cream compared to an oil-based CAL/BDP gel [4]. This study evaluated LC-OCT for monitoring therapeutic responses in PsO following treatment with CAL/BDP PAD-cream (50 mcg/g + 0.5 mg/g).

Case Presentation

The study was conducted at the Dermatology Unit, University Hospital of Siena, Italy, in compliance with the Declaration of Helsinki. Ten patients (5 males, 5 females) with mild

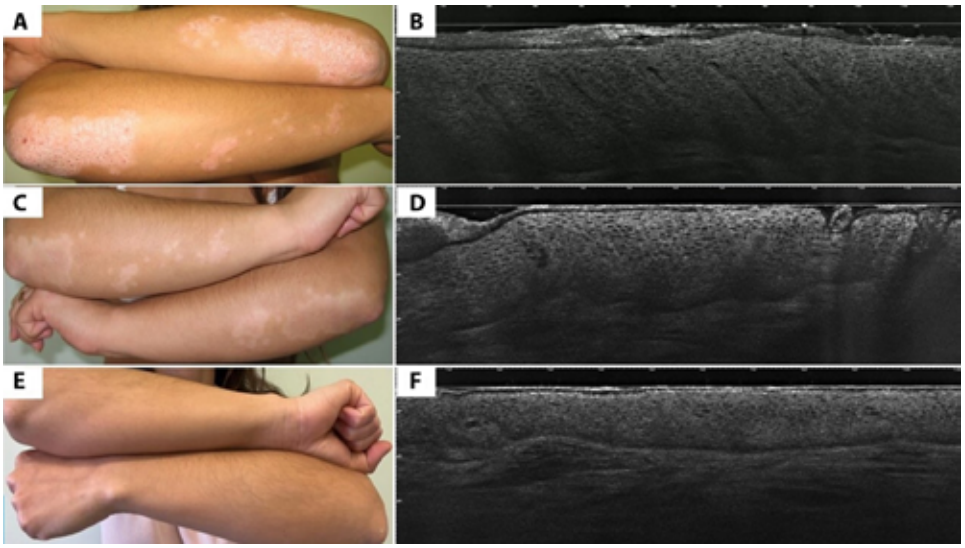

Figure 1. (A) Clinical presentation of plaque psoriasis at baseline. (B) Line-field confocal optical coherence tomography (LC-OCT) examination at baseline. Vertical section showing an increase in corneal layer and in epidermal thickness with hypergranulosis, and a well-defined DEJ was evident as a hypo-reflecting line with a wavy appearance; hypo-reflective canalicular vessels were visible within dermal papillae. (C) Clinical presentation at 4-week follow-up. (D) LC-OCT examination at 4-week follow-up. Vertical section showing a normalization of the thickness of the corneal layer, a reduced undulation of the dermo-epidermal junction, and hypergranulosis of the epidermidis. (E) Clinical presentation at 8-week follow-up. (f) LC-OCT examination at 8-week follow-up. Vertical section showing a flattening of the dermo-epidermal junction and resolution of hypergranulosis.

psoriasis on the elbows participated, providing informed consent. None had received systemic therapy during the study. The clinical severity was evaluated using a lesion score (LS), designed considering erythema, desquamation, and infiltration. LC-OCT was performed at baseline after four and eight weeks. Paraffin oil was applied to the skin surface prior to imaging to minimize refraction. Patients applied CAL/BDP PAD-cream, two fingertip units, once daily for four weeks, then twice weekly for the subsequent four weeks. Patients were instructed to avoid emollients or oil-based baths throughout the observation period. At baseline, lesions appeared as moderately infiltrated erythematous-desquamative plaques (mean LS 6.8±1.3) (Figure 1A). LC-OCT revealed increased corneal and epidermal thickness with hypergranulosis. The dermo-epidermal junction (DEJ) appeared as a hypo-reflective wavy line, with hypo-reflective canalicular vessels visible within dermal papillae (Figure 1B). By week 4, patients reported clinical improvement, with reduced hyperkeratosis and infiltrate (mean LS 3.2±0.8) (Figure 1C). LC-OCT demonstrated normalization of corneal layer thickness and reduced DEJ undulation, though complete flattening was not achieved. Hypergranulosis remained unchanged (Figure 1D). At week 8, seven patients achieved complete remission (mean LS 1.1±0.9) (Figure 1E). LC-OCT findings showed DEJ flattening and resolution of hypergranulosis (Figure 1F). All patients completed the study without side effects.

Conclusion

PAD technology enhances drug penetration and supports patient adherence to topical treatments. LC-OCT is a valuable tool for accurate, non-invasive monitoring of treatment response, offering deeper insights than do traditional clinical evaluations. Standardized digital parameters are needed to objectively quantify lesion characteristics and their changes during therapy.

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