

Treatment of folliculitis decalvans by photodynamic therapy using a new light-emitting device: A case series of 4 patients



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INTRODUCTION

Folliculitis decalvans (FD) is a rare condition that affects young people, with a slight predominance in males. The lesions start with follicular erythema that progresses to pustules. The pustules evolve into a crust, leading to hair loss and scarring alopecia. The etiology of FD is unknown but could involve an inadequate immune response to *Staphylococcus aureus*, resulting in a chronic inflammatory reaction of the affected area. Treatment of FD can be challenging. The aim of the treatment is to stop the development of pustules and the extension of irreversible alopecia. However, because the disease is rare, we lack sufficient evidence on the efficacy of therapy. In clinical practice, systemic and topical antibiotics, retinoids, dapson, zinc, and/or topical tacrolimus are generally used.¹ Some reports of treatment of FD with photodynamic therapy (PDT) have been published, with encouraging results.^{2,3} These positive results may be due to the antibacterial and immunomodulation effects of PDT.⁴ However, the use of this treatment is limited due to the variability of the illumination as well as the pain it causes, which is considered its main side effect. Moseley et al⁵ showed that 2 commercial light-emitting devices did not provide uniform light and demonstrated that the fluence rate could be 30% lower

Abbreviations used:

FD: folliculitis decalvans
PDT: photodynamic therapy
VAS: visual analog scale

than that delivered to the central zone at a distance of only 2 cm from the central zone. To overcome this disadvantage, the development of a flexible light source appears to be an interesting solution for nonplanar surfaces such as the scalp. Recently, a textile PDT device incorporating light-emitting fabric was developed (Fig 1, A and B).⁶ The treatment of actinic keratosis with textile PDT showed promising results in terms of efficiency and tolerance (visual analog scale [VAS], 0.3/10).⁷ Moreover, the flexible nature of this device appears to be well suited for use on curved surfaces such as the scalp, resulting in uniform illumination.⁶

Here, we report a series of 4 patients with FD treated with textile PDT, showing excellent tolerance and good clinical outcomes.

All 4 patients gave their informed consent. The affected area was delimited, and hair on the edge was cut or shaved to improve the precursor and light penetration. Methylaminolevulinic acid (Metvixia, Galderma) was applied on the affected area and

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Fig 1. **A**, One stripe of the textile device. **B**, Photodynamic therapy with the textile device.

1 cm around. After 30 minutes under occlusion, a transparent plastic dressing and the light-emitting textile device were applied. Illumination was performed with red light (635 nm) for 2 hours and 30 minutes. The light irradiation was between 12 and 37 J/cm², depending on the device.

CASE SERIES

Patient 1 was a 24-year-old man with a 5-year history of FD that had been treated unsuccessfully with multiple antibiotics, dapsone, and systemic retinoids. The physical examination revealed a large area of cicatricial alopecia with numerous erosive lesions and some pustules (Fig 2, A). The symptoms (exudate and pain) caused severe functional impairment. Three sessions of textile PDT at 37 J/cm² were performed at 1-week intervals. Systemic retinoids were stopped on the day of the first PDT session. Tolerance was excellent during the illumination (VAS, 0/10). A few crusts and light erythema spontaneously resolved within 2 days after the treatment. Favorable treatment outcomes were noticeable at 3-month follow-up. There were clear reductions in pain, burning, and oozing, and the pustules had resolved (Fig 2, B). The alopecia was relatively stable, with a slight progression at the center of the alopecic area. Control of the disease lasted for 4 months. Adalimumab 40 mg every 2 weeks was then prescribed, allowing stabilization of the disease.

Patient 2 was a 37-year-old man who received a diagnosis of FD 10 years previously. He had been treated with systemic retinoids and topical and systemic antibiotics without any improvement. He had had no treatment in the past year. The physical examination showed a cicatricial alopecic area, with pustules and crusts on the periphery (Fig 3, A). Three

sessions of textile PDT at 12 J/cm² were performed at 1-month intervals. Tolerance was excellent (VAS, 0/10). Light erythema and edema were noted after each illumination. The evolution was favorable at 3 months, with a decrease of symptoms such as pain and burning and stability of the alopecic area (Fig 3, B). Systemic retinoids were then prescribed for a period of 6 months, allowing stabilization of the disease. At 2 years of follow-up, the disease was stable and the patient only applied topical moisturizers.

Patient 3 was an 18-year-old man who received a diagnosis of FD 2 years previously. Systemic retinoids were contraindicated because of liver fibrosis. He had been treated with systemic and topical antibiotics, which improved symptoms but were stopped after 1 month because of noncompliance. The physical examination showed multiple nodules, pustules, and crusts of the occipital area and the temples, with a few alopecic areas. Three sessions of textile PDT at 12 J/cm² were performed at 1-month intervals. Tolerance was excellent (VAS, 0/10). The evolution was favorable, with no sign of disease activity 6 months after treatment.

Patient 4 was a 38-year-old man with scalp dermatosis that was initially diagnosed as psoriasis. He had undergone multiple treatments for psoriasis, including local corticosteroids and methotrexate, which were partially effective in reducing the FD symptoms. In addition, 40 mg of adalimumab every 2 weeks had been initiated 7 years previously, which reduced the flareups of FD. FD was diagnosed a few years later. Treatment with systemic antibiotics had a partial effect. Despite these multiple treatments, the disease was still active. The patient continued adalimumab throughout the PDT treatment course.



Fig 2. **A**, Before photodynamic therapy: numerous erosive lesions, oozing, and inflammation. **B**, Evolution at 3 months after 3 sessions of textile photodynamic therapy: decrease in erosive lesions, oozing, and inflammation and stability of alopecia.

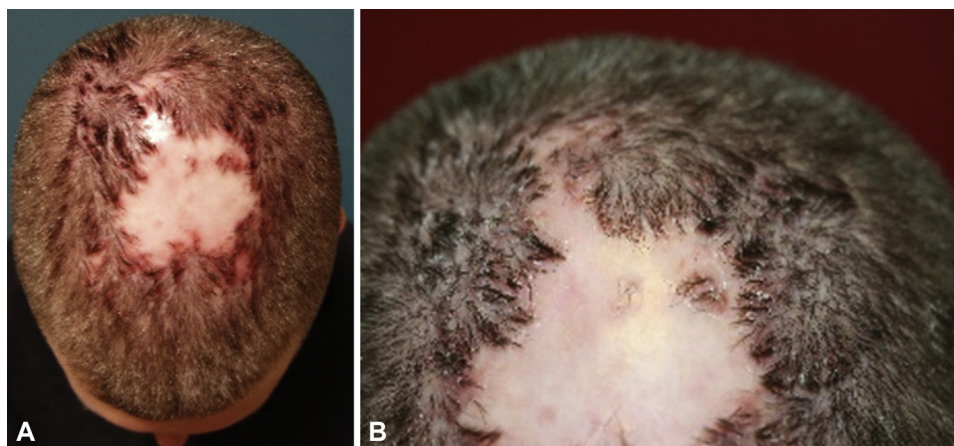


Fig 3. **A**, Before photodynamic therapy: pustules, inflammation, and crusts on the periphery of the alopecic area. **B**, Evolution at 3 months after 3 sessions of textile photodynamic therapy: decrease in inflammation and crusts.

The physical examination showed a large alopecic area 7 cm in diameter with erythema and pustules and symptoms such as itching, burning, and oozing. Three sessions of textile PDT at 12 J/cm² were performed at 1-month intervals. Tolerance was excellent (VAS, 0-2/10). The evolution was favorable, with decreases in erythema, pruritus, and oozing and stability of the alopecia. There was no evidence of flareups in the 6 months following the last session.

DISCUSSION

Our case studies show that PDT sessions resulted in stabilization of FD and a decrease in symptoms in all 4 patients, with excellent tolerance (VAS, 0-2/10). All patients indicated that the reduction of symptoms resulted in a significant improvement of their quality

of life (not assessed with a standardized score). The PDT sessions of the first patient were performed at 37 J/cm², and the PDT sessions of the next 3 patients were performed at 12 J/cm², according to the device available at the time. There was no difference between light irradiation of 12 and 37 J/cm² in the effectiveness of treating actinic keratosis.⁷ One patient was prescribed adalimumab during PDT sessions, which may have had a synergistic effect against FD.

The reported clinical results of treatment of FD with PDT are variable.^{8,9} Miguel-Gomez et al³ reported a prospective series of 10 patients treated by conventional PDT. Nine patients (90%) showed clinical improvement, and 6 patients (60%) had a persistent remission. The main side effect was pain.

In contrast, in a study by Burillo-Martinez et al,¹⁰ PDT resulted in no improvement in all 3 patients and an overall worsening of the disease in 1 patient. All patients experienced discomfort that lasted from 1 to 3 days.

Despite encouraging results in the treatment of FD, conventional PDT has 2 main disadvantages compared with textile PDT: variability of light delivery and pain. These 2 parameters are improved by using new light-emitting devices.^{7,11,12} On the basis of our clinical experience, we believe that monthly to weekly sessions are required until the symptoms are controlled. The disease often recurs a few months after the sessions are stopped.¹ To avoid recurrence, regular sessions of PDT could be performed. Furthermore, a well-tolerated illumination device, such as textile PDT, facilitates multiple sessions.

Systemic antibiotic therapy is currently the first-line treatment for FD, but it can increase bacterial resistance. Higher resistance rates of *S aureus* were shown in a cohort of patients with FD.¹³ Photodynamic therapy has antibacterial effects, with no resistance, and provides local immunomodulation,^{4,14} which could help reduce the use of repeated antibiotic therapies and the risk of bacterial resistance. The bactericidal effect of PDT on *S aureus* biofilm has been shown in vitro, with more than 99% of bacteria killed after the treatment.¹⁵

As with most other treatments used for FD, textile PDT may lead to transient results, but without any systemic side effects or development of bacterial resistance. It could potentially be synergic in combination with other treatments and thus serve as an alternative or combined treatment for FD.

Photodynamic therapy using a new textile light-emitting device had a good outcome and excellent tolerance in 4 patients. This treatment could be an option in selected patients experiencing frequent flareups of FD and resistance to classical therapies.

Conflicts of interest

None disclosed.

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