Successful Treatment of Alopecia Areata Patches with Triamcinolone Acetonide Using MMP®: Report of 2 Cases

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Established Facts

- Alopecia areata (AA) is a chronic, organ-specific autoimmune disease that is often difficult to treat. Corticosteroids are useful, but injections can be painful and increase the risks of cutaneous atrophy at the site of treatment.
- There is a growing interest in new treatments, alone or associated with traditional therapies, to improve clinical results and quality of life in patients with AA.

Novel Insights

- We describe the first 2 cases of AA successfully treated with a novel drug delivery technique.
- MMP® was well tolerated by the patients.
- This technique promotes a more uniform absorption of corticosteroids than traditional treatment methods of AA.

Keywords

Alopecia · Alopecia areata · Steroids · Transdermal therapeutic system

Abstract

Intralesional (IL) injection of corticosteroids is an effective treatment of alopecia areata (AA). A novel drug delivery technique that uses a tattoo machine (MMP®) has been successfully used to treat other skin disorders. We tested this technique to treat AA. We used the Cheyenne dermopigmentation machine (Anvisa 80281110016; Germany) with a 27 Magnum needle cartridge (Anvisa 80281110015) at a frequency of 70 Hz and needle depth of 1.0 mm. A triamcino-

lone acetonide (TAC) solution was placed in a sterile receptacle and loaded onto the cartridge by capillarity. We produced micropunctures of the skin with the medication-soaked needles until the affected area was covered by a bloody dew. Case 1: J.C.V., a male, with a diagnosis of AA in patches was treated with 1-monthly session with 2.5 mg/mL TAC delivered by MMP® (4 sessions in total). Case 2: L.M.V., a 78-year-old female with a diagnosis of AA was treated with 1-monthly session with 10 mg/mL TAC delivered by MMP® (4 sessions in total). MMP® is a novel technique that combines microneedling with drug delivery, and it could be used to deliver IL TAC to AA patients. This technique promotes a more uniform absorption of corticosteroids than traditional treatment methods of AA.

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Introduction

Alopecia areata (AA) is a complex autoimmune disease. It typically presents with sharply demarcated round patches of hair loss that can affect individuals regardless of gender or age [1]. Traditional medical therapies include topical, intralesional (IL), and systemic corticosteroids, other systemic immunosuppressors, contact immunotherapy, UVB narrowband, light therapy, and, recently, JAK inhibitors [1]. Corticosteroids are the most common treatment used by dermatologists. Corticosteroids act by decreasing inflammation and accelerating the recovery of damaged hair follicles [1]. IL corticosteroid injection is an effective treatment that produces complete hair regrowth in 63% of patients within 4 months [2]. However, this can cause cutaneous atrophy at the site of treatment [1], often attributed to variations in medication dilution, volume, and depth of the local injections [3, 4]. Therefore, there is growing interest in new treatments, either alone or combined with traditional therapies, to improve clinical results and the quality of life of patients affected by AA.

The use of dermaroller microneedling for AA is increasing and has gained an important role in trichology in the clinical treatment of androgenetic alopecia and AA [3]. MMP® is a novel drug delivery technique that uses microneedling with a tattoo machine to infuse drugs into

the skin (Fig. 1). It delivers smaller volumes of the drug in uniform depths [4] and has been shown to be a safe, tolerable, and effective modality of drug delivery [4].

We describe 2 cases of AA treated with triamcinolone acetone (TAC) using the MMP® technique.

Case Report

We used the Cheyenne dermopigmentation machine (Anvisa 80281110016; Germany) with a 27 Magnum needle cartridge (Anvisa 80281110015) at a frequency of 70 Hz, and needle depth set at 1.0 mm. We diluted a 40 mg/mL TCA solution in saline to obtain solutions containing 2.5 mg/mL (case 1) and 10 mg/mL (case 2). The diluted solutions were placed in sterile receptacles. We cleansed the patient's scalp with alcoholic chlorhexidine and used a fenestrated drape to delimit the area to be treated. We removed the cartridge from its sterile envelope and attached it to the distal end of the Cheyenne machine. The machine was turned on and the moving needles were placed in contact with the solution in the sterile receptacle. The solution was aspirated into the cartridge through the back and forth movement of the needles. The medication was loaded onto the cartridge by capillarity. We placed the medication-soaked needles perpendicular to the skin for microneedling (1.0-mm depth) and drug delivery. We aspirated more solution to replenish the cartridge, and we repeated the microneedling procedure until the affected area was covered by bloody dew. Patients were instructed not to wash or apply anything to the treated area for 12 h. Sessions were repeated at monthly intervals for a total of 4 sessions. Photographs were taken before and 1 month after the 4th treatment session.

Fig. 1. Motor of the tattoo machine (a) and tattoo machine coupled to a cartridge with sterile needles used to inject triamcinolone acetone (b).

Results

Case 1

A 38-year-old man had a clinical and dermoscopic diagnosis of AA in multiple patches for many years. Previous treatments included oral and IL corticosteroids, topical minoxidil, and vitamins, with variable results and recurrence of the lesions. The last lesion episode presented 1 year and 2 months ago in the absence of treatment for several months. He presented with many patches of hair loss on the frontal, parietal, and occipital areas of scalp hair. Dermoscopy revealed yellow dots, black dots, broken hairs, and some “exclamation mark.” The treatment only consisted of 4-monthly MMP® sessions (2.5 mg/mL of TAC) without other treatments. After the treatment, the patient had complete hair regrowth of the

frontal and parietal areas, and partial regrowth of the temporo-occipital hair implantation (ophiasic) region (Fig. 2).

Case 2

A 78-year-old female patient had a dermoscopic and histological diagnosis of patchy AA for 1 year. She had patches in the frontal and parieto-occipital regions that showed yellow dots, black dots, and broken hairs on dermoscopy. She had previously been treated with biotin 10 mg/day and 5% minoxidil once a day for 4 weeks without improvement. We kept her on topical minoxidil and started monthly MMP® sessions (10 mg/mL of TAC) for a total of 4 sessions. The patient had complete hair regrowth with clinical and dermoscopic improvement in the area (Fig. 3).

Fig. 2. Scalp of a male patient (case 1): multiple alopecic patches before treatment (a, b) and significant hair regrowth after 4 sessions (c, d).

Fig. 3. Scalp of a female patient (case 2): multiple alopecic patches before treatment (a, b) and total hair regrowth after 4 sessions (c, d).

Discussion

IL corticosteroids are the first-line therapy for focal AA. The treatment lasts from 6 weeks to 6 months with corticosteroid administration at a concentration range from 2.5 to 10 mg/mL per session every 3–4 weeks. Although the studies show that high doses are more effective, they also include an increased risk of side effects, especially of skin atrophy [5].

The challenge is to find a way of delivering corticosteroids at an optimal dose with less side effects than the current treatment. The search for new ways of administering corticosteroids seems promising for the improvement in quality of life of AA patients. The use of dermaroller microneedling for hair loss is increasing. Recently, it was used to treat androgenic alopecia [6] and AA [3]. Studies show that the mechanisms of hair regrowth induced by microneedling are the release of platelet-derived growth factor and also epidermal growth factor via platelet activation and skin wound regeneration mechanisms [6].

The first study on the use of microneedling combined with topical TCA for AA was published in 2014 and reported on 2 patients who had not responded well to previous treatment [3]. A dermaroller (depth of 1.5 mm) with topical application of TAC (concentration 10 mg/mL) before and after microneedling was administered for a total of 3 sessions at 3-week intervals. Both patients showed improvement 3 weeks after their last session [3].

These same authors then performed a prospective pilot study in more patients (15 patients: 10 males and 5 females) who had insignificant responses to prior treatments of systemic and topical corticosteroids, minoxidil, and immunotherapy. They used a depth of 0.5 mm for the dermaroller for this study with TAC (10 mg/mL) applied immediately before microneedling [7]. Despite significant responses to this treatment, quantification of hair density, before and after treatment, was not provided [7, 8].

In 2017, Ito et al. [9] used another microneedling device to deliver IL triamcinolone and reported excellent results in 12 patients with patchy AA. TAC (5 mg/mL) was injected into the right side of the scalp, using the 3-microneedle de-

vice with a needle length of 1.5 mm. On the left side, they used the 29-G single insulin needle with TAC every 4 weeks. Six months after the first injection, TMD resulted in significant improvement in patchy AA compared to single-needle injection, and the visual analog scale score for pain was not significantly different between both needle types.

Using microneedling to deliver TCA facilitates the absorption of this immunomodulatory drug. An additional benefit of microneedling is that it induces collagen production, an effect that can limit the atrophy associated with IL corticosteroids [3]. However, randomized controlled studies are needed to prove their efficacy.

MMP® (the Portuguese acronym for *microinfusão de medicamentos na pele* [i.e., microinfusion of drugs into the skin]) is a novel drug delivery technique that uses microneedling with a tattoo machine to infuse drugs into the skin. The procedure was first described by Arbache and Godoy [10] in 2013. MMP® was conceived as a medical drug delivery system based on the ancient tattooing procedure [4, 10–15]. Recently, it has been successfully used to treat skin disorders such as punctate leukoderma, achromic scars, and androgenetic alopecia [4, 10–17]. With the MMP technique, a drug is actively delivered into the skin via needling regardless of its chemical nature (lipophilic or hydrophilic), its molecular weight, bleeding, or exudation [4]. This is a technique that allows the operator to adjust the medication delivery depth and provides more uniform injection of smaller drug volumes than conventional IL infiltrations [4]. These factors increase the safety of this technique [4]. Moreover, we believe that the micropunctures produced by MMP® can also stimulate local growth factor production, an effect that can contribute to hair regrowth by the same mechanism as microneedling with a dermaroller. However, more studies which confirm our results are needed.

We describe 2 cases of AA successfully treated with TAC using the MMP® technique. As shown in the photographs, both patients had noticeable improvement. The partial regrowth of the ophiasic area in 1 patient was not unexpected, since this specific anatomical region has previously been described as resistant to AA treatment [1]. We used different concentrations to evaluate if a lower dose (2.5 mg/mL) of TAC could be effective and if a higher dose (10 mg/mL) would have more side effects. Both concentrations had considerable effects. There were no side effects during or after MMP® treatment. Both patients described the pain during the procedure as mild and did not need a local anesthetic. It is well tolerable for patchy AA, but it can be painful without an anesthetic in patients with alopecia totalis or universalis. After treat-

ment, the patients were followed up monthly for 3 months, and recurrence did not occur. Although responses were significant, the assessment method involving dermoscopic views of affected areas and clinician assessment did not directly quantify hair density. Another limitation of this study was the lack of a control group to determine the effect of TAC-only treatment or MMP® alone. Despite the lack of more objective evidence of improvement, our findings suggest that MMP® is a safe, tolerable, and effective intervention for AA.

Conclusions

MMP®, a novel technique that combines microneedling with drug delivery, was used to deliver IL TCA to 2 patients with AA. Our results indicate that this is a safe and promising intervention to stimulate hair growth in AA patches. However, more studies involving a larger number of patients are needed to confirm our findings. Standardized protocols need to be developed for concentration, needle length, and optimal treatment frequency and duration.

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Statement of Ethics

All patients have given written consent for their details to be described in this paper including publication of images.

Disclosure Statement

The authors have no conflicts of interest to declare.

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Author Contributions

M.B. wrote the majority of the original draft of the manuscript. M.B. and L.G. designed the study, collected, construed, and analyzed the study data, wrote the paper, had access to all of the raw data of the study, reviewed the pertinent raw data on which the results and conclusions of this study are based, and approved the final version of the paper.

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