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CASE STUDY

A case of myasthenia gravis following alopecia areata

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Abstract

We present a case of myasthenia gravis that occurred after alopecia areata and evaluate the literature on the comorbidity of alopecia and myasthenia gravis. A 41-year-old male noticed hair loss on his scalp 4 months ago, and his hair loss progressed with drooping of both upper eyelids and diplopia. Physical and laboratory examination identified the comorbidity of myasthenia gravis and alopecia areata. Prednisolone 10 mg/day and tacrolimus 3 mg/day were administered for 7 days following hospitalization, which served to improve diplopia and ptosis. Following methylprednisolone therapy, hair loss in alopecia areata improved without the enlargement of bald areas. Based on the literature review, a total of 29 cases with alopecia and myasthenia gravis including our case have been reported. Among them, seven cases of myasthenia gravis developed after alopecia. The average time for the onset of myasthenia gravis after alopecia was 16.6 months. Four cases showed other autoimmune disease comorbidity, such as vitiligo, lichen planus, cutaneous lupus erythematosus, and pemphigus foliaceus, suggesting the involvement of Th1-significant immunological states in these patients.

KEYWORD
hair diseases/disorders

1 | INTRODUCTION

Explicit autoimmune responses are triggered through the accidental recognition of autoantigen. The comorbidity of autoimmune diseases is occasionally acknowledged in diverse scenarios,[1] because of the numerous conditions that have been proposed as candidate molecules for the development of autoimmune disease. In this article, we present a case of myasthenia gravis that occurred after alopecia areata and evaluate the literature on the comorbidity of alopecia and myasthenia gravis.

2 | CASE REPORT

A 41-year-old male noticed hair loss on his scalp 4 months ago, and his hair loss progressed progressively with drooping of both upper eyelids and diplopia. He was also referred to our division for a hair loss examination. He had no history of previous autoimmune diseases. On the frontal, parietal, and occipital areas, there were sporadic bald patches that ranged in size from the tip of a thumb to the size of a chicken egg (Figure 1A). The pull test resulted in a positive result. A trichoscopy revealed short vellus hairs and black or yellow spots (Figure 1B). A skin biopsy performed on the area of hair loss revealed inflammatory cell infiltration in the hair bulb (Figure 1C). Alopecia areata was the identified cause of his hair loss.

Furthermore, edrophonium administration reduced upper eyelid drooping. Antiacetylcholine receptor antibody was elevated (0.5 nmol/L; normal range 0.3 mmol/L). A thymoma was not found on the chest computed tomography. As a result, he was given the diagnosis of myasthenia gravis and alopecia areata. Prednisolone 10 mg/

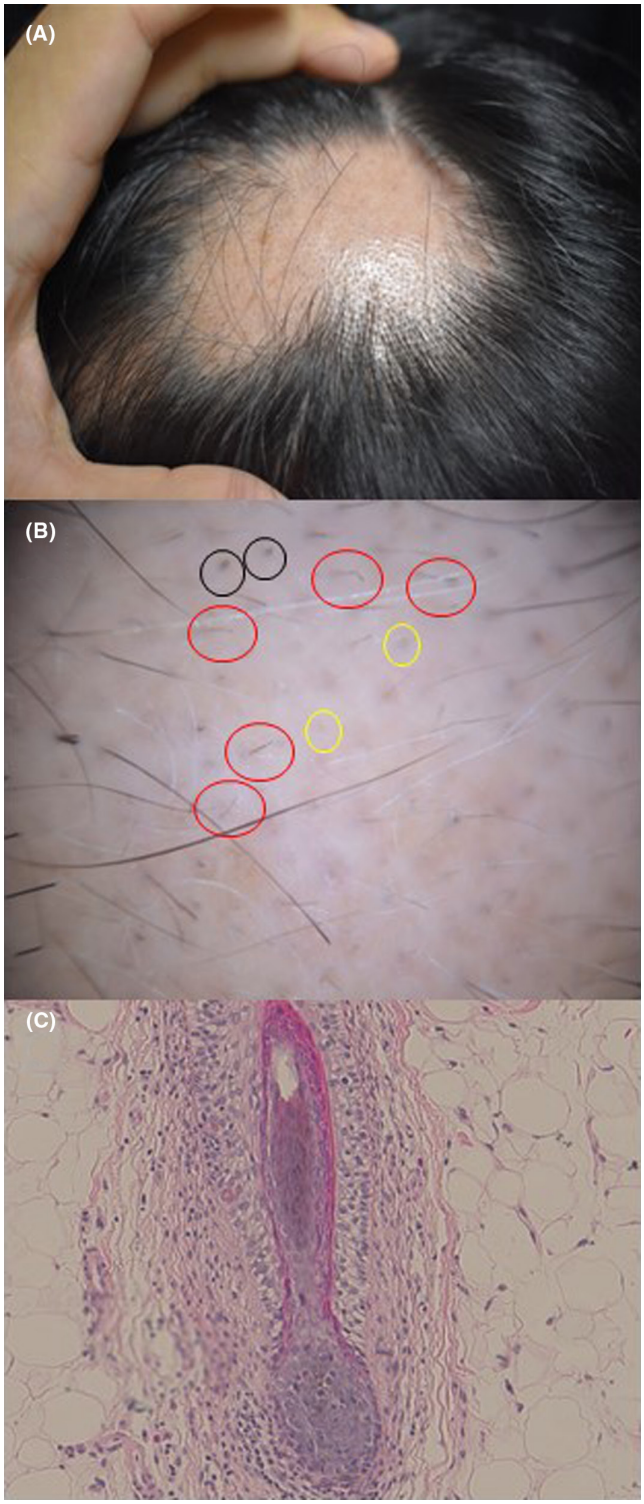

FIGURE 1 Clinical findings and histological analysis. (A) Clinical manifestation of alopecia areata. (B) Trichoscopy findings. A trichoscopy revealed short vellus hairs (red circles) and black (black circles) or yellow spots (yellow circles). (C) Histological findings.

day and tacrolimus 3 mg/day were administered for 7 days following hospitalization, which served to improve diplopia and ptosis. Following methylprednisolone therapy, hair loss in alopecia areata improved without the enlargement of bald areas.

TABLE 1 The reported cases of alopecia and myasthenia gravis.

Authors	Age/sex	Prior disease	Other autoimmune diseases
Dunn C, et al.[5]	60/female	Not described	None
Tajima Y, et al.[6]	51/female	Not described	None
	46/female	MG	None
Nazari F, et al.[7]	38/female	Not described	None
Qiao J, et al.[8]	53/male	MG	Vitiligo, oral lichen planus
O'Sullivan SS, et al.[9]	57/female	MG	Cutaneous lupus erythematosus
Suzuki S, et al.[10]	44/ND	MG	None
	35/ND	MG	None
	38/ND	MG	None
	33/ND	MG	None
	20/ND	MG	None
	20/ND	MG	None
Izumi Y, et al.[11]	49/ND	Alopecia before MG (3 months)	Pemphigus foliaceus
Noguchi Y, et al.[12]	4/Male	Alopecia before MG (3 years)	None
Korn-Lubetzki I, et al.[13]	14/female	Alopecia before MG (1 year)	None
Kamada N, et al.[14]	57/female	MG	None
Kubota A, et al.[15]	46/female	MG	None
	43/male	Alopecia before MG (1 month)	None
	54/male	MG	None
	55/female	Alopecia before MG (3 years)	None
	51/female	MG	None
	35/female	MG	None
Wakata N, et al.[16]	43/male	MG	None
Starink TM, et al.[17]	51/female	Alopecia before MG (2 years)	None
Satoh A, et al.[18]	17/female	MG	None
Ridley CM, et al.[19]	32/female	MG	None
Tan RS[20]	38/male	MG	Lichen planus Vitiligo
Brown AC, et al.[21]	32/female	Not described	None
Our case	41/male	Alopecia before MG (4 months)	None

3 | DISCUSSION

Attacks on hair follicles in the anagen phase by the immune system are hypothesized to disrupt the hair cycle and cause a transition to the regression phase.[2,3] Previous investigations have mentioned the

comorbidity of various autoimmune illnesses. Myasthenia gravis has been linked to genetic polymorphisms in regulatory T cells, and it has also been linked to increased IFN-γ production by effector T cells. Increased IFN-γ causes immunological tolerance surrounding the hair follicle to break seen in alopecia areata, which prompts cytotoxic T cells as part of an autoimmune response.[4]

A total of 29 cases with alopecia and myasthenia gravis including our case have been reported (Table 1).[5–21] Twenty-two cases (75.9%) were Asian population, indicating a possibility of the race different conditions to cause the comorbidity.

Among them, the majority of the progression was from MG to AA, while 7 cases of myasthenia gravis developed after alopecia. The average time for the onset of myasthenia gravis after alopecia was 16.6 months; however, it seems that there are two populations that the disease starts early phase in several months (3 cases) and progresses slowly over a period of 1–3 years (4 cases).

Four cases (13.8%) showed other autoimmune disease comorbidity, such as vitiligo, lichen planus, cutaneous lupus erythematosus, and pemphigus foliaceus. Vitiligo and lichen planus were prevalent in two cases, while cutaneous lupus erythematosus and pemphigus foliaceus occurred in one instance. These autoimmune diseases correspond to the pathogenesis of alopecia areata because vitiligo, lichen planus, and lupus erythematosus, excluding pemphigus foliaceus, are Th1-significant immunological states.[22–24] Interestingly, vitiligo and lichen planus were observed in the same individuals, suggesting a possible Th1-dominant state in these patients.

Although the pathogenesis remains unclear, acetylcholine receptors (AchRs) are found in hair follicles,[25] suggesting that autoimmune reactions to hair follicles may provide an opportunity to recognize the exposed AchRs in hair follicles as antigens, leading to the further immunological development of autoantigens production against AchRs via immunological reactions to hair follicles.

No observation was reported of a clinical course of enhanced autoimmune reaction, such as an increase in anti-AchRs antibodies in previous cases. However, this result was simply a view that has not received much attention in past reports. Fortunately, our case experienced further extended the severity of AA and MG in addition to other autoimmune diseases. From this point of view, there might be a risk of exacerbation of these autoimmune diseases in the future, and our case also needs caution based on this point of view.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

Not applicable.

ETHICS STATEMENT

Approval of the research protocol: N/A.

Informed Consent: The case report was conducted in accordance with the Declaration of Helsinki. The patient gave us consent for her photographs and medical information to be published in print and online with the understanding that this information is publicly available.

Registry and the Registration No: N/A.

Animal Studies: N/A.

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