Efficacy of Oral Iron Supplementation in Treating Patients with Female Pattern Hair Loss and Low Serum Ferritin: A Pilot Study

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To the Editor: Androgenetic alopecia or pattern hair loss (PHL) is the most common cause of non-scarring alopecia in the general population. It is characterized by a gradually progressive decline in hair density and diameter in both sexes.[1] The association between iron deficiency (ID) and hair loss is controversial.[2] Currently, there is no standard oral iron supplementation for patients with Female PHL (FPHL) who have ID. We investigated the efficacy of oral iron supplementation for treating FPHL patients with ID.

Patients diagnosed with FPHL and ID (serum ferritin level <70 μg/l) were included in the study.[3] The FPHL diagnoses were made by dermatologists based on histories, physical examinations, and dermoscopic findings.[4] We excluded patients with other hair diseases (e.g., scarring alopecia, telogen effluvium), scalp inflammatory diseases (e.g., scalp psoriasis, tinea capitis), and systemic diseases that can have an impact on hair loss conditions (e.g., diabetes mellitus, hypo/hyperthyroidism). Patients who had received any other type of hair-thinning treatment in the prior 24 weeks were also excluded.

We performed a 24-week, randomized, open comparative study at a dermatology clinic, Siriraj Hospital, Mahidol University. Twenty individuals were recruited and assigned to two groups of 10 by using block randomization. The treatment group was given 200 mg ferrous sulfate (65 mg elemental iron; Inpac Pharma Co. Ltd., Bangkok, Thailand) orally three times daily after meals, as well as 3% topical minoxidil solution (made by the Department of Pharmacy, Faculty of Medicine Siriraj Hospital, Mahidol University). 50% ethyl alcohol, 25% propylene glycol, and 25% filtered water were used as solution vehicles. Patients were instructed to apply 1 ml of minoxidil twice daily to affected areas of the scalp. The control group was administered 3% minoxidil solution alone, with the same instructions and treatment period.

The primary outcome was a change in terminal hair density (hairs/cm^2) of the target area on the scalp vertex was evaluated from baseline to week 24. Secondary outcomes were global photographic assessments (by two blinded dermatologists), patient satisfaction, and change in serum ferritin and CBC.

Seventeen patients completed the study. Dropouts were unrelated to treatment side effects. Their mean age was 35.2 years, and most (70.6%) had Ludwig grade II. There were no significant differences in the profiles of the two groups, except baseline serum ferritin (Table 1). Consequently, the serum ferritin level was adjusted using multiple linear regression to diminish the baseline difference. The changes in hair densities of the groups were not significant ($P = 0.118$). At week 24, there were no significant differences in physician assessment and patient satisfaction between the groups (Table 2). Side effects reported from iron supplements were dark stools (35.3%), diarrhea (17.6%), nausea (11.8%), gastrointestinal irritation (11.8%), and constipation (11.8%).

Serum ferritin, a main iron-binding protein in nonerythroid cells that decreases in the very early stage of ID, is considered the most effective screening tool for ID.[5] Park and colleagues administered an oral iron

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TABLE 1. Demographic data, baseline clinical characteristics, and laboratory results of patients with female pattern hair loss and iron deficiency.

	Total (N = 17)	Ferrous sulfate and 3% minoxidil solution (N = 9)	3% minoxidil solution (N = 8)	*P* value
Age (years), mean ± SD	35.2 ± 7.4	34.1 ± 6.5	36.5 ± 8.7	0.527
Duration of hair loss (months), median (min, max)	12.0 (2.0, 120.0)	12.0 (4.0, 84.0)	12.0 (2.0, 120.0)	0.618
Comorbidities, n (%)				
Allergic rhinitis	2 (11.8)	0	2 (25.0)	0.206
GERD	1 (5.9)	0	1 (12.5)	0.471
Family history of hair loss, n (%)	9 (52.9)	5 (55.6)	4 (50.0)	1.000
Physical examination				
Ludwig classification, n (%)				
Grade I	4 (23.5)	1 (11.1)	3 (37.5)	0.424
Grade II	12 (70.6)	7 (77.8)	5 (62.5)	
Grade III	1 (5.9)	1 (11.1)	0	
Signs of hyperandrogenism, n (%)	6 (35.3)	3 (33.3)	3 (37.5)	1.000
Hirsutism	2 (11.8)	1 (11.1)	1 (12.5)	1.000
Acne vulgaris	4 (23.5)	2 (22.2)	2 (25.0)	1.000
Oily skin	3 (17.6)	2 (22.2)	1 (12.5)	1.000
Irregular menstruation	2 (11.8)	1 (11.1)	1 (12.5)	1.000
Hair density, mean ± SD	98.9 ± 36.8	114.8 ± 40.9	81.1 ± 22.4	0.057
Laboratory investigations				
Serum ferritin (µg/l), mean ± SD	39.2 ± 19.6	23.9 ± 11.8	56.4 ± 8.9	**< 0.001***
Hemoglobin (g/dl), mean ± SD	12.8 ± 0.7	12.7 ± 0.8	12.9 ± 0.7	0.578
Hematocrit (%), mean ± SD	38.9 ± 2.3	39.1 ± 2.6	38.9 ± 2.0	0.959
ESR (mm/h), median (min, max)	11.0 (7.0,42.0)	9.0 (7.0,25.0)	15.5 (7.0,42.0)	0.091
25-hydroxyvitamin D_2 (ng/ml), mean ± SD	23.9 ± 5.1	24.6 ± 4.5	23.3 ± 5.8	0.728

*, *P* value < 0.050

Abbreviations: ESR, erythrocyte sedimentation rate; GERD, gastroesophageal reflux disease; SD, standard deviation

TABLE 2. Clinical evaluations and laboratory results of patients with female pattern hair loss and iron deficiency after treatment.

		Mean ± SD or n (%) Ferrous sulfate and 3% minoxidil solution (N = 9)	3% minoxidil solution (N = 8)	*P* value
Clinical evaluations				
Change in terminal hair density (hairs/cm^2), mean ± SD	Difference (baseline VS week 24)	20.6 ± 16.7	20.6 ± 24.1	0.995
Physician assessment	At week 24			
Improvement		4 (44.4)	6 (75.0)	1.000
No improvement		5 (55.6)	2 (25.0)	
Patient satisfaction	At week 24			
Satisfied		8 (88.9)	7 (87.5)	1.000
Not satisfied		1 (11.1)	1 (12.5)	
Laboratory investigations				
Serum ferritin (µg/l), mean ± SD	Difference (baseline VS week 24)	94.5 ± 59.5	4.7 ± 13.2	**0.003***
Hemoglobin (g/dl), mean ± SD	Difference (baseline VS week 24)	0.09 ± 0.52	0.09 ± 0.41	0.995
Hematocrit (%), mean ± SD	Difference (baseline VS week 24)	0.13 ± 1.84	0.30 ± 1.55	0.844

*, *P* value < 0.050
Abbreviation: SD, standard deviation

supplement (325 mg of ferrous sulfate twice daily; 65 mg elemental iron) for 6 months to FPHL patients with serum ferritin <70 µg/l. There was no significant difference in the patient-assessed treatment responses of the supplementation and non-supplementation groups.[6] Moreover, Sinclair reported that four of seven FPHL patients with serum ferritin <20 µg/l responded to oral spironolactone and iron replacement, with a similar response rate to FPHL patients with normal ferritin treated with oral spironolactone alone.[2] Although the total elemental iron prescribed in our study was higher than those in previous studies, treatment responses (terminal hair density, physician assessment, and patient satisfaction) were not statistically significant compared with topical 3% minoxidil treatment alone.[2,6]

In conclusion, topical 3% minoxidil combined with oral iron supplementation was not superior to topical 3% minoxidil alone in treating FPHL with ID. However, no serious side effect was documented from that supplement. Further studies with larger samples are needed to determine the efficacy of oral iron supplementation for FPHL with ID.

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Authorship

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Author Contributions

DT, NJ, CS and CL conceptualized this study, generated population and conducted the field trials with assistance from KT, RT and SV. DT and SW performed the data analysis with advice from KT, RT and SV. DT, KT, SW and NV wrote the manuscript. All authors revised the manuscript.

Disclosures

All named authors have nothing to disclose.

Compliance with Ethics Guidelines

This study is approved by the Siriraj Institutional Review Board with Certificate of Approval No. Si 500/2015

Data Availability

Data sharing is not applicable to this article as no datasets were generated or analyzed during the current study.

Conflict-of-interest declaration

All authors declare that there are no conflicts of interest related to any aspect of this research.

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