
Changes in hair weight in men with androgenetic alopecia after treatment with finasteride (1 mg daily): Three- and 4-year results

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Background: We previously reported the effects of finasteride on scalp hair weight and count over a 2-year period in men with androgenetic alopecia (AGA).

Objective: Our purpose was to evaluate the effects of finasteride on hair weight and count over 4 years in men with AGA.

Methods: Men with AGA were randomized to receive finasteride (1 mg/d) or placebo for 192 weeks. Results of the second (weeks 96-144) and third (weeks 144-192) extension periods are reported.

Results: Finasteride increased hair weight at 144 and 192 weeks (week 192: finasteride, 21.6% increase from baseline; placebo, 24.5% decrease from baseline; net increase in hair weight for finasteride vs placebo = 46.0%, $P < .001$). Hair count also increased with finasteride at 144 and 192 weeks (week 192: finasteride, 7.2% increase from baseline; placebo, 13.0% decrease from baseline; net increase in hair count for finasteride vs placebo = 20.3%, $P < .05$). Finasteride was generally well tolerated.

Limitations: Because this study was extended from its original 48-week duration to nearly 4 years, the sample size available for analysis decreased with time.

Conclusion: Long-term finasteride treatment led to sustained improvement in hair weight compared with placebo. Hair weight increased to a larger extent than hair count, implying that factors other than the number of hairs, such as increased growth rate (length) and thickness of hairs, contribute to the beneficial effects of finasteride in treated men. (J Am Acad Dermatol 2006;55:71-4.)

Male pattern hair loss, or androgenetic alopecia (AGA), produces progressive, visible thinning of scalp hair in genetically susceptible men.¹ This progressive miniaturization of hair follicles is due to a shortened duration of the

anagen, or growth, phase and a reduction in the size of the hair matrix, with the gradual transformation of large terminal follicles to miniaturized follicles that produce shorter and finer hairs.² In susceptible scalp follicles, dihydrotestosterone (DHT) binds to the androgen receptor and the hormone-receptor complex in some manner activates genes responsible for the miniaturization process. Compared with the occipital scalp, the frontal scalp of young men with AGA contains higher levels of DHT, type 2 5 α -reductase, and androgen receptor.^{3,4}

Finasteride is a type 2 5 α -reductase inhibitor shown to decrease levels of DHT in both scalp and serum, and clinical trials have shown that finasteride slows progressive hair loss and increases hair growth in men with predominantly vertex or frontal AGA.^{2,4-9} A double-blind, placebo-controlled study of men with AGA found that finasteride (1 mg/d) slowed hair loss and increased hair growth over the course of 5 years ($P < .001$).⁹ Similarly, a 1-year, double-blind,

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placebo-controlled study followed by a 1-year open extension showed that finasteride (1 mg/d) slowed hair loss and increased hair growth in the frontoparietal scalp.⁷

Results from the first two 48-week periods of a 192-week study of men with AGA showed that finasteride (1 mg/d) significantly increased hair weight in the frontoparietal scalp in men with AGA compared with placebo ($P < .001$).⁸ We report herein the long-term efficacy and safety data from the third and fourth 48-week periods of this study (weeks 96 to 192).

METHODS

Study design and procedures

This double-blind, randomized, placebo-controlled, single-center study examined the efficacy and safety of finasteride (1 mg/d) in men with AGA. The initial study included a 48-week double-blind period, which was followed by 3 double-blind 48-week study extensions. The last two study extensions (weeks 96-144 and 144-192) are described herein. Sampling and evaluation procedures for the extension studies were identical to those previously published.⁸ Clinical and laboratory adverse events were monitored throughout the study.

Hair weight and count

Hair weights were obtained from clippings taken from a 1.34-cm² area of the frontoparietal scalp. At the beginning of the first 48-week study, baseline 6-week hair growth weight was determined for each subject by averaging the clipped hair weight for the period of growth between week -12 and week -6 and the weight for the period between week -6 and week 0 (initiation of treatment). During the study period of this report (weeks 96-192), clipped hair weights, measured every 6 weeks, are reported at weeks 108, 120, 132, and 144 for the second study extension (third 48-week period) and at weeks 156, 168, 180, and 192 for the third study extension (fourth 48-week period). Before weighing, clipped hair samples were degreased in hexane, dried, and conditioned for at least 24 hours at 20°C, 65% relative humidity. A computerized balance with a precision of 0.01 mg was used to weigh samples. An experienced technician, blinded to treatment, patient, and visit number, performed the weighings for samples collected from weeks 108 to 192 during a single session at the end of each study extension.

After the hair samples were weighed, they were placed on a marked grid in groups of 5 and manually counted. Hairs that were less than 2 mm in length were excluded from the count because they could represent hair shaft fragments rather than intact hairs.

Clinical and laboratory analysis. All clinical adverse experiences reported by the patients were recorded. Hematology; urinalysis; serum chemistry measurements, including prostate-specific antigen levels; and hormone measurements, including testosterone, DHT, luteinizing hormone, and follicle-stimulating hormone, were completed at weeks 144 and 192. Serum DHT was determined at Esoterix Endocrinology, Calabasas Hills, California. All other laboratory values were determined at Medical Research Laboratories International, Highland Heights, Kentucky.

Study population

Sixty-six men with mild to moderate AGA (grade II, IIa, IIv, III, or IIIv according to the modified Norwood-Hamilton scale)¹⁰ who were between 22 and 40 years of age and in good physical and mental health were enrolled in this study. Men were not permitted to have had any hair restoration procedures, use any hair enhancement or restoration products or drugs, including finasteride or other 5 α -reductase inhibitors, have used minoxidil within 1 year before study entry, or alter their hairstyle or have their hair dyed during the course of the study. Institutional review board approval and patient informed consent were obtained before study enrollment.

Sixty-six men were enrolled in the initial 48-week study and 33 were randomly assigned to receive finasteride, 1 mg, and 33 to receive placebo. Of the 49 subjects who completed the initial 48-week study and entered the first study extension, 28 entered the second study extension (third 48-week period), with 18 in the finasteride group and 10 in the placebo group. Twenty-four patients who completed the second study extension entered the third study extension (fourth 48-week period), with 15 in the finasteride group and 9 in the placebo group. The third study extension was completed by 22 patients, with 15 in the finasteride group and 7 in the placebo group. The data reported refer to the patients who entered the second and third study extensions.

Statistical analysis

Hair weight. Data from patients who entered a given study extension and provided at least one measurement for that study extension were included in the efficacy analysis for that study extension. Percent change in hair weight was calculated from the difference between the 6-week interval weight at a given time point and the baseline weight, divided by the baseline weight.

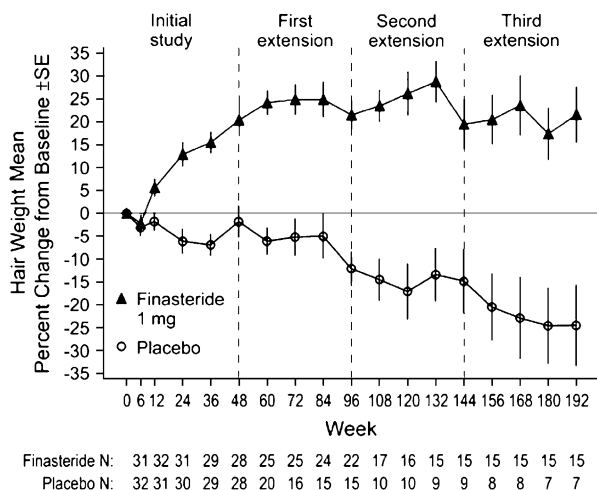


Fig 1. Mean percent change from baseline in hair weight across the study.

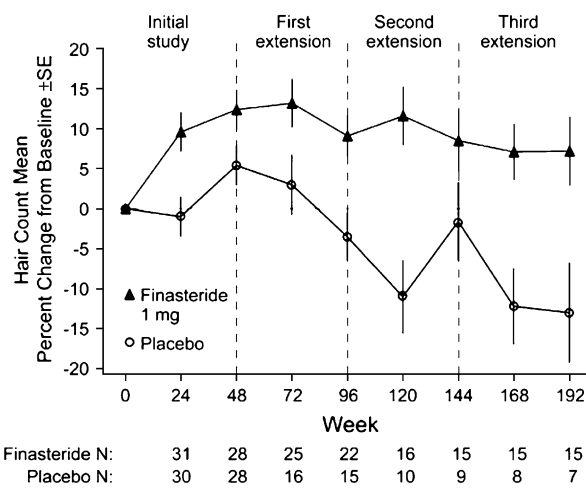


Fig 2. Mean percent change from baseline in hair count across the study.

Safety. Percentage of patients with a given clinical or laboratory adverse event was calculated. Fisher's exact test was used to evaluate differences between the two study groups in the incidence of clinical adverse events.

RESULTS

The following data refer to the patients who entered the second (weeks 96-144) and third (weeks 144-192) study extensions.

Hair weight

Fig 1 shows the percent change in hair weight from baseline across the entire 192-week study.

After the second study extension (third 48-week period), patients treated with finasteride for 144 weeks showed a mean percent increase in hair weight from baseline of 19.5% ($P < .01$). In contrast, subjects treated with placebo showed a mean percent decrease in hair weight from baseline of 14.8% ($P < .05$), resulting in a net increase in hair weight for the finasteride group of 34.3% (95% confidence interval [CI], 17.0-51.5; $P < .001$).

After the third study extension (fourth 48-week period), patients treated with finasteride for 192 weeks showed a mean percent increase in hair weight from baseline of 21.6% ($P < .01$), compared with a mean percent decrease of 24.5% ($P < .05$) from baseline in placebo-treated men, resulting in a net increase in hair weight for the finasteride group of 46.0% (95% CI, 25.0-67.0; $P < .001$).

Manual hair counts

Fig 2 shows the mean percent change from baseline in hair count across the entire 192-week study period.

At week 144 there was an 8.5% mean increase in hair count from baseline in finasteride-treated men compared with a 1.6% decrease in hair count in placebo-treated men, resulting in a (nonsignificant) net increase of 10.1% (95% CI, -2.2-22.3; $P = .119$) in the finasteride group compared with the placebo group.

At week 192, there was a 7.2% mean increase in hair count from baseline in the finasteride group compared with a 13% mean decrease from baseline in the placebo group ($P < .05$), resulting in a net increase in hair count of 20.3% (95% CI, 5.4-35.1; $P < .05$) in the finasteride group compared with the placebo group.

Adverse events

Finasteride was generally well tolerated. No patients were discontinued from the study because of an adverse event. One subject reported a drug-related sexual adverse event (decreased libido) during the initial 48-week study period and again during the second study extension; he continued in the study and completed the third study extension. No other drug-related clinical or laboratory adverse events were reported during either the second or the third study extensions.

DISCUSSION

Treatment with finasteride significantly increased scalp hair weight in men with AGA over the course of this 192-week study. The hair weight taken at 6-week intervals increased during the initial 96 weeks,⁸ with improvement evident as early as 12 weeks, and the increase at 96 weeks was sustained during the two

successive 48-week study extensions in men who received finasteride. In contrast, treatment with placebo resulted in a progressive decrease in scalp hair weight during the study. At 192 weeks, treatment with finasteride produced a net increase in hair weight of 46% compared with the placebo group ($P < .001$). Hair counts with finasteride treatment increased during the first 48 weeks, and then stabilized between weeks 48 and 96 (Fig 2). Subsequently, through week 192, hair counts remained increased above baseline, whereas hair counts in the placebo group declined. At week 192, there was a 20.3% net increase in hair count for the finasteride group compared with the placebo group ($P < .05$).

Finasteride treatment produced greater increases in hair weight than in hair count at all time points. This suggests that increased hair length (growth rate) or hair thickness,¹¹ or both, contribute to the increase in hair weight beyond that expected because of the increase in the number of hairs. This helps explain the continued improvement in scalp coverage seen in some patients by global photographic assessment over 5 years of finasteride treatment, even in the presence of no additional increases in hair counts.⁹ On the basis of these data, the miniaturized hairs appear to continue to become longer and thicker with continued finasteride treatment over several years.

One limitation of this study was that because it was extended from its original 48-week duration to nearly 4 years, the sample size available for analysis decreased with time.

In conclusion, treatment with finasteride (1 mg daily) significantly increased scalp hair weight in men with AGA over nearly 4 years. Net increases in hair weight at 144 and 192 weeks in the finasteride-treated group were 34.3% and 46.0%, respectively.

Finasteride treatment was generally well tolerated in this study.

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CORRECTION

Tuchinda C, Srivannaboon S, Lim HW. Photoprotection by window glass, automobile glass, and sunglasses. *J Am Acad Dermatol* 2006;54:845-54 (May).

On page 846 of the above article, the final sentence of the "Clear glass" section should state that clear glass allows up to 72% of UV (assessed from 300 to 380 nm) to pass through. On page 849, the incorrect range for measurement of UV transmission was also printed. The relative transmission in the range of 300 to 380 nm is used to calculate transmission of UV, as a percentage.