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# THERAPEUTIC HOTLINE

# Finasteride, 1 mg daily administration on male androgenetic alopecia in different age groups: 10-year follow-up

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**ABSTRACT:** Finasteride 1 mg is indicated for the treatment of men with androgenetic alopecia (AGA). However, more than 5 years efficacy and safety has not been previously reported. To assess the efficacy over 10 years in different age groups of men with AGA. 118 men, between 20 and 61 years, with AGA receiving finasteride (1 mg/day), were enrolled in this uncontrolled study. Efficacy evaluation was assessed with standardized global photographs at T0,T1,T2,T5,T10. Statistical analysis was made using frequency tables and evaluating the chi-square index with its *p*-value. Better improvements are observed in patients older than 30 years (42.8% aged between 20 and 30 years did not improve also after 10 years) or with higher AGA grades (58.9% for AGA grade IV and 45.4% for AGA grade V had the first improvement just after 1 year). In 21% of cases, the treatment continuation beyond 5 years provided better results. Side effects were referred by 6% of the patients; nevertheless, some of them went on with treatment because of the great results. In our opinion, the result after the first year can help in predicting the effectiveness of the treatment. Its efficacy was not reduced as time goes on; in fact, a big proportion of subjects unchanged after 1 year, improved later on, maintaining a positive trend.

**KEYWORDS:** 5-alpha reductase inhibitor, benign prostatic hyperplasia, color standardized macrophotograph, dihydrotestosterone, male pattern hair loss

## Introduction

Male pattern hair loss or androgenetic alopecia (AGA) is a genetically determined, potentially reversible type of hair loss (1). This condition is characterized by the progressive visible thinning of scalp hair in genetically susceptible men and in some women. The thinning is due to the gradual miniaturization of genetically marked hair follicles and represents shortening of the anagen or growth phase and reduction in matrix volume. Although testosterone is the major circulating androgen, to be maximally active in scalp hair follicles, it must first be converted to dihydrotestosterone (DHT) by the enzyme 5α-reductase (2). The importance of DHT as an etiologic factor in male pattern hair loss (MPHL) is shown by the absence of this condition

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in men with congenital deficiency of type II 5α-reductase, and by varying amounts of hair regrowth in men with MPHL treated with finasteride, a selective type II 5α-reductase inhibitor (3). In previous clinical trials, finasteride, 1 mg/day, slowed the progression of hair loss and increased hair growth (4–10).The aim, of the present uncontrolled study was to assess the efficacy of finasteride through the evaluation of the hair growth persistence, using long-term analysis in different age groups of men with AGA.

## Methods

### Study population

One hundred eighteen men, aged between 20 and 61 years, in good physical and mental health, with mild to moderate AGA (grade II–V according to the modified Norwood-Hamilton scale) were enrolled. Objective examination, pull test, anamnestic data led to the diagnosis. Exclusion criteria at study entry were significant abnormalities on screening physical examination or laboratory evaluation, prior surgical correction of scalp hair loss, topical minoxidil use within 1 year, use of drugs with androgenic or antiandrogenic properties, use of finasteride or other 5α-reductase inhibitors, or hair loss from causes other than AGA 5. Alterations in hair styling and dyeing of the hair were not allowed during the study. Institutional review board approval was obtained each year prior to entering subjects into each study. All men were provided written consent, and the protocol (n. 122-01) and consent forms were approved by local review boards. The use of any proprietary sampling contact information (e.g., mailing address) was approved by its owner. All patients were treated with finasteride 1 mg/day. They were evaluated by using a color standardized macrophotograph (Canfield Imaging Systems, Fairfield, NJ) before starting the treatment (baseline), after 1, 2, 5, and 10 years of treatment.

At each follow-up, the photos were examined by the same three experts (two dermatologists experienced in assessment of changes in scalp hair growth and one junior dermatologist). Together, the experts assigned to each subject a value (a score) from –3 (greatly decreased compared to the baseline) to +3 (greatly increased compared to the baseline); a value of 0 specified an unchanged hair state. The study was carried out at the Department of Dermatology and Plastic Surgery, Sapienza Medical School of Rome, Italy.

*Preliminary analysis.* Only five patients of 118 abandoned the study during the years because of adverse reactions. Preliminary analysis considered the frequencies of the enrolled patients over the years and the distribution of their initial AGA grade in different age classes (20–30 years old; 31–40; >41).

Then, the year of the first improvement was identified and related to age classes and the initial AGA grade.

A third analysis compared the treatment response after 1 year with each of the remaining follow-ups; in this case, we reduced the scores to only three values: improved (for all the scores greater than 0), unchanged, or worsened (for the scores less than 0). We considered the numbers of patients classified in each of these groups for each follow-up, and in case of a significant relation (revealed by using the chi-square index), we built a transition table filled with the empirical probabilities to have a given result after 1 year and those possible in the *i-th* follow-up.

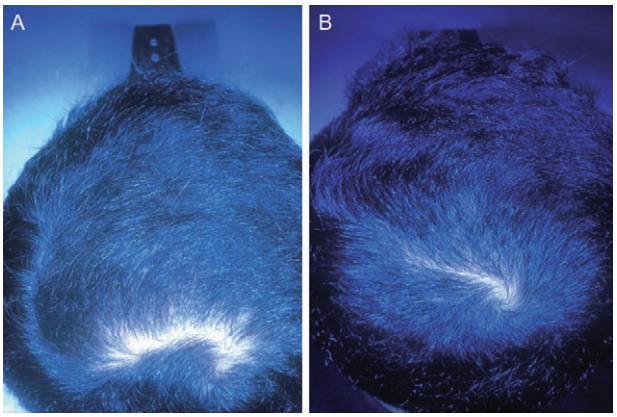
*Persistence and further improvement analysis.* The idea of this analysis was to measure the persistence, or not, of the hair growth after 5 years; we compared in details the scores after 5 years with those at 10 years. We identified three groups of patients: the ones that benefited from the 10 years treatment (those with a score at 10 years greater to the one at 5 years), the unchanged but improved (those with the same score, at 5 and 10 years, greater or equal to 0), and the worsened (the remaining ones). We described their significant characteristics using age and initial AGA grade.

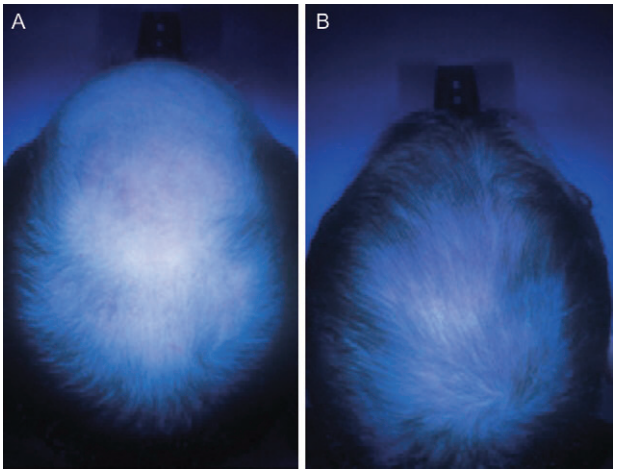
*Adverse reactions.* Subjects treated with finasteride 1 mg/day may occasionally have adverse reactions, such as libido or ejaculated semen reduction, erection problems (8,11–16). It is possible to have multiple side effects simultaneously.

## Results

### Expert panel assessment of global photographs

In correspondence of each follow-up, the three dermatologists jointly assessed the current macrophotograph with the one taken at the beginning of the treatment, by considering both vertex and frontal regions. After their agreement on the results, they assigned to the patient a numeric values from –3 (greatly decreased compared with the baseline) to +3 (greatly increased compared to the baseline;




**FIGS 1 and 2.** **(A) At time 0 before treatment. (B) 10 years later showed a great improvement.**

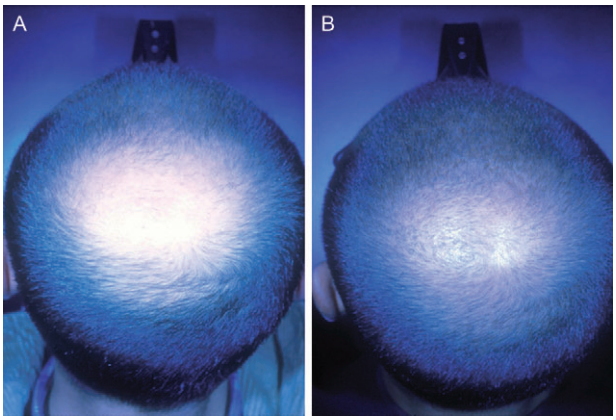



**FIG. 3.** **(A) At baseline. (B) 10 years later, the photo showed a significant greater improvement in the vertex area.**

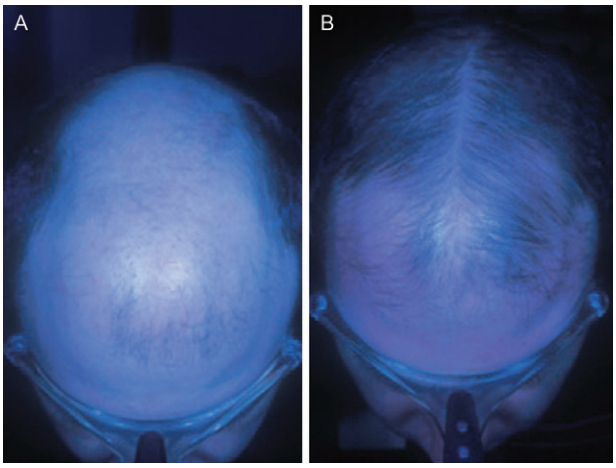



**FIG. 4.** **(A) At baseline. (B) Frontal region less evident improvement after 10 years treatment.**

FIGS 1 and 2) (5). In the vertex photographs, finasteride showed significantly great improvement (FIG. 3) at 10 years. In the frontal region, the improvement was less evident (FIG. 4).

*Preliminary analysis.* One patient abandoned the treatment before the first year (because of adverse reactions); just four more before the 10 years follow-up (Table 1). In our sample, we observed a strong relationship between the initial AGA grade and the age classes (Table 2); in particular, the grade growth with the age class (the chi-square index is 26.6 and the associated probability is less than 0.05). The year of first improvement is directly related with both the age classes (chi square = 9.16 with a *p*-value less than 0.05) and the initial AGA grade (chi-square = 9.51 with a *p*-value less 0.05; Table 3). We observed that the patients older than 30 years had better responses than the younger ones (53.6% of patients with age between 31 and 40 years showed an improvement of hair growth at the first follow-up, 47.4% of those greater than 41 years had an improvement at the same time). Furthermore, there is a great part of young patients, 42.8%, that do not show an improvement also after 10 years.

The dependency between the results obtained after 1 year with those observed in the next years tends to significantly enforce (Table 4); this allow us to consider that the first year can be important to determine the effectiveness of the therapy. For those patients (114) that had the first and the third follow-up (after 5 years), about the 50% (55 individuals) showed a hair growth after the first year of treatment. For these, the empirical probability to maintain the hair growth was 0.45, whereas the probability to have an improvement at 5 years was 0.53 (that is to say that almost one of two patients with an improvement at the first follow-up will show a better improvement after 5 years). For those 52% with unchanged or worse results at the first year (59 individuals), just the 25% (15) will have an improvement at 5 years (Table 5).

**Table 1.** Number of patients in treatment over the years

| | Beginning of treatment | 1 year | 2 years | 5 years | 10 years |
|---|---|---|---|---|---|
| In treatment | 118 | 117 | 116 | 114 | 113 |
| Ceased | 1 | 1 | 2 | 1 | 0 |

Showed that some patients interrupted the treatment; one just at the beginning of the treatment.

**Table 2.** Age group and initial AGA grade (chi-square = 26.6 with an associated probability < 0.05); absolute values and column percentage frequencies

| | Age group | | |
|---|---|---|---|
| Initial AGA grade | 20–30 years old | 31–40 years old | >40 years old |
| ≤II | 8 (19%) | 6 (10.7%) | 2 (10%) |
| III | 27 (64.3%) | 18 (32.1%) | 6 (30%) |
| IV | 2 (4.8%) | 29 (51.8%) | 9 (45%) |
| ≥V | 5 (11.9) | 3 (5.4%) | 3 (15%) |
| Total | 42 (100%) | 56 (100%) | 20 (100%) |

The chi-square index between the two variables is 26.6 with an associated probability < 0.05; this means that there was a dependence between age classes and initial AGA grade (this growth with the growing of the age).

AGA, androgenetic alopecia.

**Table 3.** First improvement related to age classes (chi-square = 9.16 with an associated probability < 0.05), and to the initial AGA grade (chi-square = 9.51 with an associated probability < 0.05); absolute values and column percentage frequencies

| | Age group | | | Initial AGA grade | | | |
|---|---|---|---|---|---|---|---|
| First improvement | 20–30 years old | 31–40 years old | >40 years old | ≤II | III | IV | ≥V |
| At 1 year | 17 (40.5%) | 30 (53.6%) | 9 (47.4%) | 6 (37.5%) | 22 (43.1%) | 23 (58.9%) | 5 (45.4%) |
| At 2 years | 7 (16.7%) | 8 (14.3%) | 3 (15.8%) | 3 (18.7%) | 7 (13.7%) | 5 (12.9%) | 3 (27.3%) |
| At 5 years | 0 (0.0%) | 6 (10.7%) | 1 (5.2%) | 0 (0.0%) | 3 (5.9%) | 4 (10.3%) | 0 (0%) |
| Not improved | 18 (42.8%) | 12 (21.4%) | 6 (31.6%) | 7 (43.8%) | 19 (37.3%) | 7 (17.9%) | 3 (27.3%) |
| Total | 42 (100.0%) | 56 (100.0%) | 19 (100.0%) | 16 (100%) | 51 (100%) | 39 (100%) | 11 (100%) |

The first improvement was related to the age and to the initial AGA grade. The patients older than 30 years responded to the treatment earlier than the younger ones.

AGA, androgenetic alopecia.

**Table 4.** Chi-square and its *p*-value correlation between the first follow-up with the next ones

| | 1 year vs. 2 years | 1 year–5 years | 1 year–10 years |
|---|---|---|---|
| Chi-square | 16.76 | 34.56 | 31 |
| *p*-value | 0.052 | <0.05 | <0.05 |

The dependency between the results at T1 with the following ones tended to significantly enforce over the years.

After 10 years, the patients with an improvement at the first year (54 of 113, one less than in respect to the previous analysis because one treatment discontinuation) have an empirical probability of 0.04 to have worse results; otherwise, they tend to maintain the hair growth (with a probability equals to 0.28), or more probably, to improve (with a probability equals to 0.68). For those with unchanged or worse results at the first years (52.2%, given by (48 + 11)/113 = 59/113), only 32.2% (19) will have an improvement at 10 years (Table 6).

It is important to consider that the majority of the patients with no improvements at the first follow-up could show just an unchanged result (in respect of the baseline) after 10 years.

**Table 5.** Transition probabilities between 1 and 5 years follow-ups (row relative frequencies) and corresponding number of patients (in brackets)

| | Response at 5 years | | | |
|---|---|---|---|---|
| Response at 1 year | Worse | Unchanged | Improved | Number of patients |
| Worse | 0.45 (5) | 0.45 (5) | 0.1 (1) | 1 (11) |
| Unchanged | 0.04 (2) | 0.66 (32) | 0.30 (14) | 1 (48) |
| Improved | 0.02 (1) | 0.45 (25) | 0.53 (29) | 1 (55) |

55 of 114 patients with an improvement at the first year had an empirical probability of 0.02 to have worse results; otherwise, they tended to maintain the hair growth (with a probability equals to 0.45) or to improve (with a probability equals to 0.53). For those with unchanged or worse results at the first years (48 + 11 = 59), only 15 (25%) will have an improvement.

**Table 6.** Transition probabilities between 1 and 10 years follow-ups (row relative frequencies) and number of patients (in brackets)

| | Response at 10 years | | | |
|---|---|---|---|---|
| Response at 1 year | Worse | Unchanged | Improved | Number of patients |
| Worse | 0.36 (4) | 0.64 (7) | 0 | 1 (11) |
| Unchanged | 0.04 (2) | 0.56 (27) | 0.40 (19) | 1 (48) |
| Improved | 0.04 (2) | 0.28 (15) | 0.68 (37) | 1 (54) |

54 of 113 patients with an improvement at the first year had an empirical probability of 0.04 to have worse results; otherwise they tended to maintain hair growth (with a probability equals to 0.28) or, more probably, to improve (with a probability equals to 0.68). For those with unchanged or worse results at the first years (48 + 11 = 59), only 19 (32.2%) will have an improvement.

**Table 7.** Detailed transition probabilities between responses at 5 and 10 years follow-ups (row relative frequencies) and number of patients visited (in brackets); the chi-square value of the table is 338.65 with an associated *p*-value less than 0.05

| | | Response at 10 years | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | –3 | –2 | –1 | 0 | 1 | 2 | 3 | Total |
| Responses at 5 years | –3 | 1 (1) | 0 | 0 | 0 | 0 | 0 | 0 | 1 (1) |
| | –2 | 0 | 0.5 (1) | 0 | 0.5 (1) | 0 | 0 | 0 | 1 (2) |
| | –1 | 0 | 0.2 (1) | 0.8 (4) | 0 | 0 | 0 | 0 | 1 (5) |
| | 0 | 0 | 0 | 0 | 0.7 (43) | 0.14 (8) | 0.11 (7) | 0.05 (3) | 1 (61) |
| | 1 | 0 | 0 | 0 | 0.13 (4) | 0.73 (22) | 0.13 (4) | 0 | 1 (30) |
| | 2 | 0 | 0 | 0.1 (1) | 0.1 (1) | 0.2 (2) | 0.4 (4) | 0.1 (1 | 1 (9) |
| | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 1 (5) | 1 (5) |
| | Total | 0.01 (1) | 0.2 (2) | 0.04 (5) | 0.44 (49) | 0.28 (32) | 0.14 (15) | 0.08 (9) | 1 (113) |

We defined three groups of patients: the ones that benefited from the 10 years treatment (those with a score at 10 years greater to the one at 5 years, i.e., 24 patients), the unchanged but improved (those with the same score, at 5 and 10 years, greater or equal to 0, i.e., 74 patients), and the worsened (15).

*Persistence and further improvement analysis.* Table 7 showed the details on the transition probabilities between the scores at 5 and 10 years follow-up; these were significantly dependent (chi-square = 338.65 with an associated *p*-value less than 0.05). On 113 patients, the ones that benefited from the 10 years treatment were 24 (21%), whereas the no change were 74 (65%), and only 15 (14%) were the worsened.

Fifty percent of the patients improved after 10 years of treatment, have the IV grade of initial AGA and tends to be significant older than the others (37 years old against 33 of the other patients); the unchanged but improved and the worsened are not age-related and have low grades of initial AGA (Table 8).

*Adverse reactions.* Side effects were observed on 5.9% (7) patients. Libido and ejaculated semen reduction plus erection problems were reported only by one patient, which interrupted the treatment just at the beginning of the treatment.

The most frequent side effect was the libido reduction (5,1%) of the ejaculated semen amount,

**Table 8.** Characteristics of patients that really benefited from 10 years of treatment and of the others, defined by the scores at 5 and 10 years

| | Initial AGA grade, row percentage frequencies and absolute values (chi-square = 8.0 with an associated *p*-value = 0.04) | | | | | Age (mean value and *t*-test statistics, with the associated probability, for each group) | |
|---|---|---|---|---|---|---|---|
| Type of patients | ≤II | III | IV | ≥V | Total | Mean | *t*-test (*p*-value) |
| Really benefited | 8 (2) | 29 (7) | 50 (12) | 13 (3) | 100 (24) | 36.9 | 1.9 (0.06) |
| Unchanged but improved | 13 (10) | 50 (37) | 30 (22) | 7 (5) | 100 (74) | 33.7 | 0.7 (0.46) |
| Worsened | 27 (4) | 33 (5) | 27 (4) | 13 (2) | 100 (15) | 31.7 | 1.7 (0.10) |

The patients that benefited from the 10 years treatment had mostly the IV grade of initial AGA and tended to be older than the others; the unchanged but improved and the worsened are not characterized by age and had low grades of initial AGA.

AGA, androgenetic alopecia.

**Table 9.** Adverse reactions and percentage of dropout (percentage on total patients enrolled at the beginning of the study and absolute values)

| Types of adverse reaction | Percentage and number of patients | Patients that interrupted the treatment | % of interruptions |
|---|---|---|---|
| Reduced libido | 5.1% (6) | 4 | 67% |
| Reduction amount of ejaculated semen | 1.7% (2) | 1 | 50% |
| Erection problems | 3.4% (4) | 4 | 100.0 |

The most frequent side effect (observed in 5.1% of individuals) was reduced libido, but only the 67% of subjects that reported it interrupted the treatment, whereas all individuals with erection problems interrupted the treatment.

leading to therapy discontinuation in 67% of cases (13–15) (Table 9). All the erection disorders caused the interruption of the treatment; these results are similar to the ones previously recorded (8,16).

Gynecomastia and depression were not reported at all. None of our patients had change in the spermatogenesis process, but it is important to point out that in patients with other problems contributing to infertility (varicocele), the negative influence of finasteride, noted by others, might be amplified (15).

## Discussion

AGA in young males is a psychosociological problem and the number of affected people is increasing. To date, this study represents the longest (over 10 years) reported uncontrolled study in men with MPHL. Our results underlined that finasteride 1 mg/day administration produced significant and durable increases in hair growth in men with AGA. Presumably, under the influence of finasteride, whose blood concentration is not going to be reduced over time, previously miniaturized scalp hairs continued to become longer, thicker, and more cosmetically significant during 10 years treatment because it is still working as a selective type, the II 5α-reductase inhibitor. Since miniaturization of scalp hairs in AGA develops over a period of many years, it is not surprising that reversal of this process may also take a number of years.

Comparing different age groups, our study underlined that subjects older than 30 years showed a better hair growth in the long term. These findings are in agreement with that of a previous study in men with early-onset AGA (8).

Our results showed also that in contrast with what usually observed with other medications, finasteride efficacy is not going to be reduced over time, especially in the older group since it is well known what happen to androgens in that age in men subjects (16).

It is interesting to point out that of the 113 patients followed for 10 years, only 14% worsened, whereas the remaining (86%) had benefits (21%) from the treatment duration or (65%) persisted in their improvements. Patients not improved at all after one year (i.e., with a significant decreasing in their hair growth) could be considered not respondent to a long-term therapy.

Side effects were observed on 5.9% (7) patients, but these effects were not age related (12–14). Some of the patients who experienced side effects did not drop out of the treatment because of perceived good results.

As in a previous study, finasteride 1 mg was generally well tolerated and long-term treatment led to sustained improvement in treated men (7,8).

In conclusion, finasteride is a safe and effective treatment for controlling male pattern baldness with long-term daily use even in men over the age of 40 years. The satisfactory clinical results, the few side effects observed, and the lack of alternative medications, led us to consider finasteride an effective treatment especially if taken in the early stages of AGA.

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None.

## Conflict of interest disclosure

None declared.

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