The effectiveness of treatments for androgenetic alopecia: A systematic review and meta-analysis

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Background: Androgenetic alopecia, or male pattern hair loss, is a hair loss disorder mediated by dihydrotestosterone, the potent form of testosterone. Currently, minoxidil and finasteride are Food and Drug Administration (FDA)—approved, and HairMax LaserComb, which is FDA-cleared, are the only treatments recognized by the FDA as treatments of androgenetic alopecia.

Objective: This systematic review and meta-analysis assesses the efficacy of nonsurgical treatments of androgenetic alopecia in comparison to placebo for improving hair density, thickness, growth (defined by an increased anagen:telogen ratio), or subjective global assessments done by patients and investigators.

Methods: A systematic review of randomized controlled trials was conducted. PubMed, Embase, and Cochrane were searched up to December 2016, with no lower limit on the year. We included only randomized controlled trials of good or fair quality based on the US Preventive Services Task Force quality assessment process.

Results: A meta-analysis was conducted separately for 5 groups of studies that tested the following hair loss treatments: low-level laser light therapy in men, 5% minoxidil in men, 2% minoxidil in men, 1 mg finasteride in men, and 2% minoxidil in women. All treatments were superior to placebo ($P < .00001$) in the 5 meta-analyses. Other treatments were not included because the appropriate data were lacking.

Limitations: High heterogeneity in most studies.

Conclusions: This meta-analysis strongly suggests that minoxidil, finasteride, and low-level laser light therapy are effective for promoting hair growth in men with androgenetic alopecia and that minoxidil is effective in women with androgenetic alopecia. (J Am Acad Dermatol 2017;77:136-41.)

Key words: alopecia; androgenetic alopecia; finasteride; laser light therapy; male pattern hair loss; meta-analysis; minoxidil; systematic review.

Androgenetic alopecia, or male-pattern hair loss, is a hair loss disorder mediated by dihydrotestosterone, the potent form of testosterone. Dihydrotestosterone induces miniaturization of hair follicles, causing transformation of terminal hair into vellus hair.[1] Without treatment, patients undergo progressive hair loss.[2] Androgenetic alopecia is common, and its incidence increases with age. The prevalence shows similar trends with some variation across different populations. Approximately 73% of men and 57% of women over the age of 80 are affected by androgenetic

Abbreviations used:

FDA:	Food and Drug Administration
LLLLT:	low-level laser light therapy
RCT:	randomized controlled trails

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alopecia, and 58% of men over the age of 50 are affected.[3-5] Androgenetic alopecia can lead to negative psychological effects in both men and women. These include self-conscious preoccupation, worries about aging, helplessness, and feelings of diminished attractiveness; these effects are more pronounced in women.[6-8]

Currently, minoxidil and finasteride are the only Food and Drug Administration (FDA)—approved drugs and low-level laser light therapy (LLLLT) the only FDA-cleared device for the treatment of androgenetic alopecia. Studies have been conducted on these treatments, but, to our knowledge, a meta-analysis summarizing the efficacy of these treatments for androgenetic alopecia has not been conducted. This systematic review and meta-analysis aims to determine the efficacy of nonsurgical treatments of androgenetic alopecia in comparison with placebo for improving hair density, thickness, growth (defined by increased anagen:telogen ratio), or subjective global assessments done by patients and investigators.

CAPSULE SUMMARY

- Minoxidil, finasteride, and low-level laser light therapy are Food and Drug Administration—approved/cleared treatments for androgenetic alopecia.
- Before this meta-analysis, available studies showed conflicting results. By pooling the results of these studies in a meta-analysis, we were able to increase the power to show the real effect and the confidence in the validity of that effect.
- Minoxidil, finasteride, and low-level laser light therapy have been shown to be effective treatments for male-pattern hair loss in a meta-analysis of randomized controlled trials.

METHODS

Eligibility criteria

Only randomized controlled trials (RCTs) studying the effects of a nonsurgical treatment on patients with androgenetic alopecia were included in this study. Studies had to compare treatment with a placebo and be conducted in a double-blind fashion. Pilot studies were excluded. The primary outcome of each study had to be change in hair density and had to provide an effect size such as mean and a mesure of variance (standard deviation, standard error, or 95% confidence interval). Also, studies had to be of fair or good quality according to the US preventive services task force quality rating criteria. All studies included were published in English.

Information sources

We searched the PubMed, Embase, and Cochrane databases. The databases were searched from their earliest dates until December 2016. We searched PubMed first and identified the majority of RCTs included in this study. Eight additional RCTs were found in Cochrane, and 1 in Embase. We also searched through the references of reviews written on androgenetic alopecia treatments and identified 1 additional RCT through this method.

Search strategy

The final search string was "alopecia" [Mesh:noexp] OR "androgenetic alopecia" OR "male pattern baldness" AND randomized controlled trial [ptyp]. No additional filters were used. This search resulted in 213 articles (Fig 1). An additional article was found by searching through article references resulting in the final total of 214 articles. Using the titles and abstracts of these 214 articles, we eliminated studies unrelated to androgenetic alopecia, basic science research articles, pilot studies, commentaries, reviews, and studies that did not include a placebo treatment group. This strategy narrowed down the list to 45 articles. The full text of these articles was reviewed to assess their eligibility for inclusion.

Study selection and quality assessment

The 45 articles were reviewed by 2 authors. The review assessed whether the eligibility criteria were met and whether the article met the quality criteria used in the US Preventive Services Task Force for labeling RCTs good or fair; articles labeled poor by this method were excluded. This process excluded 22 of the 45 articles leaving 23 articles available for inclusion (Fig 1). One of these articles had 2 intervention arms (minoxidil 5% and minoxidil 2%).

RESULTS

A cut off of at least 3 articles was set for conducting a meta-analysis. A meta-analysis was conducted separately for 5 groups of studies that tested the following hair loss treatments: laser treatment in men, 5% minoxidil in men, 2% minoxidil in men, 1 mg finasteride in men, and 2% minoxidil in women. Only a qualitative analysis (Supplementary Table I; available at http://www.jaad.org)[9-31] was done for 4 studies testing 0.5 mg dutasteride in men because only 2 articles presented data with some