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Review

The efficacy and use of finasteride in women: a systematic review

Allison C. Hu[1], BA, Lance W. Chapman[2], MD, MBA, and Natasha A. Mesinkovska[3], MD, PhD

[1]School of Medicine, University of California, Irvine, Irvine, CA, USA, [2]Department of Dermatology, University of California, San Francisco, San Francisco, CA, USA, and [3]Department of Dermatology, University of California, Irvine, Irvine, CA, USA

Correspondence
Natasha A. Mesinkovska, MD, PHD
Department of Dermatology,
University of California, Irvine
118 Medical Surge 1
Irvine, CA 92697-2400
USA
E-mail: nmesinko@uci.edu

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Abstract

Background Physicians are beginning to use finasteride as treatment for hair loss, hirsutism, and various other dermatologic conditions in women. However, the reported efficacy and use of finasteride in the female population varies widely. The purpose of this study is therefore to better define the efficacy and use of finasteride in women and identify research gaps that require further investigation.

Methods A systematic review of the current literature describing finasteride use in women.

Results A total of 2,683 patients participated in 65 studies involving finasteride use in women published between January 1997 and July 2017. Most randomized controlled trials (RCTs) evaluated finasteride use in women with hirsutism (48.7%) or female pattern hair loss (34.7%). RCTs recommend finasteride treatment for women with hirsutism or polycystic ovarian syndrome. Meanwhile, other forms of hair loss were studied such as alopecia, lichen planopilaris, and frontal fibrosing alopecia, but no RCTs evaluating finasteride therapy were identified. Other prospective and retrospective studies report that finasteride may improve hair loss in women with female pattern hair loss or frontal fibrosing alopecia. Overall, doses of oral finasteride ranged from 0.5 to 5 mg/day, in females aged 6–88, over a duration of 6–12 months (57.6%), as monotherapy (88.9%), and for continuous use (96.4%).

Conclusion The studies reviewed highlight the finasteride dosage, length of treatment, and candidate conditions that can benefit from finasteride therapy. Future long-term studies are necessary to fully assess the therapeutic mechanisms and potential consequences of finasteride use and to optimize treatment protocols.

Introduction

Finasteride is a competitive inhibitor of 5-alpha-reductase, an enzyme that catalyzes the conversion of testosterone to dihydrotestosterone (DHT). While there are multiple 5-alpha-reductase isotypes in the body, finasteride specifically acts on isoenzyme II, which is found in the uterus, endometrium, fallopian tube, prostate, male genitalia, hair follicle root sheath, and liver.[1–8] Because finasteride neither directly inhibits testosterone synthesis nor interacts with the androgen receptor, its physiologic actions are restricted to DHT-dependent tissues.[7,9–11] However, since finasteride inhibits the conversion of testosterone to DHT, the mean circulating levels of testosterone are concomitantly increased following use. Elevated testosterone may negatively compete with estrogen in the blood. Overall, it is estimated that finasteride use results in a 15% increase in both testosterone and estradiol compared to baseline, which is still considered within the physiologic range.[12]

Finasteride is clinically indicated for treatment of conditions associated with pathologic accumulation of DHT, such as symptomatic benign prostatic hyperplasia and male pattern hair loss driven by DHT excess in the prostate and hair follicles, respectively.[13] Because of DHT's critical role in embryonic development, finasteride use may yield adverse consequences. Animal studies have demonstrated external genital abnormalities including hypospadias, in male fetuses exposed to 5-alpha-reductase type II inhibitors.[14–16] As such, finasteride and dutasteride are classified in FDA pregnancy category X and are not FDA-approved for use in women. Dutasteride is another competitive inhibitor of 5-alpha-reductase, three times as potent as finasteride at inhibiting type II, and more than 100 times as effective at inhibiting type I.[17] Concerns regarding the adverse effects of finasteride and dutasteride use in men have led the NIH to add the controversial "post-finasteride syndrome", described as a persistent sexual, neurological, and physical adverse reaction, to its Genetic and Rare Diseases Information website.[16,18]

Despite its potential teratogenicity, finasteride is prescribed to women for off-label use in treatment of alopecia and hirsutism.[7,9–11,19–22] Women are usually informed about the teratogenic risks with finasteride and are often administered a contraceptive to reduce pregnancy potential. To date, research focusing on the efficacy of finasteride treatment in the female patient population varies and is limited.

Methods

Study sources and search strategy

We searched the MEDLINE and Cochrane databases for articles published from January 1997 to July 2017. The following search terms were used: "finasteride", "proscar", "propecia", or "5-alpha-reductase inhibitor" combined with "women", "woman", or "female". This search resulted in 577 articles (Fig. 1).

Study inclusion and exclusion criteria

Published randomized clinical trials (RCTs), prospective cohort studies, retrospective studies, and case reports involving finasteride use in females were included. All basic science articles, reviews, commentaries, and studies that were non-English, only in men, or did not specify gender were eliminated. This filtering strategy excluded 512 of the 577 articles, leaving 65 articles available for inclusion (Fig. 1). Information regarding the entire cohort or the subset of females was extracted.

Quality assessment

The quality of evidence for each study was assessed using a modified version of the Oxford Centre for Evidence-Based Medicine scheme for rating individual studies (Table 1).

Results

Androgen receptor-CAG repeats

Previous data demonstrated that the frequency of cytosine, adenine, and guanine (CAG) nucleotide repeats in the androgen receptor (AR) gene influences AR function, with low CAG repeat numbers resulting in greater androgen sensitivity, and >36 repeats associated with pathologic insensitivity.[23] Caucasian women with female pattern hair loss (FPHL) who have greater androgen sensitivity (<24 CAG repeats) are more likely to have a significant response to finasteride compared to placebo, and to women with androgen insensitivity (≥24 CAG repeats).[24] However, a larger but nonrandomized study of Japanese FPHL women found that finasteride efficacy cannot be predicted by AR-CAG repeats.[25]

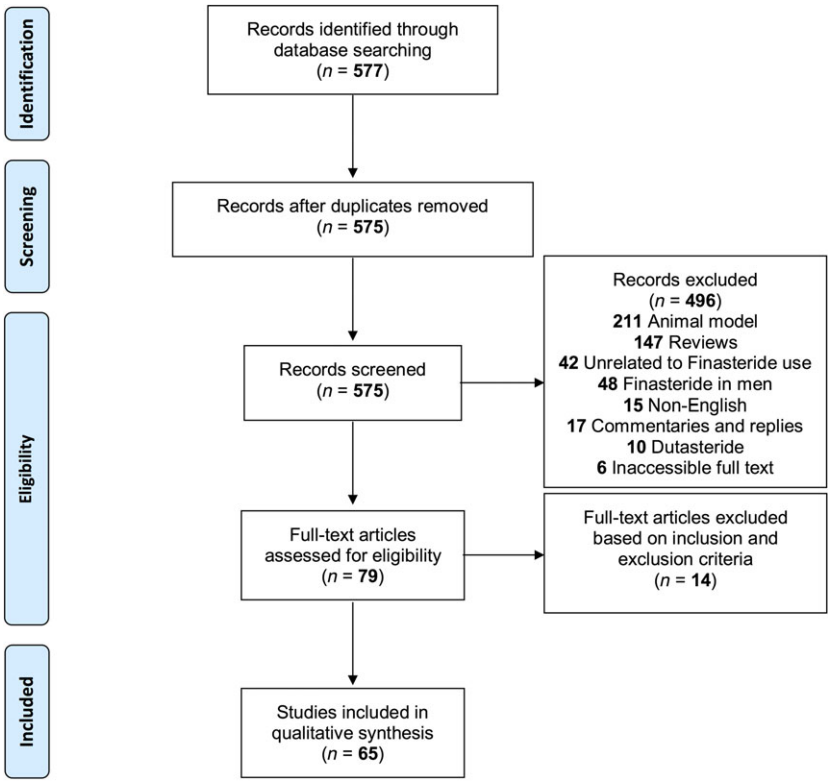

Figure 1 Flowchart of selected studies for inclusion in systematic review. This figure demonstrates the number of studies identified, screened, assessed, and included or excluded during study selection

Table 1 Summary and comparison of the 65 studies that met inclusion criteria

Source	Study design	Quality rating	No. of patients in study (no. women, no. women treated with finasteride); patient population (specifics)	Mean age women; range (specifics)	Primary disease(s)	Length of treatment	Finasteride administration method (dosage)	Drug comparison (dosage)	Outcome measure
Alijanpour[46]	Double-blind placebo-controlled clinical trial	2	104 (104, 52); F (premenopausal)	21.55; N/A (treatment) 30.71; N/A (placebo)	IH	6–12 months	Topical (0.5% solution/day)	Placebo	Counted unwanted hairs in 5 cm^2 zone on the chin
Altomare *et al.*[88]	Retrospective study	3	23 (5, 5); F (Italian) + M	31.2; 28–37	AGA	2–4 months	Oral (1 mg/day)	N/A	N/A
Ariê *et al.*[72]	Randomized double-blind controlled trial	1	31 (31, ~15); F (premenopausal)	N/A; 18–35	PCOS	3 months	Oral (5 mg/day)	Placebo	Ovary volume
Bayhan *et al.*[60]	Randomized clinical study	1	60 (60, 34); F	N/A	IH	6 months	Oral (5 mg/day)	GnRH agonist (3.75 mg/day)	Ferriman-Gallwey score and serum hormone levels
Bayram *et al.*[66]	Nonrandomized clinical trial	2	35 (35, 35); F	N/A	Hirsutism	12 months	Oral (5 mg/day)	N/A	Ferriman-Gallwey score and serum hormone levels
Bayram *et al.*[67]	Randomized controlled trial	1	56 [56 (21 IH + 35 hirsutism with PCOS), 56]; F (premenopausal)	23.2; 18–41	IH or Hirsutism + PCOS	12 months	Oral (2.5 or 5 mg/day)	N/A	Ferriman-Gallwey score and serum hormone levels
Bayram *et al.*[68]	Nonrandomized clinical trial	2	29 [29 (12 IH + 17 hirsutism with PCOS), 29]; F (premenopausal)	23.6; 17–32	IH or Hirsutism + PCOS	12 months	Oral (2.5 mg/day)	N/A	Ferriman-Gallwey score and serum hormone levels
Beigi *et al.*[63]	Randomized clinical study	1	40 [40 (29 IH + 11 hirsutism with PCOS), 20 (6 IH + 14 hirsutism with PCOS)]; F (premenopausal)	N/A; 16–29	IH or Hirsutism + PCOS	9 months	Oral (5 mg/day)	CPA (25 mg/day) + EE (20 ug/day)	Ferriman-Gallwey score, hair growth, and serum hormone levels
Boersma *et al.*[21]	Retrospective study	3	120 (120, 120); F (premenopausal and postmenopausal)	NA; 16–84 (Age range of database of 3500 women)	AGA	36 months	Oral (1.25 mg/day)	Dutasteride (0.15 mg/day)	Global macroscopic images on a 3-point scale (−1 to +1) via hair experts
Boychenko *et al.*[33]	Case report	5	1 (1, 1); F	44; N/A	FAGA	3.5 months	Oral (1.25 mg/day)	N/A	N/A
Carmina and Lobo[26]	Randomized clinical study	1	48 (48, 12); F (hyperandrogenic premenopausal)	24.1; N/A	Acne	12 months	Oral (5 mg/day)	Flutamide (250 mg/day), CPA (2 mg/day) + EE (35 ug/day), or CPA (50 mg/day) + EE (25 ug/day)	Cook scores and serum hormone levels
Carmina and Lobo[29]	Randomized unmasked trial	2	48 (48, 12); F (premenopausal)	25; N/A	AGA	12 months	Oral (5 mg/day)	Flutamide (250 mg/day), CPA (50 mg/day) + EE (25 ug/day), or no treatment	Ludwig scores, patient assessments, and investigator assessments on a 7-point scale (−3 to +3)
Check *et al.*[82]	Case report	5	1 (1, 1); F (premenopausal)	N/A	Chronic migraines	N/A	Oral (5 mg/day)	N/A	N/A
Erenus *et al.*[48]	Randomized single-blind study	1	41 (41, 13); F (premenopausal)	23.6; 18–34	IH	12 months	Oral (5 mg/day)	Spironolactone (100 mg/day)	Ferriman-Gallwey score

Table 1 Continued

Source	Study design	Quality rating	No. of patients in study (no. women, no. women treated with finasteride); patient population (specifics)	Mean age women; range (specifics)	Primary disease(s)	Length of treatment	Finasteride administration method (dosage)	Drug comparison (dosage)	Outcome measure
Faloia[65]	Prospective study	2	27 (27, 27); F (premenopausal)	16–35	IH	6 months	Oral (5 mg/day)	Oral (5 mg/day) + Gestodene (0.075 mg/day) + EE (0.03 mg/day)	Ferriman-Gallwey score, serum hormona level and biochemical evaluation
Falsetti *et al.*[47]	Randomized clinical study	1	44 (44, 22); F (premenopausal)	22.9; N/A	Hirsutism + PCOS	6 months	Oral (5 mg/day)	Flutamide (250 mg 2×/day)	Ferriman-Gallwey score, hair diameter, and serum hormone levels
Falsetti *et al.*[50]	Randomized clinical study	1	110 [110 (46 IH + 64 hirsutism with PCOS), 55 (23 IH + 32 hirsutism with PCOS]; F (premenopausal)	22.6; 18–29	IH or Hirsutism + PCOS	12 months	Oral (5 mg/day)	Flutamide (250 mg 2×/day)	Ferriman-Gallwey score, hair diameter, and serum hormone levels
Farrell *et al.*[74]	Case report	5	2 (1,1); F (postmenopausal) + M	55; N/A	HS	3 months	Oral (5 mg/day)	N/A	Self-reporting
Fruzzetti *et al.*[52]	Randomized open controlled trial	2	45 [45 (16 IH + 29 hyperandrogenic hirsutism), 14 (6 IH + 8 hyperandrogenic hirsutism)]; F (premenopausal)	22.1; 16–29	IH or Hyperandrogenic Hirsutism	12 months	Oral (5 mg/day)	Flutamide (500 mg/day) or CPA (25 mg/day) + EE	Ferriman-Gallwey score
Hong *et al.*[31]	Case report	5	1 (1, 1); F (postmenopausal)	47; NA	AGA	10 months	Oral (2.5 mg/day)	N/A	Clinical photographs
Iorizzo *et al.*[30]	Nonblind, nonrandomized prospective cohort study	2	37 (37, 37); F (premenopausal)	33.7; 19–50	FPHL	12 months	Oral (2.5 mg/day)	N/A	Global photographic assessment on a 7-point scale (−3 to +3), hair density score from videodermoscopy, and self-administered questionnaire
Joseph *et al.*[73]	Preliminary study	5	7 (5,5); F (premenopausal) + M	28.6; 16–36	HS	1.5–3 months	Oral (5 mg/day)	N/A	Clinical response
Keene *et al.*[24]	Blinded, randomized controlled trial pilot study	2	13 (13, 8); F (Caucasian and postmenopausal)	N/A	AGA	6 months	Oral (1 mg/day)	Placebo	Hair count via global and microphotographs with Beck Depression Inventory survey
Keleştimur *et al.*[59]	Randomized clinical study	1	65 [65 (31 IH + 34 hirsutism with PCOS), 33]; F (premenopausal)	20.8; N/A	IH or Hirsutism + PCOS	12 months	Oral (5 mg/day) + spironolacotne (100 mg/day)	Spironolactone (100 mg/day)	Ferriman-Gallwey score and serum hormone levels
Khandalavala[75]	Case report	5	1 (1, 1); F (premenopausal)	19; N/A	HS	36 months	Oral (5 mg/day) + dapsone (100 mg/day) + metformin (2000 mg/day) + liraglutide (0.6 mg/day)	N/A	Observation

Table 1 Continued

Source	Study design	Quality rating	No. of patients in study (no. women, no. women treated with finasteride); patient population (specifics)	Mean age women; range (specifics)	Primary disease(s)	Length of treatment	Finasteride administration method (dosage)	Drug comparison (dosage)	Outcome measure
Kim *et al.*[34]	Prospective study	2	18 (18, 18); F (premenopausal and postmenopausal)	46.3; N/A	FPHL	6.4 months	Oral (1.25 mg/day)	N/A	Phototrichogram for hair thickness and density and global photographic assessment on a 7-point scale (−3 to +3) via patient and physician
Kohler *et al.*[27]	Retrospective study	3	12 [12 (6 acne + 6 alopecia), 12]; F (premenopausal and postmenopausal)	43.7; 26–76	Acne or Alopecia	N/A	Oral (5 mg/day)	N/A	Subjective patient questionnaire on analog scale
Ladizinski *et al.*[38]	Retrospective study	3	19 (19, 3); F (premenopausal and postmenopausal)	62.9; 44–80	FFA	Mean 10 months	Oral (1–2.5 mg/day), Oral (1–2.5 mg/day) + Methotrexate, or Oral (1–2.5 mg/day) + Acitretin + Topical Imiquimod	Dutasteride (0.5 mg/day), Methotrexate (15–25 mg/week), Hydroxychloroquine (400 mg/day), Minocycline, Imiquimod, Acitretin, Interferon alpha-2b, Azathioprine, Pioglitazone	Clinical notes and global photographic assessment on a 3-point scale (−1 to +1)
Lakryc *et al.*[43]	Randomized double-blind controlled trial	1	24 [24 (10 IH + 14 hirsutism with PCOS), 24]; F (premenopausal)	N/A; 19–40	IH or Hirsutism + PCOS	6 months	Oral (5 mg/day)	Placebo	Ferriman-Gallwey score, hormonal evaluation, and patient satisfaction
Lucas[70]	Preliminary study	5	8 (8, 8); F	N/A	Hirsutism	6 months	Topical (0.25% solution/day)	Placebo	Hair count and hair thickness
Lumachi *et al.*[58]	Randomized clinical study	1	40 (20, 20); F (premenopausal)	20.4; N/A	IH	9 months	Oral (5 mg/day)	Spironolactone (100 mg/day)	Ferriman-Gallwey score and serum hormone levels
Mardones *et al.*[42]	Retrospective study	3	103 [67 (26 FFA + 41 CLPP), 18 (10 FFA + 8 CLPP)]; F (Chilean) + M	FFA: 62.9; N/A CLPP: 54.1; N/A	FFA or CLPP	12 months	Oral (1–2.5 mg/day) + Cetirizine (5 mg/day) + Topical medication	Cetirizine (5 mg/day) + Topical medication + Hydroxychloroquine (200–400 mg/day), Methotrexate (7.5–15 mg/day), or Isotretinoin (20 mg/day)	Clinical categorization as none, mild, or satisfactory

Table 1 Continued

Source	Study design	Quality rating	No. of patients in study (no. women, no. women treated with finasteride); patient population (specifics)	Mean age women; range (specifics)	Primary disease(s)	Length of treatment	Finasteride administration method (dosage)	Drug comparison (dosage)	Outcome measure
Moghetti *et al.*[54]	Randomized double-blind controlled trial	1	40 [40 (19 IH + 21 hirsutism with PCOS), 10 (6 IH + 4 hirsutism with PCOS)]; F (premenopausal)	20.4; N/A	IH or Hirsutism + PCOS	6 months	Oral (5 mg/day)	Flutamide (250 mg/day), spironolactone (100 mg/day), or placebo	Ferriman-Gallwey score, hair diameter, and serum hormone levels
Moisseiev *et al.*[77]	Retrospective study	3	23 (3, 3); F + M	61; 24–75 (range is of female and male participants)	CSCR	3–6 months	Oral (5 mg/day)	N/A	SRF resolution via OCT
Moreno-Arrones, *et al.*[36]	Retrospective study	3	10 (10, 10); F (F-to-M transgender)	35; 28–41	AGA	12 months	Oral (1 mg/day)	N/A	Norwood-Hamilton scale
Moreno-Ramírez *et al.*[41]	Case series	5	16 (16, 7); F (postmenopausal)	61.4; 45–79	FFA	12–48 months	Oral (2.5 mg/day) + Minoxidil (5% 2×/day) + Triamcinolone acetonide (20 mg/mL/3 months)	N/A	Hair density observation
Mota *et al.*[76]	Case series	5	5 (4,4); F (entered puberty)	8; 6–11	HS	24 months (maximum)	Oral (1–5 mg/day)	N/A	Observation
Müderris *et al.*[53]	Randomized clinical study	1	70 [70 (33 IH + 37 hirsutism with PCOS), 35 (14 IH + 21 hirsutism with PCOS)]; F (premenopausal)	23; N/A	IH or Hirsutism + PCOS	12 months	Oral (5 mg/day)	Flutamide (250 mg/day)	Ferriman-Gallwey score and serum hormone levels
Oliveira-Soares *et al.*[11]	Nonblind, nonrandomized prospective cohort study	2	40 (40, 40); F (normoandrogenic postmenopausal)	N/A	AGA	18 months	Oral (5 mg/day)	N/A	Global photographic assessment and patient satisfaction
Petrone *et al.*[64]	Nonrandomized clinical study	2	40 [40 (20 IH + 20 hirsutism with PCOS), 40]; F	N/A	IH or Hirsutism + PCOS	12 months	Oral (5 mg/day)	N/A	Ferriman-Gallwey score and serum hormone levels
Price and Allen *et al.*[69]	Randomized blinded study	1	9 (9, 5); F (premenopausal)	N/A	Hirsutism	6 months	Topical (0.25 or 0.5% solution/day)	Placebo	Hair density, hair diameter, hair growth time, serum hormone levels

Table 1 Continued

Source	Study design	Quality rating	No. of patients in study (no. women, no. women treated with finasteride); patient population (specifics)	Mean age women; range (specifics)	Primary disease(s)	Length of treatment	Finasteride administration method (dosage)	Drug comparison (dosage)	Outcome measure
Price and Roberts *et al.*[7]	Double-blind placebo-controlled randomized multicenter trial	1	137 (137, 67); F (postmenopausal)	53; 41–60	AGA	12 months	Oral (1 mg/day)	Placebo	Scalp hair counts, patient and investigator assessments, assessment of global photographs by blinded expert panel, and histologic analysis of scalp biopsy specimens
Pugnaghi *et al.*[81]	Case report	5	1 (1, 1); F (premenopausal)	57; N/A	Temporal lobe epilepsy	N/A	Oral (5 mg/day)	N/A	Interictal EEG
Rallis *et al.*[37]	Nonrandomized controlled trial	2	18 (18, 5); F (postmenopausal)	62.3; 48–88	FFA + AGA	12 months	Oral (2.5 mg/day) + minoxidil (5%)	Topical clobetasol (0.05%) or no treatment	Clinical pictures and concomitant measurement of alopecia band; patient satisfaction via visual analogue scale (0–10)
Sahin *et al.*[49]	Randomized double-blind controlled trial	1	42 [42 (24 IH + 18 hirsutism with PCOS), 21 (12 IH + 9 hirsutism with PCOS)]; F (premenopausal)	24.2; N/A	IH or Hirsutism + PCOS	9 months	Oral (5 mg/day)	CPA (2 mg/day) + EE (35 ug/day)	Ferriman-Gallwey score and serum hormone levels
Sahin *et al.*[57]	Randomized clinical study	1	40 (40, 20); F (premenopausal)	25.13 N/A	Hirsutism + PCOS	12 months	Oral (5 mg/day) + CPA (2 mg/day) + EE (35 ug/day)	CPA (2 mg/day) + EE (35 ug/day)	Ferriman-Gallwey score and serum hormone levels
Sallout and Alwadi[80]	Case report	5	1 (1, 1); F (premenopausal)	41; N/A	Fertility	N/A	Oral (1 mg/day)	N/A	N/A
Shum *et al.*[32]	Case report	5	4 (4, 4); F (hyperandrogenism, premenopausal and postmenopausal)	50.5; 36–66	FPHL	24–30 months	Oral (1.25 mg/day)	N/A	Hair growth compared with baseline clinical photographs
Tahvilian *et al.*[45]	Double-blind randomized study	1	30 (30, 15); F	N/A	IH	6 months	Gel (0.25% solution/day)	Placebo	Rate of hair growth, mean caliber of three plucked hairs, and Ferriman-Gallwey score of the skin area
Tartagni *et al.*[56]	Randomized single-blind study	1	50 [50 (30 IH + 20 hirsutism with PCOS), 25 (15 IH + 10 hirsutism with PCOS)]; F (premenopausal)	IH: N/A; 18–36 PCOS: N/A: 19–31	IH or Hirsutism + PCOS	6 months	Oral (5 mg/day) + CPA (2 mg/day) + EE (35 ug/day)	CPA (2 mg/day) + EE (35 ug/day)	Ferriman-Gallwey score, hormonal evaluation, and self-evaluation

Table 1 Continued

Source	Study design	Quality rating	No. of patients in study (no. women, no. women treated with finasteride); patient population (specifics)	Mean age women; range (specifics)	Primary disease(s)	Length of treatment	Finasteride administration method (dosage)	Drug comparison (dosage)	Outcome measure
Tartagni *et al.*[55]	Randomized clinical study	1	38 [38 (22 IH + 16 hirsutism with PCOS), 38]; F (premenopausal)	Hirsutism: N/A; 18–34 PCOS: N/A: 19–30	IH or Hirsutism + PCOS	10 months	Oral (2.5 mg/day or 3 days)	N/A	Ferriman-Gallwey score and serum hormone levels
Tartagni *et al.*[71]	Double-blind randomized study	1	60 (60, 34); F (premenopausal)	28.8; 21–37	PCOS	0.69 months	Oral (5 mg/day) + rFSH (100 IU)	rFSH (100 IU)	Ovulation rate in women with PCOS
Tartagni *et al.*[79]	Case report	5	1 (1, 1); F (premenopausal)	33; N/A	Fertility	0.52 months	Oral (5 mg/day) + rFSH (100 IU)	N/A	N/A
Tartagni *et al.*[44]	Randomized clinical trial pilot study	2	28 [28 (14 IH + 14 hirsutism with PCOS), 14 (7 IH + 7 hirsutism with PCOS)]; F (premenopausal)	N/A; 15–19	IH or Hirsutism + PCOS	6 months	Oral (2.5 mg/3 days)	Placebo	Hirsutism score, clinical and hormonal effects
Thai *et al.*[28]	Case report	5	1 (1, 1); F (postmenopausal)	67; N/A	AGA	12 months	Oral (5 mg/week)	N/A	Standardized global photography with stereotactic device
Tosti *et al.*[40]	Case series	5	11 (11, 8); F (postmenopausal)	62; 54–78	FFA	12–30 months	Oral (2.5 mg/day)	IM Triamcinolone acetonide (40 mg/3 weeks)	Global photography with measurement of the height of the alopecic band
Trüeb *et al.*[9]	Case series	5	5 (5,5); F (postmenopausal)	60; 52–69	AGA	18 months	Oral (2.5 or 5 mg/day)	N/A	Patient questionnaire, investigator assessments, and global photographic assessment on a 7-point scale (−3 to +3) via expert panel
Unlühizarci *et al.*[62]	Randomized clinical study	1	34 [34 (22 IH + 12 hirsutism with PCOS); 16]; F (premenopausal)	20.3; N/A	IH or Hirsutism + PCOS	6 months	Oral (5 mg/day) + Spironolactone (100 mg/day)	Spironolactone (100 mg/day)	Ferriman-Gallwey score and serum hormone levels
Unluhizarci *et al.*[61]	Prospective study	2	44 [44 (11 IH + 13 IHA + 20 hirsutism with PCOS), 28 (10 IH + 7 IHA + 11 hirsutism with PCOS]; F (premenopausal)	23.5; N/A	Hirsutism	12 months	Oral (5 mg/day)	Flutamide (125 mg/day) or Flutamide (125 mg/day) + Finasteride (5 mg/day)	Hirsutism score
Vañó-Galván *et al.*[39]	Retrospective study	3	355 (343, 102); F (premenopausal and postmenopausal) + M	56.7; 23–86 (range is of female and male participants)	FFA	N/A	Oral (2.5–5 mg/day)	N/A	Clinical notes and global photographic assessment on a 3-point scale (worsening, stabilization, improvement)

Table 1 Continued

Source	Study design	Quality rating	No. of patients in study (no. women, no. women treated with finasteride); patient population (specifics)	Mean age women; range (specifics)	Primary disease(s)	Length of treatment	Finasteride administration method (dosage)	Drug comparison (dosage)	Outcome measure
Venturoli *et al.*[51]	Prospective study	2	66 [66 (39 IH + 27 hirsutism with PCOS), 15]; F (premenopausal)	22.9; N/A	IH or Hirsutism + PCOS	12 months	Oral (5 mg/day)	Flutamide (250 mg/day), Ketoconazole (300 mg/day), or CPA (12.5 mg/day) + EE (0.01–0.02 mg/day)	Ferriman-Gallwey score, hair diameter, and hair growth rate
Whiting *et al.*[35]	Randomized multicenter clinical trial	1	120 (94, 44); F (postmenopausal) + M	N/A; 41–60	AGA	12 months	Oral (1 mg/day)	Placebo	Histologic analysis via counting follicles (terminal anagen, terminal telogen, total terminal, vellus, and total terminal and vellus hairs) in horizontal sections of scalp biopsies
Wong *et al.*[78]	Prospective study	2	5 (5,5); F	N/A	Fertility	3 consecutive menstrual cycles	Oral (5 mg/day)	N/A	Serum hormone levels, urine LH, and urine creatinine
Yamazaki *et al.*[25]	Nonblind, nonrandomized prospective cohort study	2	37 (37, 37); F (Japanese premenopausal and postmenopausal)	51.8; 29–75	FPHL	6 months	Oral (1 mg/day)	N/A	Finasteride efficacy via macroscopic photographic assessment on a 7-point scale (−3 to +3)
Yeon *et al.*[10]	Nonblind, nonrandomized prospective cohort study	2	86 (86, 86); F (Asian premenopausal and postmenopausal)	44.4; 21–69	FPHL	12 months	Oral (5 mg/day)	N/A	Phototrichogram for hair thickness and density and global photographic assessment on a 7-point scale (−3 to +3) via dermatologist

Quality rating scheme is modified from the Oxford Centre of Evidence-Based Medicine for ratings of individual studies: (1) properly powered and conducted randomized clinical trial; systematic review with meta-analysis; (2) well-designed controlled trial without randomization; prospective comparative cohort trial; (3) case-control studies; retrospective cohort study; (4) case series with or without intervention; cross-sectional study; (5) opinion of respected authorities; case reports. AGA, androgenetic alopecia; AR-CAG, androgen receptor cytosine, adenine, guanine; CLPP, classic lichen planopilaris; CPA, cyproterone acetate; CSCR, central serous chorioretinopathy; EE, ethinyl estradiol; F, female; FAGA, female androgenic alopecia; FFA, frontal fibrosing alopecia; FPHL, female pattern hair loss; GnRH, gonadotropin-releasing hormone; HS, Hidradenitis Suppurativa; IH, idiopathic hirsutism; IHA, idiopathic hyperandrogenemia; IU, international units; M, male; No., number; N/A, not available; OCT, optical coherence tomography; PCOS, polycystic ovary syndrome; SRF, subretinal fluid.

Acne

An RCT demonstrated finasteride (5 mg/day) to be less beneficial than flutamide (250 mg/day) and cyproterone acetate with ethinyl estradiol (CPA+EE) in treating hyperandrogenic women for acne.[26] A retrospective study in females ($n = 12$) with normal levels of free testosterone with acne or alopecia reported effective finasteride treatment (5 mg/day) in nine patients including decreased symptoms and subjective psychological improvement.[27]

Female pattern hair loss (androgenetic alopecia in women)

Finasteride dosage for treatment of FPHL varied widely (1–5 mg/day). Four studies suggested that high-dose (5 mg/day) finasteride use in postmenopausal patients with FPHL could effectively improve hair loss in 6–12 months.[9–11,28] One of the studies further demonstrated no significant difference between premenopausal and postmenopausal groups in the percentage of improvement in scalp hair appearance and changes in hair thickness.[10] Notably, the premenopausal women in this study were treated with finasteride without using oral contraceptive and instead used nonhormonal contraceptive measures.[10] One RCT, however, showed no significant reduction in Ludwig scores among all 12 premenopausal patients after 1 year of high-dose finasteride and mechanical contraception.[29]

At medium-dose finasteride (2.5 mg/day) with oral contraception, improvement on global photography assessment scale in 62% of the premenopausal patients ($n = 37$) and significant increase in hair density score were observed.[30] A postmenopausal woman with FPHL following exogenous androgen supplementation responded well to medium-dose finasteride, with slower rates of hair loss, decreased hirsutism, and higher pitch of voice after 10 months of treatment.[31]

Low-dose finasteride (1.25 mg/day) also proved to be efficacious in most premenopausal and postmenopausal patients. After 3 years of treatment, 81.7% of the FPHL patients showed increased hair thickness, and 68.9% showed superior hair density on imaging.[21] Multiple case reports describe women with FPHL unresponsive to minoxidil or CPA+EE demonstrating reduced hair shedding and increased hair regrowth following finasteride therapy.[32,33] Objective phototrichogram assessments have also demonstrated mean increments of 5.87% of hair density and 11.8% of hair thickness after 28 weeks, however without statistical significance.[34]

Most studies demonstrated no change in FPHL with lower-dose finasteride (1 mg/day).[7,35,36] Two RCTs showed no significant difference in hair or follicular counts between finasteride and placebo groups after 12 months of treatment in postmenopausal women.[7,35] Interestingly, in a retrospective study, all 10 female-to-male transgender patients with AGA improved one grade on the Norwood–Hamilton scale after an average of 5.5 months of finasteride treatment.[36]

Frontal fibrosing alopecia

Finasteride treatment in females with frontal fibrosing alopecia (FFA) resulted in variable improvements in hair loss.[37–41] While two studies[37,38] showed lack of hair loss stabilizing following finasteride (1–2.5 mg/day), a large retrospective multicenter study ($n = 102$) demonstrated finasteride (2.5–5 mg/day) use to result in regrowth of hair in the hairline in 48 patients and arrest of hairline recession in 54 patients.[39] Two case series showed finasteride (2.5 mg/day) combination therapy to halt or slow FFA progression.[40,41]

Lichen planopilaris

A retrospective study showed mild and satisfactory improvements for 65.3% of lichen planopilaris (LPP) and 74.1% of FFA cases following treatment with finasteride (1–2.5 mg/day), cetirizine (5 mg/day), and a topical medication but none with complete clinical remission after 12 months.[42] However, from the information provided in that manuscript, it is not possible to determine whether those improvements were due to finasteride use in women.[42]

Hirsutism

Hirsutism is the most studied condition in women treated with finasteride in the past 20 years.[43–70] Four studies, three of which were RCTs, demonstrated a significant decrease in Ferriman-Gallwey (FG) score after 6–12 months of oral finasteride for treatment of idiopathic hirsutism (IH) or hirsutism secondary to PCOS.[43,44,55,64] Another study showed both finasteride (5 mg/day) alone and finasteride with an oral contraceptive to significantly improve hirsutism after 6 months, but only combination therapy showed significant reduction in DHT.[65]

There are several prospective studies by Bayram *et al*. on oral finasteride treatment in hirsute women.[66–68] The initial study demonstrated reduction in hirsutism scores at 6 ($25.8 \pm 11.3\%$) and 12 months ($41.3 \pm 18.5\%$) after high-dose finasteride (5 mg/day) therapy.[66] Subsequent studies showed similar improvements in hirsutism scores at medium dosages (2.5 mg/day).[67,68]

Topical finasteride gel (0.25–0.5%) demonstrated inconsistent efficacy in IH management.[45,46,69,70] An RCT compared topical finasteride at various concentrations for 6 months and showed no difference between hair density, hair diameter, serum testosterone levels, and serum DHT levels in all groups.[69] However, more recent studies proved topical finasteride alone or prior to diode laser (810 nm) treatment to be efficacious in reducing mean hair counts (MHC) and/or mean hair thickness (MHT) after 6–12 months.[45,46,70]

Many RCTs compared treatment with finasteride (5 mg/day) to other drugs.[47–54,56–61] Finasteride reduced the FG score and hair diameter more than flutamide (250 mg twice/day) after 6 months of therapy,[47] but flutamide was more effective at 12 months.[50] Studies consistently reported a decrease in hirsutism scores[51–54] with finasteride monotherapy. While some studies demonstrated comparable effects between finasteride

Table 2 Summary of demographic and treatment characteristics

Demographic and treatment characteristics	No. of studies (% of all studies) (n = 63)[a]	Total no. of patients treated with finasteride (% of all patients) (n = 1,457)	No. of patients in RCTs treated with finasteride (% of all patients) (n = 734)
Average age (years)			
<25	20 (31.7%)		
26–35	6 (9.5%)		
36–45	3 (4.8%)		
46–55	6 (9.5%)		
56–65	8 (12.7%)		
>66	1 (1.6%)		
N/A	19 (30.2%)		
Menopausal status			
Premenopausal	34 (54.0%)	794 (54.5%)	566 (77.1%)
Postmenopausal	11 (17.5%)	257 (17.6%)	119 (16.2%)
Both	8 (12.7%)	237 (16.3%)[b]	0 (0.0%)
N/A	10 (15.9%)	169 (11.6%)	49 (6.7%)
Primary disease			
Acne[c]	1.5 (2.4%)	18 (1.2%)	12 (1.6%)
AGA, FAGA, FPHL	17 (27.0%)	496 (34.0%)	67 (9.1%)
Alopecia[c]	0.5 (0.8%)	6 (0.4%)	0 (0.0%)
Chronic migraines	1 (1.6%)	1 (0.1%)	0 (0.0%)
CLPP[d]	0.5 (0.8%)	8 (0.5%)	0 (0.0%)
CSCR	1 (1.6%)	3 (0.2%)	0 (0.0%)
Fertility	2 (3.2%)	6 (0.4%)	0 (0.0%)
FFA[d]	4.5 (7.1%)	130 (8.9%)	0 (0.0%)
FFA + AGA	1 (1.6%)	5 (0.3%)	0 (0.0%)
Hirsutism	28 (44.4%)	724 (49.7%)	602 (82.0%)
HS	4 (6.3%)	11 (0.8%)	0 (0.0%)
PCOS	2 (3.2%)	49 (3.4%)	53 (7.2%)
Length of treatment (months)			
<1	2 (3.2%)	35 (2.4%)	34 (4.6%)
≤6	20 (31.7%)	280 (19.2%)	188 (25.6%)
≤12	30 (47.6%)	838 (57.5%)	512 (69.8%)
≤18	2 (3.2%)	45 (3.1%)	0 (0.0%)
≤24	1 (1.6%)	4 (0.3%)	0 (0.0%)
≤36	3 (4.8%)	125 (8.6%)	0 (0.0%)
12–30	1 (1.6%)	8 (0.5%)	0 (0.0%)
12–48	1 (1.6%)	7 (0.5%)	0 (0.0%)
N/A	3 (4.8%)	115 (7.9%)	0 (0.0%)
Drug administration method and dosage			
Oral drug dosage (mg/day)	n = 59	n = 1377	n = 662
1.0	6 (10.2%)	171 (12.4%)	119 (18.0%)
1.0–2.5	2 (3.4%)	21 (1.5%)	0 (0.0%)
1.0–5.0	1 (1.7%)	4 (0.3%)	0 (0.0%)
1.25	4 (6.8%)	143 (10.4%)	0 (0.0%)
2.5	8 (13.6%)	139 (10.1%)	52 (7.9%)
2.5–5.0	3 (5.1%)	163 (11.8%)	56 (8.5%)
5.0	35 (59.3%)	736 (53.4%)	435 (65.7%)
Topical drug dosage (% solution/day)	n = 4	n = 80	n = 72
0.25	2 (50.0%)	25 (31.3%)	17 (23.6%)
0.25–0.50	1 (25.0%)	–	–
0.50	1 (25.0%)	55 (68.8%)	55 (76.4%)
Type of therapy			
Monotherapy	52 (82.5%)	1295 (88.9%)	606 (82.6%)
Monotherapy and combination therapy	1 (1.6%)	–	–
Combination therapy	10 (15.9%)	162 (11.1%)	128 (17.4%)

Table 2 Continued

Demographic and treatment characteristics	No. of studies (% of all studies) (n = 63)[a]	Total no. of patients treated with finasteride (% of all patients) (n = 1,457)	No. of patients in RCTs treated with finasteride (% of all patients) (n = 734)
Frequency of use			
Continuous	61 (96.8%)	1405 (96.4%)	682 (92.9%)
Continuous and intermittent use	1 (1.6%)	38 (2.6%)	38 (5.2%)
Intermittent	1 (1.6%)	14 (1.0%)	14 (1.9%)

AGA, androgenetic alopecia; CLPP: classic lichen planopilaris; CSCR, central serous chorioretinopathy; FAGA, female androgenic alopecia; FFA, frontal fibrosing alopecia; FPHL, female pattern hair loss; HS, hidradenitis suppurativa; PCOS, polycystic ovary syndrome; RCTs, randomized clinical trials.

[a]Studies involving finasteride cessation were not included.[80,81]

[b]Studies that investigated both premenopausal and postmenopausal women but did not identify which patients were treated with finasteride.[21,27,38,39]

[c]One study looked at patients with either acne or alopecia.[27]

[d]One study looked at patients with either CLPP or FFA.[42]

and flutamide (250–500 mg/day),[52,54] others showed finasteride to be less effective.[51,53] The combination therapy of finasteride with flutamide was most efficacious compared to either monotherapy.[61] RCTs showed no significant difference between finasteride and spironolactone (100 mg/day) reductions in hirsutism scores after 6 months,[54] but spironolactone was more effective after 9–12 months.[48,58] Spironolactone plus finasteride combination therapy proved to be more efficacious than spironolactone monotherapy.[59,62] Finasteride (5 mg/day) is equally effective in decreasing hirsutism scores compared to high-dose CPA+EE,[52,63] less effective compared to medium and low-dose CPA+EE,[49,51] and more effective than CPA+EE monotherapy when used in combination after 6–12 months.[56,57] An RCT showed IV GnRH (3.75 mg/month) therapy to decrease hirsutism scores by a greater mean percentage than oral finasteride (5 mg/day) after 6 months.[60]

Hyperandrogenic polycystic ovary syndrome

In a double-blind RCT, administration of finasteride with recombinant FSH (rFSH) during ovarian stimulation improved the ovulation rate in hyperandrogenic anovulatory women with PCOS and prior resistance to gonadotropin stimulation.[71] Another RCT used ultrasound-guided assessment to demonstrate no differences in volume and number of cysts in ovaries of women treated with finasteride (5 mg/day) after 3 months.[72]

Hidradenitis suppurativa

A couple case series examined finasteride (5 mg/day) for hidradenitis suppurativa (HS) therapy.[42,73–76] Five women and two men with HS unresponsive to antibiotics were treated with finasteride. Six patients improved significantly and three of them had completely healed lesions, but the study lacked gender data.[73] A report showed no new HS lesions 3 months following finasteride treatment,[74] while another showed faster healing lesions (3 weeks vs. 6 months) and ultimately no new lesions after 3 years.[75] Case series of girls with HS (6–11 years old) treated with finasteride (1–5 mg/day) for 24 months had overall improvement of disease, with a reduction in frequency and intensity of flares.[76]

Central serous chorioretinopathy

Central serous chorioretinopathy (CSCR) is an acquired idiopathic chorioretinal disorder characterized by exudative detachment of the retina and/or retinal pigment epithelium (RPE).[77] The first study of finasteride use for treatment of CSCR in women reported no significant change in visual acuity, a modest reduction in macular thickness, and improvement in subretinal fluid levels.[77]

Fertility

A pilot study examining finasteride (5 mg/day) therapy on normal ovulatory women (n = 5) demonstrated no alteration in follicular development or in ovulation.[78] However, a 33-year-old hyperandrogenic woman who failed to ovulate after rFSH (150 IU) stimulation had finasteride (5 mg/day) added to her treatment for 16 days and delivered a normal male infant 40 weeks later.[79] On the other hand, the first potential case of finasteride teratogenicity resulted in the delivery of a baby girl with aphalangia.[80] Prior to her pregnancy, the patient was treated with finasteride (1 mg/day) for her pattern alopecia, which was discontinued immediately after pregnancy was confirmed at 6 weeks gestation. Although the patient delivered six previous healthy children, no family history of congenital or genetic diseases, and no radiation or other teratogenic exposure, it is unclear if these deformities are a direct effect of unintended finasteride use during pregnancy.

Neurologic conditions

A case of a 57-year-old woman with a history of temporal lobe epilepsy and hirsutism demonstrated improved response to

Table 3 Summary of recommendations for finasteride treatment in women

Recommendation	Grade of recommendation	Quality of evidence	Source
Finasteride can be used to treat females with IH or hirsutism secondary to PCOS	1	A	Faloia[65]; Petrone *et al.*[64]; Bayram *et al.*[66]; Bayram *et al.*[68]; Lakryc *et al.*[43]; Tartagni *et al.*[55]; Tartagni *et al.*[44]
Topical finasteride can be used to treat women with IH	1	A	Lucas[70]; Tahvilian *et al.*[45]; Alijanpour[46]
For shorter courses of treatment, finasteride is more effective than flutamide in treating females with IH or hirsutism secondary to PCOS	1	A	Falsetti *et al.*[47]
Medium-dose finasteride (2.5 mg/day) is just as effective as high-dose finasteride (5 mg/day) for treating females with IH or hirsutism secondary to PCOS	1	A	Bayram *et al.*[67]
Finasteride is just as effective as flutamide, spironolactone, and CPA+EE for treating females with IH or hirsutism secondary to PCOS	1	A	Fruzzetti *et al.*[52]; Moghetti *et al.*[54]; Beigi *et al.*[63]
Finasteride is less effective than flutamide, spironolactone, CPA+EE, and GnRH in treating females with IH or hirsutism secondary to PCOS	1	A	Erenus *et al.*[48]; Sahin *et al.*[49]; Falsetti *et al.*[50]; Venturoli *et al.*[51]; Bayhan *et al.*[60]; Müderris *et al.*[53]; Lumachi *et al.*[58]
Combination therapy of finasteride and spironolactone or finasteride and CPA+EE is more effective than monotherapy in treating IH or hirsutism secondary to PCOS	1	A	Tartagni *et al.*[56]; Sahin *et al.*[57]; Unlühizarci *et al.*[62]; Keleştimur *et al.*[59]
Combination therapy of finasteride and rFSH can be used to treat females with PCOS	1	A	Tartagni *et al.*[71]
Finasteride does not alter the volume and number of cysts in female ovaries	1	A	Ariê *et al.*[72]
Finasteride is less effective than flutamide and CPA+EE in treating females with acne	1	A	Carmina and Lobo[26]
AR-CAG repeat numbers can predict finasteride efficacy in Caucasian females with FPHL	1	A	Keene *et al.*[24]
Lower-dose finasteride (1 mg/day) and high-dose finasteride (5 mg/day) are not effective for treating hair loss in females with FPHL	1	A	Whiting *et al.*[35]; Price and Roberts *et al.*[7]; Altomare *et al.*[88]; Carmina and Lobo[29]
Topical finasteride is not effective for treating hirsutism	2A	A	Price and Allen *et al.*[69]
Combination therapy of finasteride and flutamide is more effective than monotherapy in treating hirsutism	2A	B	Unluhizarci *et al.*[61]
Finasteride can improve symptoms in females with acne and alopecia	2A	B	Kohler *et al.*[27]
AR-CAG repeat numbers cannot predict finasteride efficacy in Japanese females with FPHL	2A	B	Yamazaki *et al.*[25]
Low to high-dose finasteride (1.25–5 mg/day) can improve hair loss in females with FPHL	2A	B	Shum *et al.*[32]; Thai *et al.*[28]; Yeon *et al.*[10]; Boychenko *et al.*[33]; Oliveira-Soares *et al.*[11]; Boersma *et al.*[21]
Low-dose finasteride (1.25 mg/day) or combination therapy of finasteride and minoxidil is not effective for treating hair loss in females with FFA	2A	B	Rallis *et al.*[37]; Kim *et al.*[34]
Finasteride can improve hair loss in females with FFA	2A	B	Tosti *et al.*[40]; Ladizinski *et al.*[38]; Vañó-Galván *et al.*[39]
Finasteride therapy does not alter follicular development or ovulation	2A	B	Wong *et al.*[78]
Finasteride can cause mood disturbances in females with FPHL	2B	B	Altomare *et al.*[88]
Finasteride can improve hair loss in female-to-male transgender patients with FPHL	2B	B	Moreno-Arrones *et al.*[36]
Combination therapy of finasteride, cetirizine, and a topical medication can mildly improve symptoms of CLPP and FFA	2B	B	Mardones *et al.*[42]

Table 3 Continued

Recommendation	Grade of recommendation	Quality of evidence	Source
Finasteride can resolve SRF in females with central serous chorioretinopathy	2B	B	Moisseiev *et al.*[77]
Combination therapy of finasteride, minoxidil, and triamcinolone acetonide can improve hair loss in females with FFA	2B	C	Moreno-Ramírez *et al.*[41]
Finasteride can improve symptoms in females with HS	2B	C	Farrell *et al.*[74]; Joseph *et al.*[73]; Khandalavala[75]; Mota *et al.*[76]
Finasteride can be used to alleviate chronic migraines in females	2B	C	Check *et al.*[82]
Finasteride cessation can stop seizures in females	2B	C	Pugnaghi *et al.*[81]
Finasteride therapy prior to pregnancy can result in successful full-term pregnancy and live birth	2B	C	Tartagni *et al.*[79]
Unintentional finasteride during early pregnancy can cause aphalangia in newborn girl	2B	C	Sallout and Alwadi[80]

According to criteria by Robinson et al[90]: Grade of recommendation: 1, strong recommendation; high-quality, patient-oriented evidence; 2A, weak recommendation; limited-quality, patient-oriented evidence; 2B, weak recommendation; low-quality evidence. Quality of evidence: A, systematic review/meta-analysis; randomized clinical trials with consistent findings; all-or-none observational studies; B, systematic review/meta-analysis of lower-quality clinical trials or studies with limitations and inconsistent findings; lower-quality clinical trial; cohort study; case-control study; C, consensus guidelines, usual practice, expert opinion, case series. AGA, androgenetic alopecia; AR-CAG, androgen receptor cytosine, adenine, guanine; CLPP, classic lichen planopilaris; CPA, cyproterone acetate; CSCR, central serous chorioretinopathy; EE, ethinyl estradiol; FAGA, female androgenic alopecia; FFA, frontal fibrosing alopecia; FPHL, female pattern hair loss; HS, hidradenitis suppurativa; IH, idiopathic hirsutism; PCOS, polycystic ovary syndrome; SRF, subretinal fluid.

antiepileptic therapy after finasteride (5 mg/day) was discontinued.[81] In another case, a woman with chronic migraines was successfully treated with 5 mg/day finasteride.[82]

Discussion

The role of finasteride use in women is controversial, with published reports describing both successes and limitations of treatment. Although finasteride is not FDA-approved for use in women, it is becoming more commonly prescribed to women for off-label use in treating hair loss.

Most RCTs evaluated finasteride use in women with hirsutism (48.7%) or FPHL (34.7%). While other forms of hair loss were studied, such as alopecia,[27] LPP,[42] and FFA,[37–41] no RCTs evaluating finasteride therapy for those conditions were identified (Tables 1 and 2).

A large body of evidence suggests that finasteride can effectively improve hirsutism scores in women with IH or hirsutism secondary to PCOS.[43–70] Finasteride therapy has also been beneficial in resolving subretinal fluid in women with CSCR, a condition associated with elevated testosterone levels.[77,83–86]

Although hirsutism, PCOS, and CSCR in women are all associated with elevated testosterone levels, PCOS has only been previously associated with hirsutism and not with CSCR. Interestingly, a case series suggests a correlation between the two diseases, as women with PCOS or a first-degree relative with PCOS presented with CSCR.[87]

Two studies suggested that finasteride use can improve symptoms in women with acne.[26,27] Although shown to be effective, finasteride was reported to be less beneficial than flutamide and CPA+EE in the RCT,[26] and the small retrospective study only used a subjective patient questionnaire to assess outcomes.[27]

Current research on finasteride in premenopausal and postmenopausal women with FPHL has highlighted its use in high (5 mg/day),[9–11,28,29] medium (2.5 mg/day),[30,31] low (1.25 mg/day),[21,31–33] and lower (1 mg/day)[7,35,36,88] doses. This range has predominantly improved hair loss in women with FPHL,[10,11,21,28,32,33] but evidence from RCTs[7,29,35] suggests otherwise for high and low doses, and high-powered studies are lacking for medium and low doses in the past 20 years (Table 3). Interestingly, the high finasteride doses that did demonstrate improvement were only studied in postmenopausal women, and none were RCTs.[9–11,28] Of note, one of these therapeutically successful studies compared finasteride use in premenopausal and postmenopausal women in the absence of oral contraceptives in order to assess the pure effects of finasteride without confounding the antiandrogenic effects.[10] The RCTs that did investigate finasteride use in postmenopausal women used a lower dose and did not show significant difference in hair counts between treatment and placebo groups.[7,35] Additionally, the only RCT using high-dose finasteride was studied in premenopausal women who were simultaneously on mechanical contraception and resulted in no significant reduction in Ludwig scores.[29] However, in a retrospective study, scalp coverage and hair structure assessments showed low-dose finasteride to be more effective in the above 50 age group, while hair thickness increase was similarly effective in both above and below

50 age groups.[21] Furthermore, in one case series, two FPHL patients in their seventh decade improved with low-dose finasteride, but these patients also had hyperandrogenism.[32] Efforts to validate AG-CAG repeats as a genomic predictor of finasteride's therapeutic efficacy in premenopausal and postmenopausal women with FPHL has also largely been inconsistent.[24,25] Taken together, these studies demonstrate the pathophysiologic complexity of FPHL and underscore the need to further understand the molecular basis and optimize therapeutic strategies for this condition.

Case reports have observed successful finasteride administration for improving lesions of hidradenitis suppurativa.[73–76] Other reports highlighted finasteride use in the alleviation of chronic migraines[82] and an association between finasteride cessation and reduction of seizures.[81] Although reports demonstrate that finasteride therapy prior to pregnancy can result in successful full-term pregnancy and live birth,[79,89] the authors still advise caution with use of finasteride in women who are attempting to conceive. While animal studies demonstrated no abnormalities in female offspring exposed to finasteride in utero,[14,15] the first reported case of finasteride use during early pregnancy resulted in the delivery of a baby girl with aphalangia.[80]

Furthermore, variability in study designs and outcome measures is limiting and precluded conducting a meta-analysis or making direct comparisons between studies assessing the same diseases (Table 1). Primary outcomes tended to focus on short-term effects, with treatment lengths and follow-up ranging from 16 days to 48 months, with most studies under 12 months (Table 2).

We present several recommendations regarding finasteride use in women using articles from the past 20 years (Table 3). Overall, doses of oral finasteride ranged from 0.5 to 5 mg/day, in females aged 6–88 (Tables 1 and 2). Majority of the females in these studies were treated with finasteride for hirsutism (49.7%), followed by various types of hair loss (44.2%), over a length of 6–12 months (57.5%), with finasteride monotherapy (88.9%), and for continuous use (96.4%) (Table 2). Due to finasteride's potential teratogenicity, it is important to not only caution finasteride use in women who are considering pregnancy but also administer a contraceptive to women of reproductive age throughout the duration of finasteride use.

Conclusion

Although there have been recent advances in understanding the use of finasteride in women, much remains unclear. The studies reviewed here provide a good starting point for assessing finasteride dosage and length of treatment in the management of candidate conditions that may benefit from finasteride therapy. Additional prospective, long-term studies remain necessary to fully evaluate the efficacy and consequences of chronic finasteride use and to optimize treatment protocols.

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Questions (answers found after references)

1 What is the mechanism of finasteride?
- a Noncompetitive androgen receptor antagonist
- b Competitive androgen receptor antagonist
- c Noncompetitive inhibitor of 5-alpha-reductase
- d Competitive inhibitor of 5-alpha-reductase

2 What is finasteride clinically indicated for?
- a Male pattern hair loss
- b Female pattern hair loss
- c BPH
- d a and c
- e All the above

3 What FDA pregnancy category is finasteride?
- a A
- b B
- c C
- d D
- e X

4 What condition was androgen receptor-CAG repeats' effect on finasteride response studied in?
- a Female pattern hair loss
- b Frontal fibrosing alopecia
- c Hirsutism
- d Lichen planopilaris
- e Hidradenitis suppurativa

5 What condition was most studied with finasteride therapy?
- a Female pattern hair loss
- b Frontal fibrosing alopecia
- c Hirsutism
- d Lichen planopilaris
- e Hidradenitis suppurativa

6 Topical finasteride use has been studied in patients with female pattern hair loss
- a True
- b False

7 What types of hair loss have been studied with finasteride therapy?
- a Alopecia
- b Female pattern hair loss
- c Frontal fibrosing alopecia
- d Lichen planopilaris
- e All the above

8 Which of these is a common limitation in studies on finasteride treatment in women?
- a Limited sample sizes
- b Many uncontrolled studies
- c Variability in outcome measures
- d Low quality of evidence
- e All the above

9 What was the range of doses of oral finasteride?
- a 0.1–0.5 mg/day
- b 0.1–1 mg/day
- c 1–5 mg/day
- d 0.5–5 mg/day
- e 1–10 mg/day

10 What must finasteride be administered with in women of reproductive age?
- a Dutasteride
- b Contraceptive
- c Flutamide
- d Spironolactone
- e Recombinant FSH

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Answers to questions

1. d, 2. d, 3. e, 4. a, 5. c, 6. b, 7. e, 8. e, 9. d, 10. b.