

Androgens in Hirsute Women Referred for Electroepilation

HANNE FOGH, ANNE-MARIE WORM, BENTE FORKERT and PAUL BENNETT¹

Department of Dermato-venereology, Bispebjerg Hospital and ¹Statens Seruminstitut, Copenhagen, Denmark

One hundred and five hirsute women were examined. Elevated levels of at least one androgen were found in 58 women, most often free testosterone, dehydroepiandrosterone sulfate and delta-4-androstendione. No significant correlation was found between level of androgens and hirsutism score or frequency of menstrual disturbances other than amenorrhoea. Fifty-three women were examined at least 6 months after electroepilation. A significant decrease in hirsutism score and frequency of self-treatment was found. Scarring was not observed. Electroepilation performed by an experienced person should be recommended as an excellent treatment for hirsutism.

(Accepted August 26, 1988.)

Acta Derm Venereol (Stockh) 1989; 69:179-182.

H. Fogh, Department of Dermatology, Rigshospitalet, Blegdamsvej 9, DK-2100 Copenhagen Ø, Denmark.

Hirsutism is defined as an excessive hair growth on androgen-dependent areas of the female body. It may have endocrine or non-endocrine causes. The former are pituitary, ovarian or adrenal disorders giving an excess production of androgen hormones, including neoplasms and the more common functional disorders of the ovary or adrenal glands. Androgen excess may be the cause of menstrual disturbances and infertility (1-4). Medication with androgens and corticosteroids can cause hirsutism (2). In some hirsute women, no abnormalities can be found (3, 4). Increased activity of the enzyme 5- α -reductase which mediates androgen production in peripheral tissues has been found in the skin of hirsute women regardless of the level of circulating androgens (5, 6). This leads to increased formation of androgens in the skin and may account for many cases of idiopathic hirsutism (5, 6). Elevated levels of circulating androgens, mostly free testosterone (fT) and dehydroepiandrosterone sulfate (DHAS) have been found in varying proportions of hirsute women (3, 4).

Hirsutism may be treated by the patient herself, by shaving, wax or plucking, affording a temporary effect. Medication with estrogens, corticosteroids or antiandrogens such as cyproterone acetate or spironolactone has also been used as treatment (1, 2, 7). Epilation with electrolysis is an alternative treatment

which may be complete when performed by an experienced person.

The purpose of the study was to correlate the level of androgens to a hirsutism score and to certain other clinical parameters in order to elucidate whether it is possible to identify those hirsute women in whom endocrinological evaluation should always be done. Furthermore it was the aim to evaluate the effect of epilation, which at our Department has been performed by a trained cosmetologist since April 1984.

MATERIAL AND METHOD

One hundred and thirty-seven women referred for hirsutism started treatment with epilation from April 1984 to August 1986, of whom 16 did not continue. The remaining 121 women were contacted by letter at least 6 months after the treatment was started, and of these, 105 women came for a check-up, including a clinical examination, a questionnaire and a blood test for analysis of androgens. In the premenopausal women the blood samples were taken on day 4 or 5 of the menstrual cycle. The serum levels of fT, DHAS, sexual hormone binding globulin (SHBG), testosterone (T), dihydrotestosterone (DHT) and delta-4-androstendione (4-AD) were measured using the method described previously (8).

The androgen levels recorded were correlated with data on infertility and menstrual disturbances and with an arbitrary hirsutism score from 0 to 4 (1).

The electroepilation was performed with a S. W. Erbotome 50 with a frequency of 1.7 MHz and an effect of 50 W. Initially the treatments were given once a week. The intervals between treatments increased gradually from one week to 3 months. The last check-up was made 6 months after the last treatment. During the treatment period the patients were not allowed to shave, pluck or to use other forms of hair removal.

The control group consisted of 58 premenopausal and 24 postmenopausal, healthy, non-hirsute women. The qualitative variables of the hormones, classified as increased, normal, or decreased, were analysed for dependency of hirsutism score and menstrual disturbances by χ^2 -test. The hormone values were logarithmically transformed in order to obtain normal distribution and homogeneity of variance. The difference between hirsutism patients and the control group was analysed by one-way analysis of variance within both the pre- and postmenopausal women.

RESULTS

Of the 105 women, 45 (43%) had been hirsute for more than 10 years, 32 (30%) for 5-9 years and 28 (27%) for less than 4 years. A family history of hirsutism was present in 46 women (44%), and a racial

Table I. Geometric mean of androgen values (nmol/l) in pre- and postmenopausal hirsute women and controls

	Premenopausal				Number with values above 95% control interval. Percentages in parentheses
	Patients (n=88)	95% interval	Controls (n=58)	95% interval	
SHBG	68	(17-275)	81	(38-172)	0 (0)
T*	1.41	(0.6-3.3)	1.15	(0.7-1.9)	21 (25.3)
fT*	0.019	(0.006-0.06)	0.014	(0.005-0.034)	11 (13.2)
DHT	0.55	(0.24-1.23)	0.55	(0.25-1.20)	1 (1.2)
4-AD**	6.3	(2.6-15.3)	4.7	(2.4-9.3)	16 (19.2)
DHAS**	7 600	(2 800-18 000)	3 900	(1 300-9 500)	28 (33.7)
	Postmenopausal				
	Patients (n=17)	95% interval	Controls (n=24)	95% interval	Number with values above 95% control interval. Percentages in parentheses
SHBG	102	(34-302)	105	(46-239)	0 (0)
T*	1.38	(0.41-4.7)	0.93	(0.46-1.8)	5 (29.4)
fT*	0.014	(0.004-0.51)	0.009	(0.004-0.18)	3 (17.6)
DHT	0.38	(0.12-1.2)	0.40	(0.17-0.95)	1 (5.8)
4-AD*	3.3	(1.05-10.5)	2.5	(0.88-7.05)	4 (23.5)
DHAS**	3 700	(1 250-10 900)	1 700	(550-5 200)	8 (47.1)

* $p < 0.05$. ** $p < 0.01$. SHBG = sexual hormone binding globulin, T = testosterone, fT = free testosterone, DHT = dihydrotestosterone, 4-AD = delta 4-androstendione, DHAS = dehydroepiandrosterone sulfate

disposition in 13 (11%). The median age of the 105 women was 31 years (range 16-71).

Results of hormone analyses are shown in Table I. Mean values of T, fT, 4-AD and DHAS were significantly increased in both the pre- and postmenopausal hirsute women ($p < 0.05$). Fifty-eight women (55%) had increased values of at least one androgen hormone.

Dependency of hirsutism score, menstrual irregularities and hormone values were analysed as described. Of the 17 postmenopausal hirsute women, those with increased DHAS values had a higher hirsutism score than the hirsute women with normal values ($p < 0.05$). No significant association was found between hirsutism score and the other hormones. There was no overall association between increased androgen values and menstrual irregularities. Two hirsute premenopausal women with amenorrhoea had increased androgen values. In 36 women (32%), hirsutism might have been induced by medication given before hirsutism developed: Femovirin® injections (testosterone and estradiol) in 13, hormonal

contraception in 21 and cortisone in 2 women. Nine women were taking an oral contraceptive at the time of the check-up. In 22 women (20%), an endocrinological disorder was diagnosed and treated surgically or medically before epilation.

At the time of the check-up, 53 women (50%) had completed the treatment. In these women, the medi-

Table II. Frequency of self-treatment before epilation in 105 hirsute women and after epilation in 53 hirsute women; percentages in parentheses

Frequency	Total (N=105)	Treated (N=53)	
		Before	After
Daily	49 (47)	22 (42)	0 (0)
2-6×/week	40 (38)	18 (34)	1 (2)
2-3×/month	6 (5)	6 (11)	1 (2)
<1×/month	0 (0)	0 (0)	17 (32)
Never	10 (10)	7 (13)	34 (64)

Table III. Hirsutism score before epilation in 105 hirsute women and after epilation in 53 hirsute women; percentages in parentheses

Score	Total (N=105)	Treated (N=53)	
		Before	After
5	12 (12)	6 (11)	0 (0)
3	38 (36)	17 (32)	0 (0)
2	35 (33)	17 (32)	1 (2)
1	20 (19)	13 (25)	12 (23)
0	0 (0)	0 (0)	40 (75)

an number of treatments was 25 (range 11–57 treatments). The median duration of the treatment period was 21 months (range 9–36 months). The median observation period after the last treatment was 7 months (range 6–18 months). A significant decrease in the frequency of self-treatment and the score of hirsutism was found after treatment was finished (Tables II, III) ($p < 0.01$). Fifty-one women (96%) were very satisfied, 2 (4%) were less satisfied, and none were dissatisfied with the result. All would recommend epilation as the preferred treatment to other hirsutes. There were no cases of scarring.

DISCUSSION

Abnormal androgen values have been found in from 50% (4) to almost 100% (1) of hirsute women, depending upon the selection of the material. In our material, 58 (55%) had abnormal values of at least one androgen, especially fT, DHAS and 4-AD. These results are comparable to those of Rheingold & Rosenfield (4), who suggested that the level of androgens and the peripheral sensitivity to androgens contribute equally to the pathogenesis of mild to moderate hirsutism.

Some authors (1, 2) suggest that fT and DHAS should always be measured in hirsute women, while another author (3) suggested that only women with moderate or severe hirsutism or other signs of an endocrine disorder should be evaluated endocrinologically. The purpose of endocrinological evaluation of hirsute women is to find the women with an underlying treatable endocrinological disorder. In our study it was not possible to identify women with abnormal androgens by applying clinical parameters (hirsutism

score and menstrual disturbances other than amenorrhea). However this could have been due to selection of the material. Women with endocrinological disorders may be treated elsewhere and not referred to epilation at a dermatological department. In the future we intend to follow an earlier Danish recommendation (11) that endocrinological investigation should be restricted to women with moderate and severe hirsutism and to hirsute women with menstrual disturbances, infertility or virilization.

As regards the treatment, only 16 out of 137 hirsute women (12%) discontinued epilation in our study, even though it is a protracted and unpleasant treatment. The effect of epilation depends greatly upon the expertise of the person performing the treatment (9, 10). This might explain the excellent result in our study, with a hirsutism score of zero or one in 98% of the patients seen at a control at least 6 months after the last treatment (Table III), and with a self-treatment frequency lower than once monthly in 96% (Table II). Medical treatment of hirsutism is often followed by side effects and the result is only maintained as long as the drug is taken (1, 2, 7). Epilation can give permanent results without side effects. This treatment should therefore be recommended as an alternative treatment for women with hirsutism.

ACKNOWLEDGEMENT

Statistical analysis was performed by Susanne Møller, M.Sc.

REFERENCES

- Hatch R, Rosenfield RL, Kim MH, Tredway D. Hirsutism: Implications, etiology, and management. *Am J Obstet Gynecol* 1981; 140: 815–830.
- Kvedar JC, Gibson M, Krusinski PA. Hirsutism: evaluation and treatment. *J Am Acad Dermatol* 1985; 12: 215–225.
- Maroulis G. Evaluation of hirsutism and hyperandrogenemia. *Fertil Steril* 1981; 36: 273–305.
- Rheingold SB, Rosenfield RL. The relationship of mild hirsutism or acne in women to androgens. *Arch Dermatol* 1987; 123: 209–212.
- Serafini P, Lobo RA. Increased 5α -reductase activity in idiopathic hirsutism. *Fertil Steril* 1985; 43: 74–78.
- Lucky AW. Androgens and the skin. *Arch Dermatol* 1987; 123: 193–195.
- Underhill R, Dewhurst J. Further clinical experience in the treatment of hirsutism with cyproterone acetate. *Br J Obstet Gynaecol* 1979; 86: 139–141.
- Lykkesfeldt G, Bennett P, Lykkesfeldt AE, Micic S, Møller S, Svenstrup B. Abnormal androgen and oestrogen metabolism in men with steroid sulphatase deficiency.

cy and recessive x-linked ichthyosis. *Clin Endocrinol* 1985; 23: 385-393.
 9. Richards RN, McKenzie MA, Meharg GE. Electroepilation (electrolysis) in hirsutism. *J Am Acad Dermatol* 1986; 15: 693-697.

10. Wagner RF, Tomich JM, Grande DJ. Electrolysis and thermolysis for permanent hair removal. *J Am Acad Dermatol* 1985; 12: 441-449.
 11. Starup J, Bennett P. Anvendelse af androgenstatus i gynækologien. *Ugeskr Læger* 1985; 147: 2583-2585.

Group	Before (n=10)	After (n=10)
1	0 (0)	0 (0)
2	0 (0)	0 (0)
3	1 (10)	1 (10)
4	1 (10)	1 (10)
5	1 (10)	1 (10)
6	0 (0)	0 (0)

an number of treatments was 22 (range 1-27) months. The median duration of the treatment period was 21 months (range 9-30 months). The median observation period after the last treatment was 12 months (range 8-18 months). A significant decrease in the frequency of self-treatment and the score of hirsutism was found after treatment was finished (Table II, III) ($p < 0.01$). Fifteen women (9%) were very satisfied, 3 (4%) were less satisfied, and none were dissatisfied with the result. All would recommend electrolysis as the preferred treatment to other hirsutism. There were no cases of scarring.

DISCUSSION

Abnormal androgen values have been found in from 50% (4) to almost 100% (1) of hirsute women depending upon the selection of the material. In our material, 38 (52%) had abnormal values of at least one androgen, especially (T, DHA and 4-AD). These results are comparable to those of Richtigold & Rosenfeld (4), who suggested that the level of androgens and the peripheral sensitivity to androgens contribute equally to the pathogenesis of mild to moderate hirsutism.

Some authors (1, 2) suggest that (T and DHA should always be measured in hirsute women, while another author (3) suggested that only women with moderate or severe hirsutism or other signs of an endocrine disorder should be evaluated endocrinologically. The purpose of endocrinological evaluation of hirsute women is to find the women with an underlying treatable endocrinological disorder. In our study it was not possible to identify women with abnormal androgens by applying clinical parameters (hirsutism

ACKNOWLEDGEMENT

Statistical analysis was performed by Sørensen, M.D.

REFERENCES

1. Hirsch R, Rosenfeld RL, Kim MH, Jodanis D, Hovan A. Implications, therapy and management. *Am J Obstet Gynecol* 1981; 140: 813-820.
 2. Kessler JC, Gibson M, Kistner B. Hirsutism: evaluation and treatment. *Mayo Clin Proc* 1982; 57: 315-328.
 3. Marzlin G. Treatment of hirsutism and hyperandrogenism. *Am J Obstet Gynecol* 1981; 136: 273-202.
 4. Richtigold SB, Rosenfeld RL. The relationship of mild hirsutism of women to androgens. *Acta Endocrinol* 1987; 122: 209-212.
 5. Swartz B, Long R. Increased 5 α -reductase activity in idiopathic hirsutism. *Lancet* 1985; 1: 74-78.
 6. Lacey AW. Androgens and the skin. *Arch Dermatol* 1985; 121: 197-198.
 7. Fostell R, Døvlund I. Further clinical experience in the treatment of hirsutism with cyproterone acetate. *Br J Obstet Gynaecol* 1979; 86: 139-141.
 8. Liskow G, Brangøe F, Lykkeboe AE, Mich S, Møller S, Svendsen B. Abnormal androgen and other gonadal function in men with steroid substrate defects.