Brief report

Scalp hair parameter changes in transgender individuals commencing gender-affirming hormone therapy: A 24-week prospective observational study

To the Editor: Sex steroids (androgens and estrogens) can influence hair growth by regulating the lower portion of the hair bulb during the hair cycle, thereby influencing hair diameter, growth rate, and length.[1,2] On the human scalp, androgens can shorten the anagen phase and telogen phase whereas estrogens are proposed to prolong anagen and inhibit catagen.[2,3] In transgender (trans) people, masculinizing hormone therapy (MHT) with testosterone is known to induce androgenetic alopecia (AGA), and feminizing hormone therapy (FHT) with estradiol and antiandrogens improves hirsutism.[2,3] Studies with objective outcomes of scalp hair are lacking.

We aimed to assess changes in scalp hair parameters and quality of life (QoL) over the first 24 weeks of gender affirming hormone therapy in trans adults. This was a prospective observational study with outcomes measured at 0 and 24 weeks. Mid-frontal and vertex scalp regions were marked with a tattoos and phototrichograms obtained with Canfield Scientific HairMetrix. Given the absence of validated assessment tools, the Dermatology Life Quality Index and modified Women's Androgenic Alopecia QOL questionnaires were selected to assess any QoL changes (Supplementary Files, available via Mendeley at https://doi.org/10.17632/p6rv7wm89n.1).

A total of 15 participants received MHT (mean (SD) total testosterone concentration increased from baseline 69.6 ng/dL (139.8) to 524.3 ng/dL (462.6), $P = .002$) to achieve testosterone concentrations in the male reference range and 19 participants received FHT (estradiol increased 25.1 pg/dL (7.8) to 103.7 pg/mL (58.8), $P < .0001$ and total testosterone decreased from 517.9 ng/dL (186.4) to 94.9 ng/dL (94.9), $P < .0001$), achieving sex steroid concentrations in the female reference range over 24 weeks.

Hair parameter changes with MHT are presented in Table I. Whilst there was some decrease in total large/intermediate terminal hair counts (≥60 μm) and average hair width in the mid-frontal region, overall, there was no significant change in total hair count/cm^2. There was no statistical significance in the mean difference for Dermatology Life Quality Index and modified Women's Androgenic Alopecia QOL after 24 weeks.

Table II outlines hair parameter changes with FHT. There was a significant increase in follicular units/cm^2, average hair width, total intermediate/vellus (<60 μm) and total hair count/cm^2 over 24 weeks. This was associated with significant improvements in QoL (Dermatology Life Quality Index mean difference −1.76 (95%CI −0.20 to −3.33, $P = .03$ and modified Women's Androgenic Alopecia QOL −15.18 (95%CI −23.00 to −7.36, $P < .001$).

This objective study of hair parameters demonstrated that in the first 24 weeks of FHT, hair counts/cm^2 significantly increased, associated with improved hair-related QoL. MHT did not significantly change hair counts/cm^2 nor did it impact hair-related QoL. Given the short duration of our study, the decrease in large terminal hairs in both scalp regions observed for the MHT group is likely due to testosterone accelerating pre-existing early AGA in participants with genetic tendency. Clinically evident AGA takes longer than 24 weeks to become apparent.[3,4] Limitations include small sample size and short follow-up time. Longer-term studies with larger cohort size and validated questionnaire tools will provide greater insight into *in vivo* hormonal changes on human scalp hair and may form the basis of interventional studies for those experiencing AGA.

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Table I. Change from baseline to week 24 of hair parameters in midfrontal and vertex phototrichograms of trans individuals receiving masculinizing hormone therapy

	Midfrontal trichograms				Vertex trichograms			
Hair parameters in MHT group	**Wk 0 (mean, SD)**	**Wk 24 (mean, SD)**	**Effect (95%CI)**	***P* value**	**Wk 0 (mean, SD)**	**Wk 24 (mean, SD)**	**Effect (95%CI)**	***P* value**
Interfollicular distance (mm)	1.1 (0.1)	1.1 (0.2)	0.03 (−0.02, 0.07)	.2	1.1 (0.1)	1.1 (0.2)	−0.03 (−0.07, 0.01)	.2
Follicular units/cm^2	127.2 (30.2)	131.7 (34.4)	4.50 (−5.76, 14.76)	.4	120.1 (26.7)	126.8 (35.9)	6.69 (−1.58, 14.96)	.1
Average hairs per follicular unit	1.6 (0.2)	1.5 (0.2)	−0.08 (−0.15, −0.01)	**.04**	1.7 (0.2)	1.7 (0.2)	−0.06 (−0.15, 0.02)	.1
Average hair width (μm)	71.6 (7.9)	68.1 (6.3)	−3.49 (−5.98, −1.01)	**.009**	70.6 (8.5)	68.8 (10.1)	−1.75 (−4.95, 1.44)	.3
Hair count/cm^2								
Large terminal (>90 μm)	30.8 (24.2)	21.8 (17.5)	0.71 (0.61, 0.82)	**<.0001**	35.5 (32.1)	26.3 (30.8)	0.74 (0.65, 0.85)	**<.001**
Intermediate terminal (60-90 μm)	109.2 (32.0)	108.5 (33.2)	0.99 (0.93, 1.07)	.9	110.2 (32.2)	112.5 (35.5)	1.02 (0.95, 1.10)	.6
Total large/intermediate terminal hairs (≥ 60 μm)	140.0 (29.9)	130.3 (28.3)	0.93 (0.87, 0.99)	**.03**	145.7 (23.1)	138.8 (23.6)	0.95 (0.89, 1.02)	.1
Small terminal (30-60 μm)	51.6 (23.4)	55.6 (21.4)	1.08 (0.97, 1.19)	.1	56.8 (26.1)	63.0 (34.0)	1.11 (1.00, 1.23)	**.04**
Vellus (<30 μm)	4.3 (4.0)	6.1 (5.7)	1.43 (1.04, 1.98)	**.03**	6.1 (5.4)	7.7 (6.0)	1.27 (0.95, 1.69)	.1
Total intermediate/vellus (≤ < 60 μm)	55.9 (25.7)	61.8 (23.4)	1.14 (0.95, 1.36)	.2	62.8 (26.9)	70.7 (38.1)	1.12 (1.02, 1.24)	**.01**
Total	195.3 (35.8)	192.4 (41.5)	0.99 (0.93, 1.04)	.6	208.5 (31.8)	208.0 (40.1)	1.00 (0.95, 1.05)	.9

Bold values indicate statistical significance $P < .05$.
cm^2, Centimeter-square; *MHT*, masculinizing hormone therapy; *mm*, millimeters; *μm*, micrometers.

Table II. Change from baseline to week 24 of hair parameters in midfrontal and vertex phototrichograms in trans individuals receiving feminizing hormone therapy

	Midfrontal trichograms				Vertex trichograms			
Hair parameters in FHT group	**Wk 0 (mean, SD)**	**Wk 24 (mean, SD)**	**Effect (95%CI)**	***P* value**	**Wk 0 (mean, SD)**	**Wk 24 (mean, SD)**	**Effect (95%CI)**	***P* value**
Interfollicular distance (mm)	1.2 (0.1)	1.1 (0.1)	−0.06 (−0.11, −0.02)	**.005**	1.1 (0.2)	1.1 (0.2)	−0.04 (−0.09, 0.01)	.09
Follicular units/cm^2	110.1 (23.5)	127.9 (27.3)	17.82 (9.02, 26.63)	**.0006**	118.2 (23.7)	128.7 (29.2)	10.47 (2.68, 18.25)	**.01**
Average hairs per follicular unit	1.6 (0.2)	1.5 (0.2)	−0.09 (−0.18, −0.00)	**.04**	1.7 (0.2)	1.7 (0.3)	−0.01 (−0.08, 0.07)	.8
Average hair width (μm)	70.6 (8.1)	66.2 (6.8)	−4.32 (−7.68, − 0.97)	**.01**	71.3 (8.0)	66.2 (4.5)	−5.09 (−8.49, −1.69)	**.006**
Hair count/cm^2								
Large terminal (>90 μm)	27.6 (32.0)	16.0 (18.1)	0.62 (0.35, 1.11)	.1	31.3 (25.5)	15.7 (14.8)	0.45 (0.27, 0.76)	**.003**
Intermediate terminal (60-90 μm)	105.4 (38.9)	114.9 (30.6)	1.11 (0.96, 1.27)	.1	111.2 (33.6)	114.9 (42.9)	1.03 (0.79, 1.35)	.8
Total large/intermediate terminal hairs (≥ 60 μm)	132.9 (39.9)	130.9 (35.7)	0.99 (0.89, 1.09)	.7	142.5 (33.8)	130.6 (48.1)	0.92 (0.71, 1.19)	.5
Small terminal (30-60 μm)	42.4 (18.6)	55.7 (25.7)	1.31 (1.06, 1.61)	**.01**	45.6 (20.2)	61.3 (29.0)	1.34 (1.13, 1.58)	**.0007**
Vellus (<30 μm)	5.2 (6.1)	6.4 (5.1)	1.22 (0.93, 1.61)	.1	8.1 (7.4)	9.0 (6.4)	1.21 (0.73, 1.99)	.5
Total intermediate/vellus (≤ < 60 μm)	47.6 (21.0)	62.1 (28.6)	1.30 (1.05, 1.61)	**.02**	53.7 (23.2)	70.3 (25.9)	1.31 (1.19, 1.43)	**<.0001**
Total	175.3 (29.7)	193.1 (32.9)	1.10 (1.05, 1.16)	**.0001**	196.3 (36.0)	211.9 (42.9)	1.08 (1.03, 1.14)	**.003**

Bold values indicate statistical significance $P < .05$.
cm^2, Centimeter-square; *FHT*, feminizing hormone therapy; *mm*, millimeters; *μm*, micrometers.

Patient consent: All participants provided written, informed consent.

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Key words: dermatologic; hair; LGBT; medical dermatology; quality of life; trans persons; transgender.

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Conflicts of interest

Dr Sinclair is a Director and Founder of Samson Medical Pty Ltd, which holds patents on the use of oral minoxidil to treat hair loss disorders; is on the Pharmaceutical advisory board for Eli Lilly, Pfizer Inc, Leo Pharmaceutical; Speakers' bureau for Abbvie, Novartis; is a Principal investigator in clinical trials for Amgen, Novartis, Arcutis Biotherapeutics, Aerotech, Merck and Co, Celgene, Coherus BioSciences, Jannsen, Regeneron, MedImmune, Glaxo Smith Kline, Samson Clinical, Boehringer Ingelheim, Oncobiologics, Roche, Ascend, Dermira, AstraZeneca, Akesobio, Reistone Biopharma, UCB, Sanofi, Connect, Arena, Sun Pharma, Bristol Myer Squibb, and Galderma. Drs Tang, Leemaqz, and Cheung have no conflicts of interest to declare.

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