

Naturally Occurring Female Hairline Patterns

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BACKGROUND Hair transplantation is gaining popularity in women. Although much has been written about hairline design in male patients, more information is needed about natural female hairlines.

OBJECTIVE To determine the frequency, dimensions, and location of structures that compose the female hairline.

METHODS Hairline characteristics were measured in 360 female volunteers at an informal hair salon setting.

RESULTS A widow's peak was present in 81%. The mean distance from the mid-eyebrow to the frontal midpoint was 5.5 cm. Lateral mounds were observed in 98%. The mean distance from the frontal midpoint to the apex of the lateral mounds was 3.74 cm on the right and 3.97 cm on the left. The mean distance from the apex of the lateral mounds to the apex of the temporal points was 3.78 cm on the right and 3.51 cm on the left. The shape of the temporal recessions was concave triangular or concave oval in 87% of the subjects.

CONCLUSION This study provides proposed guidelines for designing the hairline in women.

The authors have indicated no significant interest with commercial supporters.

Hair transplantation for hairline reconstruction is gaining popularity in women with fronto-temporal thinning and congenitally high hairlines and those who have undergone cosmetic facial procedures. Although naturally occurring male hairline patterns have been described,¹⁻³ these parameters do not achieve appropriate facial framing and a "feminine" look when applied to women. Moreover, although baldness progression is an important consideration for employing receding hairline patterns in men, nonreceding patterns are appropriate for use in female hairline restoration.

There is a general lack of detailed information describing natural hairline patterns in women. Most descriptions address only the position of the anterior hairline by evaluating vertical facial proportions.^{4,5} To develop guidelines for female hairline restoration design, we studied a large population and determined the frequencies, dimensions, and location of structures found in naturally occurring female hairlines. It is hoped that, with greater awareness of

what occurs in nature, hair restoration results in this subgroup of patients will improve.³

Methods

Three hundred sixty female volunteers were evaluated in an informal hair salon setting, and the following hairline characteristics were determined: presence and dimensions of a widow's peak (Figure 1) and lateral mounds (Figure 2, Table 1), number and location of hairline cowlicks, shape of temporal recessions, and presence of miniaturized hairs within the temporal recessions. In subjects with bilateral lateral mounds, the observer noted which side of the hairline had a more prominent mound by visual inspection.

The following distances were measured (Table 2): from the mid-eyebrow to the frontal midpoint or apex of the widow's peak, from the frontal midpoint or apex of the widow's peak to the apex of the lateral mounds (Figure 3), from the apex of the lateral mound to the apex of the temporal points (Figure 4),

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Figure 1. Widow's peak dimensions. Width (WP (W)) and length (WP (L)).

and from the apex of the temporal point to a line projected vertically from the lateral canthus. Distances from the frontal midpoint to cowlicks were determined. To determine the relationship between the distance from the frontal midpoint to the lateral mounds and the total distance from the midpoint to the apex of the temporal points, the ratios of these two distances were computed.

All measurements were recorded in centimeters. Individuals with visible female pattern hair loss or those who felt they had a hair loss problem or had

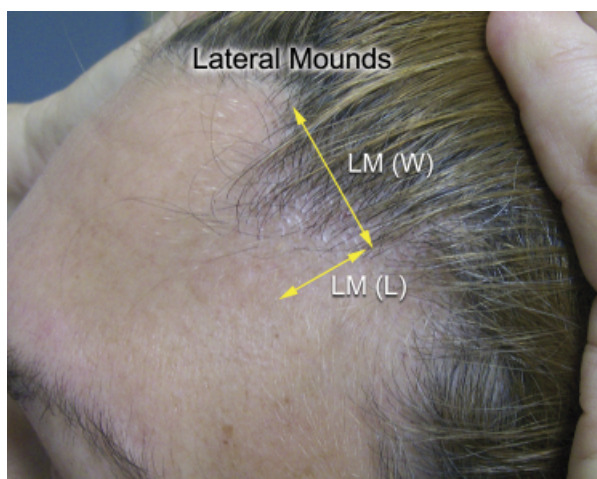


Figure 2. Lateral mound dimensions. Width (LM (W)) and length (LM (L)).

previous face or head surgery did not participate. All participants were Caucasian or of Hispanic descent.

Results

The mean age of the subjects was 41 (range 16–70). Cluster analysis of the data did not reveal any subgroups, implying that the study population was homogeneous. Results of measurements of the widow's peak and lateral mound dimensions are shown in Table 1. The mean width and length of the widow's peak were 1.83 and 0.80 cm, respectively. The mean width and length of the lateral mound were 2.12 and 0.83 cm, respectively, on the right and 2.07 and 0.80 cm, respectively, on the left. A widow's peak was present in 81% of the subjects. Lateral mounds were identified in 98% of the subjects; 86% had bilateral lateral mounds, and 12% had a unilateral mound. Of the subjects with bilateral mounds, 64% had a more prominent mound on the right. Of the subjects with a unilateral mound, 83% had the mound on the right. Lateral mound prominence was determined by visual impression and was confirmed by lateral mound dimension measurements ($p < .01$). Hairline cowlicks were present in 64%; 61% had one cowlick, 3% had two cowlicks, and 0.3% (1 subject) had three cowlicks. Of those with one cowlick ($n = 219$), 70% had the cowlick on the left and 17% on the right, and 13% had midline cowlicks (Figure 5).

Result of distance measurements are shown in Table 2. The mean distance from the mid-eyebrow to the frontal midpoint or apex of the widow's peak (ME-FMP) was 5.54 cm. The mean frontal midpoint to lateral mound distance was 3.74 cm on the right (FMP-RLM) and 3.97 cm on the left (FMP-LLM). The mean distance from the apex of the lateral mound to the apex of the temporal point was 3.78 cm on the right (RLM-RTP) and 3.51 cm on the left (LLM-LTP). The mean sum of (FMP-LLM) + (LLM-LTP) was 7.48 cm, and the mean sum of (FMP-RLM) + (RLM-RTP) was 7.51 cm. The mean for the ratio FMP-RLM:(FMP-RLM) + (RLM-RTP) was 0.5 (95% confidence

TABLE 1. Widow's Peak and Lateral Mound Dimensions (cm)

	<i>N</i>	<i>Mean (95% Confidence Interval)</i>	<i>Range</i>
Widow's peak			
Width	293	1.83 (1.76–1.89)	0.5–4.7
Length	293	0.80 (0.76–0.84)	0.2–3.0
Right lateral mound			
Width	345	2.12 (2.05–2.18)	0.7–4.0
Length	345	0.83 (0.79–0.88)	0.1–3.0
Left lateral mound			
Width	317	2.07 (2.00–2.14)	0.5–4.0
Length	317	0.80 (0.75–0.84)	0.2–2.9

interval (CI) = 0.49–0.51) (range 0.25–0.79) and for FMP-LLM:(FMP-LLM) + (LLM-RTP) as 0.47 (95% CI = 0.46–0.48) (range 0.22–0.77). The mean distance from the apex of the temporal point to a line projected vertically from the lateral canthus was 1.01 cm. The mean distance from the frontal midpoint to the cowlick was 2.66 on the left and 1.87 cm on the right. Ranges and 95% CIs for the means are shown in Tables 1 and 2.

The shape of the temporal recession was concave triangular in 61%, concave oval in 26%, convex in 9%, and straight in 3% (Figure 6); 99% of the subjects with concave triangular and concave oval

temporal recessions showed miniaturized hairs within the temporal recessions.

Pearson correlations (which measure the strength of a linear relationship between two variables) were calculated between all variables to determine which were related. Because the number of correlations was large, the significance level chosen was $p < .01$, with a size of the correlation of at least 0.3 (moderate association).⁶ The following positive correlations between variables were found: width and length of the widow's peak, width and length of lateral mounds, lack of a widow's peak, and a longer ME-FMP distance (5.91 cm without a widow's peak vs 5.46 cm with a widow's peak), FMP-LM distance on the right and left, LM-TP distance on the right and left, and sum of (FMPLM) + (LM-TP) on the right and left. No significant correlation was found between subject age and shape of the temporal recessions or ME-FMP distance.

Discussion

The increasing popularity of hair restoration surgery in women is evidenced in the results of the 2007 International Society of Hair Restoration Surgery Practice Census,⁷ which showed that 13.8% of all surgical hair restoration patients in 2006 were in

TABLE 2. Distances Between Hairline Structures

	<i>N</i>	<i>Mean (95% Confidence Interval)</i>	<i>Range</i>
(1) Mid eyebrow to frontal midpoint or apex of widow's peak	360	5.54 (5.46–5.62)	3.5–8.0 1.0–5.7
(2) Frontal midpoint to apex of lateral mound on the right	345	3.74 (3.66–3.81)	
(3) Frontal midpoint to apex of lateral mound on the left	317	3.97 (3.87–4.07)	1.5–6.0
(4) Apex of lateral mound to apex of temporal point on the right	345	3.78 (3.68–3.87)	0.3–6.2
(5) Apex of lateral mound to apex of temporal point on the left	317	3.51 (3.41–6.62)	0.3–6.0
Sum 2 + 4	345	7.51 (7.40–7.62)	—
Sum 3 + 5	317	7.48 (7.38–7.59)	—
Apex of temporal point to a vertical line projected from lateral canthus on the left	359	1.01 (0.96–1.06)	0.0–2.6
Apex of temporal point to a vertical line projected from lateral canthus on the right	360	1.01 (0.96–1.05)	0.0–2.5
Distance from the frontal midpoint to cowlicks on the right	43	1.87 (1.58–2.15)	0.5–4.5
Distance from the frontal midpoint to cowlicks on the left	158	2.66 (2.44–2.87)	0.4–5.6

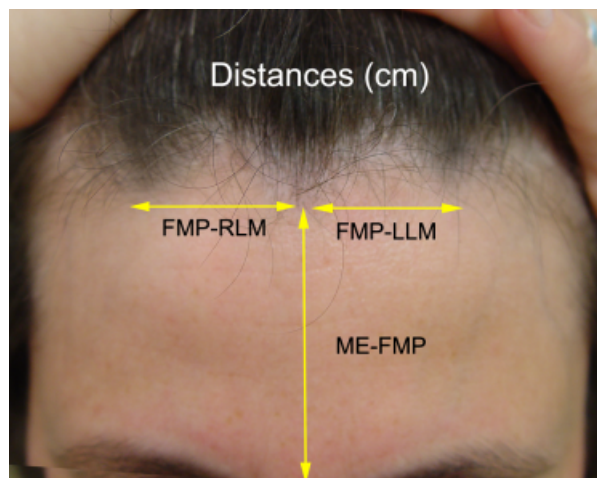


Figure 3. Distance from the mid-glabella to the frontal midpoint or apex of the widow's peak (ME-FMP); distance from the frontal midpoint to the apex of the lateral mound on the right (FMP-RLM) and on the left (FMP-LLM).

women, compared with 11.4% in 2004. Although hairline preservation is one of the features of female pattern hair loss, some patients with female pattern hair loss require frontal or temporal hairline restoration. The authors have observed an increasing number of women seeking hair restoration as an option for correction of congenital high hairlines or hairline deformities caused by previous facial cosmetic surgery.

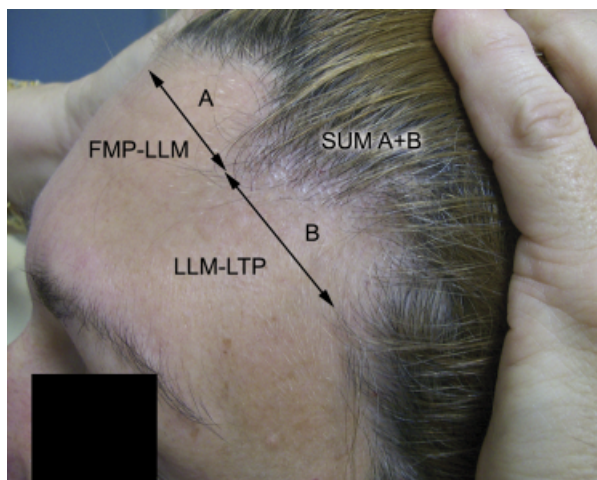


Figure 4. Distance from the apex of the lateral mound to the apex of the temporal point on the left (LLM-LTP). The sum of (FMP-LLM) + (LLM-LTP) was computed. These measurements and sum were also determined on the right side.



Widow's Peak – 81%
Cowlick – 64% (1)-61%, (2)-3%, (3) – 0.3%
One Cowlick (n=219) – 70% on left, 17% on right, 13% in midline

Figure 5. Widow's peak and cowlick frequencies. A widow's peak was present in 81% and cowlick(s) in 64%; 70% of unilateral cowlicks were on the left side, 17% on the right, and 13% in the midline.

Although much has been written about guidelines for hairline design in male patients,¹⁻³ to the authors' knowledge, this is the first report that describes detailed frequencies and measurements of the multiple structures that compose the female hairline. Most published descriptions define the position of the anterior hairline by measuring vertical facial proportions.^{4,5} The facial height is divided into upper, middle, and lower thirds beginning at the trichion and ending at the menton. Upper facial height, measured from the trichion to the supra orbital area, is determined by computing the average of the middle and lower third facial height dimensions.⁴ One study of 50 volunteers determined that the average distance from the upper edge of the eyebrow to the hairline was 5.0 cm.⁸ Our finding that the mean distance from the mid-eyebrow to the frontal midpoint was 5.5 cm is consistent with this previous report. Although we recommend a frontal midpoint height of approximately 5 to 6 cm from the mid glabella when restoring the female hairline, facial proportions and the intersection between the vertical forehead and horizontal scalp planes should be assessed and taken into consideration.

There is general awareness of mounds or protrusions along the frontal hairline in the field of hair resto-

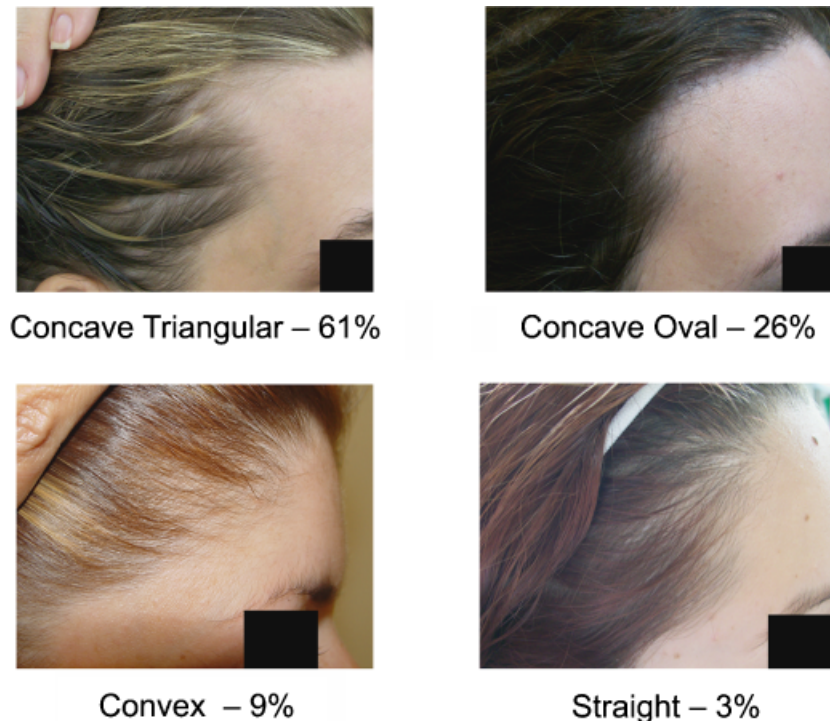


Figure 6. Frequencies of temporal recessions by shape; 87% had concave oval or concave triangular temporal recessions.

ration surgery,^{1,3} but little has been written about their specific dimensions and location in women. Parsley^{1,3} describes the presence of zero to three mounds in men and women: the two lateral mounds on each side of a central mound (the widow's peak). Citing an unpublished study of 100 male Norwood II and Norwood III patients³ as well as personal observations of male and female hairlines (WM Parsley, personal communication), Parsley notes that 55% of hairlines do not exhibit any significant mounds. Although it is difficult to define the term "significant" in this context, the fact that we identified and measured small structures when studying the widow's peak and lateral mounds may have influenced our reported frequencies of these structures toward higher numbers, as evidenced by our findings that 81% of the subjects showed evidence of a widow's peak, and 98% showed evidence of lateral mounds. Parsley¹ also observed that the distance to the peaks of the lateral mounds from the frontal midpoint varies from 1.5 cm to 4 cm. In our subjects, we observed a range of 1 cm to 6 cm, with a mean of approximately 3.75 to 4 cm. As determined by

the distance ratios, the distance from the frontal midpoint to the apex of the lateral mound ranged from 0.22 to 0.79 (mean approximately 0.50) of the distance from the frontal midpoint to the apex of the temporal point. It is the author's (BN) personal observation and strong opinion that, in women, the lateral mounds are typically larger and located more laterally than in men. The lateral mounds are important structures that should be incorporated into female hairline design to impart a "feminine" look to the transplanted hairline.

It is generally recognized that the female hairline exhibits cowlicks more frequently than in men, as suggested by our data, which showed that 64% of the subjects had one or more hairline cowlicks. It is interesting that, in the 219 subjects who had one cowlick, 70% were present on the left side. Although this has never been reported, two studies showed that 84.7% of parietal whorls occurred at the midline or right side.⁹ This predilection for one side versus the other was also observed with regard

to lateral mounds, with 64% of the subjects with bilateral lateral mounds having a more prominent mound on the right and 83% of unilateral mounds being present on the right. Despite the broad range observed in several measurements of distances and dimensions, the large sample size, and the fact that the values were not skewed allowed the normal distribution to be used for construction of all CIs for the means and resulted in narrow 95% CIs.

Correlations between variables generally related to symmetry of the dimensions of the widow's peak and lateral mound structures (the wider the structure, the longer) and symmetry between the location of structures on opposite sides of the hairline (lateral mounds and temporal points). The observed correlation between the lack of a widow's peak and a longer distance between the mid-eyebrow and the frontal midpoint is expected. Although one might intuitively predict a positive correlation between age and a higher frontal midpoint or age and a higher frequency of concave temporal recessions, no such correlations were found, implying that these features are genetically programmed and not age dependent.

Based on our findings, we propose guidelines for designing the hairline in women (Table 3). Because of the progressive nature of male pattern hair loss, receding hairline patterns are appropriate for hairline restoration in men,^{1,3} whereas nonreceding patterns are essential for achieving a "feminine" look and proper facial framing in female patients. Because of geographic location, this study did not include subjects of all racial or ethnic backgrounds, and subtle differences may exist in the frequency and size of the hairline structures described. In the authors' experience, however, the results and guidelines described in this study are universally applicable.

This paper defines the natural hairline pattern in women, and its findings should be considered when performing any intervention that affects this important cosmetic entity.

TABLE 3. Important Structures to be Incorporated into the Female Hairline Design

<i>Structure</i>	<i>Observed Frequency (%)</i>	<i>Location/Comments</i>
Widow's peak	81	Frontal midpoint 5.5 to 6 cm above the mid-eyebrow, considering vertical facial proportions and forehead-scalp (vertical horizontal) intersection
Lateral mounds	98	Apex approximately 3.75 to 4 cm from the frontal midpoint or half-way from the frontal midpoint to the apex of the temporal point
Temporal points	100	Apex 3.5 to 3.75 cm lateral to apex of lateral mounds and 1 cm posterior to a line projected vertically from the lateral canthus
Temporal recessions	87	Shape is concave triangular (61%) or concave oval (26%), with fine hairs within the recessions in 99%

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