

Naturally Occurring Hairlines in Orientals of Southeast and East Asian Origin and Their Application in Hair Restoration Surgery

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Introduction

The most common cause of male pattern baldness (MPB) is androgenetic alopecia (AGA).¹ The clinical onset of baldness in both men and women generally occurs at around the age of 30 to 40 years old.² In Southeast and East Asia (SE and E Asia), the incidence of male pattern baldness varies depending on region, is generally lower compared to their Caucasian counterpart, but is also increasing with age.³⁻¹⁰ Not surprisingly, more Orientals are seeking a permanent solution to their hair loss by means of hair transplantation. The creation of a natural hairline is possibly one of the most important steps of a successful hair transplant and reflects on the surgeon's aesthetic and artistic flare. Knowing the trend of hairline as it changes with age helps the surgeon to plan ahead and design a hairline that is most natural for the patient. To create a good hairline, understanding the anatomical differences between the Caucasian and Asian hairline is essential. East Asian men tend to have brachycephalic or round skulls, while Caucasians tend to have doliocephalic or ovoid skulls (Figure 1). East Asian scalps tend to be wider and flatter, with rounded frontotemporal angles, and most patients of East Asian origin seek a flatter hairline that mimics this nature.¹¹



Figure 1. Comparative anatomy of typical Asian and Caucasian skulls (top view). The typical East Asian male has a round skull (left), while the average Caucasian male has an ovoid skull shape (right). (Photos courtesy of DHT Clinic, Thailand)

The angle at which the hair exits the scalp is also important. It is usually at a wider angle in Asians, approximately at a 45° angle to the skin, but it can be in the range of 45°-90°. Caucasians tend to have flatter/more acute hair angles. It is harder to gauge the hair angle in patients with wavy hair. Hair at the temple is much flatter in nature, almost parallel to the skin in Caucasians but not in Asians.

Tsai et al. (2002) reported that the average hair density of the frontal scalp in non-balding Oriental men (ages 20-50) was 84.21 FU/cm² and that of the temporal scalp was 54.47 FU/cm².¹²

Planning the Hairline

Imagawa (2010) suggested that the ideal hairline should take into consideration the following:¹³

1. Basic facial shape: square, oval, round, triangular, heart shaped
2. Slope of forehead: upslope (common in Caucasian), flat (common in Asians), or downslope (commoner in Afro-Caribbeans)

3. Frontotemporal angle: Typically lies on a line drawn vertically from the lateral epicanthi of the eye to meet the frontal hairline. Asians tend to have a wide frontotemporal angle compared to the more acute ones seen in Caucasians.
4. Position of hairline: Usually is lower than in Caucasians. In Asians, a mid-frontal point 7-9cm from the glabella is usually acceptable, depending on age and projected future hair loss. Strong temples are required to balance a low hairline.

Hair direction refers to the direction in which the hair wants to naturally fall. Beehner (2008) and Unger (2004) described the most common hair direction in Caucasians at the frontal hairline to be from left to right with gradual conversion to anterior (Figure 2).^{14,15} By following the correct hair direction during hair surgery, the surgeon can avoid injuring existing hair and can minimize the risk of shock loss.¹⁴

Other variations of the hairline commonly encountered in hair restoration surgery include the conjugate "ridgeback," where the hairline on the left and right converge at the center. This is commonly seen in Caucasians but not in Asians (Figure 3). Another variation commonly seen in hair transplantation is a straight hairline on the left and an oblique hairline pointing towards the midline on the right (Figure 4).

Unger also noted the presence of a retained "frontal cowlick" in some patients, which needs to be taken into consideration and followed if the residual hair is strong.¹⁵ The presence of a widow's peak is common in men and is frequently an added on feature in hairline design.¹⁴

There is limited literature on the characteristics of the naturally occurring hairline in Orientals. We studied the changes to the hairline with age in Chinese males and its common characteristics for better application to SE and E Asian patients seeking hair restoration surgery.



Figure 2. Left-to-right hair direction extending to mid-frontal section, with gradual conversion to straight anterior on right side.



Figure 3. A conjugate "ridgeback" hairline, where there is convergence of the hairs towards the center.



Figure 4. A straight hairline on the left with hair directed towards the midline on the right.

Methodology

From September to November 2015, we studied a total of 209 Oriental men of SE and E Asia origin (Singapore, Malaysia, Indonesia, China, and Brunei) without AGA (Norwood I-II). Subjects between 18-85 years old were recruited from outside major shopping malls and train stations, bus stations and interchanges, community centers, and Chinatown in Singapore. We looked at the impact on the hairline as one ages, and its associated risk factors (smoking, family history, diet, age, etc.).

Patients age 18 years and above were recruited in the study as androgenetic alopecia becomes clinically apparent after the onset of puberty.¹⁰ The hairline in the absence of AGA in the majority of the population in the specific age group is the desired hairline that we would want to re-create in hair transplant patients.

Hairline characteristics were examined, including the direction of the hairline; the density and hair count at the first 1.5 centimeters of the frontal hairline and peaks. The mid-frontal point (distance between the interception of a horizontal line between the eyebrows, and a vertical line drawn from the glabella to the anterior-most part of the hairline) and frontotemporal point (distance between the lateral canthus to the anterior-most point of the temporal hairline) were also calculated.

The presence of a widow's peak or cowlick was noted, as well as the natural direction of the hairs at the hairline, and the frontotemporal angle (round/straight), the hair direction at the temples, and the width of the sideburns and its relationship to the tragus were investigated.

Shapiro (2004, 2013) described macro irregularity of the hairline that can be seen from a distance that consists of three "mounds" that included one central (consisting of the widow's peak) and two lateral "mounds." The presence of lateral mounds in Asians was also investigated in this study.^{16,17}

Results

We decided to stop data collection at approximately 30 patients per age bracket as the findings were consistent and the recruitment of larger numbers in the study would be an arduous process and would provide little additional input.

Risk Factors and Hair loss

Of the 209 subjects, 85.7% have no family history of hair loss, emphasizing the significance of genetics in androgenetic alopecia. There were 49.75% classified as Norwood I and 50.25% as Norwood II. Of the participants, 46.9% were smokers and a majority (84.7%) of them were on a mixture of eastern and western diet.

Density

Hair density decreases as men age (see table below for hairline density of non-androgenetic alopecia men between the ages of 18-85 [n = number of subjects]). The average frontal hairline density in men is 77.8 FU/cm² and 110 hairs/cm². This translates to 1.4 hairs/FU in the first 1.5cm of the hairline. At the temporal region, the average density is 69.6 FU/cm² and 97.6 hairs/cm². This translates to 1.4 hairs/FU.

Age	Density Frontal Hairline (FU/cm ²)	Hairs/cm ²	Density Temporal Hairline	Hairs/cm ²
18-29 (n= 41)	85.2	120.0	77.1	110.9
30-39 (n=35)	83.2	127.3	76.4	114.2
40-49 (n=29)	79.3	118.2	72.3	100.5
50-59 (n= 33)	74.7	105.8	71.1	96.6
60-69 (n= 36)	76.8	103.0	65.8	86.7
>70 (n=35)	66.3	84.7	57.3	75.3
Average (n=209)	77.8	110.0	69.6	97.6

Hairline Height

The height of the hairline in non-AGA men does not change or recede significantly with age (see table below for the hairline height in Chinese men between the ages of 18 to 85), although the right temple tends to be slightly higher than the left.

Age	Frontal Hairline Height (cm)	Right Frontotemporal Hairline Height (cm)	Left Frontotemporal Hairline Height (cm)
18-29 (n=41)	6.7	8.8	8.8
30-39 (n=35)	6.7	8.9	8.8
40-49 (n=29)	7.2	9.2	9.2
50-59 (n=33)	6.6	8.9	8.8
60-69 (n= 36)	6.7	8.9	8.8
>70 (n=35)	7.0	9.0	8.9
Average (n=209)	6.8	8.94	8.87

Hairline Shape

In the study, we noted 55.5% of the hairlines were upsloping (Figure 5), 35.4% were straight (Figure 6), and only 9.1% were downsloping (Figure 7).



Figure 5. Upsloping hairline

Face Shape

The top three most common face shapes in Chinese based in Singapore were oval (46.9%), round (16.8%), and square (13.9%).



Figure 6. Straight hairline

Hair Direction/ Widow's Peak/Lateral Mounds

The hair direction flowed from the left to right in 59.8% of the cases, flowed right to left in 15.8%, was radial in 10.5%, and was anterior flowing in 13.9%. The presence



Figure 7. Downsloping (juvenile) hairline

of a widow's peak was found in only 47.4% of men, and most Asian men did not have any lateral mounds (66%). Cowlick at the frontal hairline was present in only 1% of the participants.

Hairlines in Orientals *from page 205***Frontotemporal Angle and Hair Direction of the Temples**

The average frontotemporal angle is round in 62.2% and straight in 37.8%. The average frontotemporal angle was slightly wider on the left at 97.7° and 97.0° on the right. The temples recede gradually with age but maintain a convex shape. Temple hair direction is shown in the table below:

Temple Direction	Inferiorly	Posteriorly	Anteriorly
Right (%)	22.0	71.3	6.7
Left (%)	38.8	38.8	22.4

Sideburns

The average sideburn width was 1.43cm and was at the level of the tragus in 45.5% on the left and 46.4% on the right. On the left, 29.7% were above the tragus with an average distance of 1.42cm, and 24.9% were below the tragus with an average distance of 2.33cm. On the right, 27.3% were above the tragus with an average distance of 1.39cm, and 26.3% were below the tragus with an average distance of 2.04cm. Knowledge of the norm is important in the re-creation of sideburns in hair transplant patients.

Discussion

The frontal hairline consists primarily of 1-hair grafts, which gradually convert to 2-hair grafts as it moves 0.5-1cm posteriorly.¹⁶ Not surprisingly, the average density at the edge of the frontal hairline is 1.4 hairs/cm². It is important to create micro-irregularity in the frontal hairline for it to appear natural.^{16,17}

In SE and E Asian men, lateral mounds are frequently absent and hence may not be important in hairline creation, although the creation of a widow's peak may appear to lower the hairline in younger patients. Shapiro (2013) recommends incisional densities of 25-35 follicular units per square centimeter (FU/cm²) while Tsai et al. recommend a density of 30 FU/cm² in Orientals.^{12,17} Other hair surgeons have been able to achieve 50-60 FU/cm² with good results.¹³ It is important to avoid too much dense packing as this can result in poor growth.

As the patient ages, lesser hairline density is required for patient satisfaction as density declines progressively with age, even in non-AGA men. The average height of the MFP remains low at 6.8cm. It may be prudent to create a hairline higher than this so that the hairline continues to look natural as the patient ages.

Common shapes of the hairline seen in Orientals include slight upsloping of the hairline or straight. It is important to factor in the projected future hair loss based on family history and the patient's age, and to be extremely conservative in young patients by creating a higher, upsloping hairline (7-9cm) as it consumes fewer grafts.¹³

If a lower hairline is desired, strong temples are needed to balance the look. The hair direction of the right temple tends to point posteriorly while the left temple typically points inferiorly or posteriorly, so it may be useful to follow Mother Nature, as vellus hairs are mostly still present. Generally, only 30 FU/cm² is needed for the temples to look good due to the flat angle at which hairs exit the scalp here. Surgically created temples tend to be more angular compared to the rounded appearance of naturally occurring temples.

Face shape also plays an important role in hairline design. For example, a straight hairline will make a square face appear broader (Figure 8), a high hairline will make an oblong face appear even longer (Figure 9), and a low hairline makes a round face look shorter (Figure 10). A V-shape hairline may look good on Caucasians, but it does not look natural on East Asians.¹⁸



Figure 8. A straight hairline on a square face makes the face appear squarer. (Photos courtesy of DHT Clinic, Thailand.)



Figure 9. A high hairline makes an oblong face look longer. (Photos courtesy of DHT Clinic, Thailand.)



Figure 10. A low hairline makes a round face look short. (Photos courtesy of DHT clinic, Thailand.)

There are various tools available that help to enhance the symmetry of the surgical hairline. Pathomvanich and Ng designed a laser light-leveling device that projects a curved laser beam over the planned hairline, which can just be outlined with an eyebrow pencil.¹⁹ Cole's "Aid to Hairline Design" measuring device also allows accurate measurement of the MFP and the frontotemporal angles.²⁰

AGA can be inherited from both the maternal and paternal sides of the family. From the study, more and more patients are exposed to risk factors such as smoking and a westernized diet.^{6,21} Unsurprisingly, AGA is becoming a more common occurrence. Patients are also presenting at a younger age, and knowledge of the naturally occurring hairline will help both the surgeon and the patient to design and decide on a suitable hairline during hair restoration surgery. In addition, anticipated future hair loss and limitations of the donor reserves should be factored into the planning of a surgical hairline.

Limitations of the Study

Due to the fact that all the patients in the study had non-shaved hair, the patterns that we found may have varied from the litera-

ture and we were unfortunately unable to assess the exit angle of the hair from the scalp due to the weight of the hair, which may be misleading.

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