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## OPEN

# Natural Asymmetry in Hair Growth Direction: Implications for Hairline Design in Male Patients

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**Introduction:** Achieving a natural, aesthetically pleasing hairline is a key objective in hair transplant surgery. However, many patients erroneously assume that perfect symmetry between the left and right sides of the hairline is crucial for natural results. This misconception neglects the natural asymmetry in facial structures, including hairlines. This study quantifies the degree of asymmetry in hairline direction among male subjects, providing evidence to guide hairline design for optimal outcomes.

**Materials and Methods:** The study included 125 East Asian males with Norwood-Hamilton stage II or lower, none of whom had undergone hair restoration surgery. Standardized 60-degree photographs were used to minimize distortion, and hair growth angles were measured using Microsoft Snip & Sketch's protractor tool. Measurements were taken at specific points along the hairline, and paired *t* tests were performed to assess asymmetry.

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This study was conducted in compliance with the principles set forth in the Declaration of Helsinki.

J.K., T.J., K.-H.Y.: conceptualization. J.K., J.W., T.J., K.-H.Y.: study design. J.K., J.W.: acquisition of data. J.K., J.W., T.J., K.-H.Y.: writing—original draft preparation. J.W., J.K., T.J., K.-H.Y.: writing—review & editing. J.K., J.W., T.J., K.-H.Y.: visualization. K.-H.Y.: supervision.

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**Results:** Significant rightward asymmetry in hairline direction was found, averaging 22.2 degrees. The mean hair angle on the right side was 55.03 degrees, whereas the left averaged 32.83 degrees ( $P < 0.001$ ). Only 8.8% of subjects exhibited greater leftward asymmetry.

**Conclusion:** This study highlights the prevalence of natural asymmetry in male hairlines, particularly a rightward skew. Symmetrical hairline designs may appear unnatural, whereas embracing this asymmetry can lead to more harmonious results. Educating patients about these findings can enhance satisfaction. Further research should explore the impact of sex, ethnicity, and skull morphology on hairline asymmetry.

**Key Words:** Aesthetic surgery, facial asymmetry, hairline, hair transplantation, scalp

Hair transplant surgeons are tasked with creating a hairline that is both aesthetically pleasing and natural in appearance. However, patients often assume that perfect symmetry between the right and left sides of the hairline is a prerequisite for achieving these goals. This assumption disregards a fundamental characteristic of human anatomy—facial structures, including the hairline, are rarely symmetrical.<sup>1</sup> Designing a hairline that respects the natural asymmetry of hair growth results in more natural-looking outcomes, as it complements the patient's inherent facial features.

Hair growth direction, particularly in the hairline region, is influenced by various factors, including the rotational dynamics of the hair whorl and the positioning of the part line.<sup>2</sup> Typically, hairlines exhibit a rightward skew, after a clockwise rotation due to the natural whorl pattern.<sup>3</sup> Ignoring these patterns during hairline design can lead to an artificial appearance, potentially disappointing patients who expect a symmetrical result.

This study seeks to quantify the degree of natural asymmetry in hairline direction among male subjects. By doing so, we aim to provide a basis for educating patients on the importance of embracing natural asymmetry in hairline designs, ultimately improving the aesthetic outcomes of hair transplant surgery.

## MATERIALS AND METHODS

### Study Population

The study cohort comprised 125 male subjects of East Asian ethnicity, all presenting with Norwood-Hamilton classification<sup>4</sup> stage II or lower. The exclusion of subjects with advanced hair loss allowed for the examination of natural hairline asymmetry without the confounding influence of extensive baldness. The age of the subjects ranged from 20 to 35 years, with a mean age of 28.6 years. None of the participants had undergone previous hair restoration surgery, ensuring that the hairlines analyzed were unaltered by prior interventions. This sample is reflective of individuals who are most likely to seek hairline restoration while still retaining some of their natural hairline characteristics.

### Image Acquisition and Measurement of Hairline Asymmetry

Standardized photographs were taken at an angle ~60 degrees below the horizontal axis to reduce visual distortion between the mid-frontal point and the fronto-temporal recessions. This angle was chosen to replicate the view most commonly encountered during patient consultations and surgical planning.

Hairline asymmetry was quantified by measuring hair growth angles at 2 key points: the midpoint between the mid-frontal point and each apex of the fronto-temporal recessions. These angles were measured using the protractor tool in Microsoft Snip & Sketch. Each angle was measured 3 times, and the mean value was recorded to ensure measurement accuracy.

## Statistical Analysis

Descriptive statistics, including means, SDs, and 95% CIs, were calculated for the hair angles on both sides of the hairline. A paired *t* test was used to assess the statistical significance of differences between the right and left hairline angles, with significance defined as  $P < 0.05$ . The distribution of cases with greater left-sided hair angles was also analyzed to assess the prevalence of leftward asymmetry in the study population. Statistical analysis was conducted using SPSS software (version 25.0).

## RESULTS

### Asymmetry in Hairline Direction

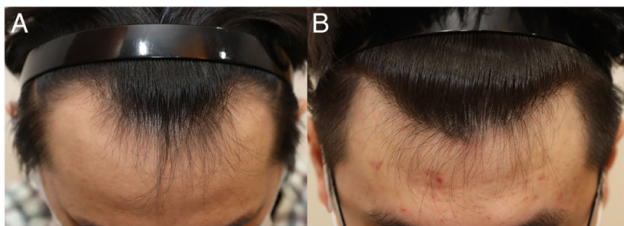
The results of the study demonstrate clear asymmetry in hairline direction between the right and left sides. The mean hair angle on the right side was 55.03 degrees (95% CI: 49.05–60.95), whereas the mean hair angle on the left side was 32.83 degrees (95% CI: 26.72–38.88), resulting in an average rightward skew of 22.2 degrees. This difference was statistically significant ( $P < 0.001$ ), confirming that hair growth in the hairline tends to follow a rightward, or clockwise, rotation.

Only 11 out of 125 subjects (8.8%) exhibited a greater hair angle on the left side compared with the right, indicating that rightward asymmetry is the predominant pattern in this population.

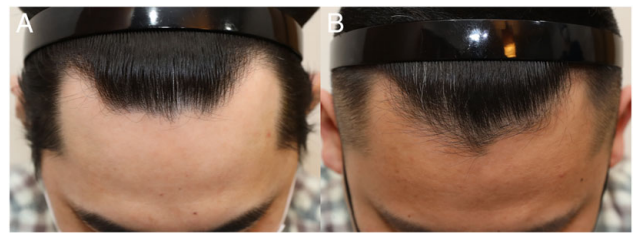
Preoperative photographs of a 40-year-old male subject (Fig. 1) and a 37-year-old male subject (Fig. 2) clearly illustrate this rightward skew, which is a common feature observed in both cases. In the 40-year-old subject, the hair angles were measured at 58.1 degrees on the right side and 35.7 degrees on the left. The 37-year-old subject presented with a right hair angle of 52.3 degrees and a left hair angle of 31.9 degrees, further supporting the overall trend of rightward asymmetry.

### Variability in Hairline Asymmetry

Although the majority of subjects demonstrated a rightward skew in hairline direction, the degree of asymmetry varied among individuals. Some subjects exhibited only minor differences in hair angles between the 2 sides, whereas others dis-



**FIGURE 1.** (A) Preoperative image of a 40-year-old male showing pronounced rightward asymmetry in hairline growth. The hair angles were measured as 58.1 degrees on the right and 35.7 degrees on the left, illustrating the natural skew commonly observed in the cohort. (B) Postoperative image of the same 40-year-old male after hair transplant surgery. The hairline design incorporated the natural rightward asymmetry, resulting in a more natural and aesthetically pleasing outcome.



**FIGURE 2.** (A) Preoperative image of a 37-year-old male displaying rightward asymmetry in hairline growth. The right hair angle was measured at 52.3 degrees, whereas the left was 31.9 degrees, demonstrating the natural asymmetry before surgery. (B) Postoperative image of the same 37-year-old male after hair transplant surgery. The hairline design respected the pre-existing asymmetry, leading to a harmonious blend with the existing hair and an improved natural appearance.

played more pronounced asymmetry. This variability underscores the importance of tailoring hairline designs to each patient's unique hair growth patterns, rather than relying on a standardized, symmetrical design.

## DISCUSSION

The results of this study provide valuable insights into the natural asymmetry present in the direction of hair growth along the hairline, particularly in male subjects. Our findings revealed a significant rightward skew in hair direction, consistent with the clockwise rotational pattern typically observed in the hair whorl. This asymmetry aligns with established knowledge regarding hair growth dynamics, confirming that symmetrical hairline designs may not always produce the most natural-looking outcomes.<sup>3</sup>

The implications for hair transplant surgery are considerable. Many patients enter consultations with the expectation that a perfectly symmetrical hairline is the key to a natural result. However, our study suggests that hairlines designed with a slight asymmetry—accounting for the natural rightward skew in hair growth—are more likely to blend seamlessly with existing hair and conform to the patient's unique hair growth patterns. This highlights the importance of patient education in the preoperative phase. Surgeons should not only be aware of the natural asymmetry in hairlines but also communicate its aesthetic benefits to patients. By doing so, patient expectations can be more effectively managed, reducing the risk of dissatisfaction with the final result.

Our study also underscores the need for personalized hairline designs rather than relying on a standardized symmetrical approach. The variability in the degree of asymmetry observed among individuals suggests that each patient's natural hair growth pattern should guide the design process. Although symmetrical hairlines may seem visually appealing in a theoretical sense, they can appear artificial if they do not correspond to the natural hair direction.

There are, however, limitations to this study. The use of 2-dimensional photography for measuring hair angles introduces some inherent constraints, particularly given that hair grows in a 3-dimensional space. Although the angle of photography was carefully chosen to minimize distortion, particularly at the outer edges of the hairline, the limitations of this method must be acknowledged. Future studies utilizing 3-dimensional imaging technology could provide a more precise representation of hair growth patterns and further substantiate our findings.

In addition, this study focused solely on male subjects of East Asian descent, a population characterized by brachyce-

phalic skull morphology. This focus allowed for the analysis of a relatively homogenous group, but the results may not be fully generalizable to other ethnicities or skull types. In populations with dolichocephalic skulls, for example, hair growth patterns and the degree of asymmetry may differ. Further research is needed to explore how these variables, including ethnicity and skull shape, may influence hairline design. Such studies would offer a broader understanding of the natural asymmetry in hair growth and could help refine hairline design strategies across diverse populations.

Moreover, sex differences in hairline design are an area worthy of further investigation. It is commonly believed that women exhibit greater asymmetry in their hairlines compared with men, yet there is limited quantitative data to support this assumption. As female hairlines tend to be designed with a softer, less structured aesthetic, the degree of asymmetry that is considered acceptable may vary between sexes. Additional research focusing on female hairline asymmetry could yield important insights and potentially lead to different design principles in hair transplant surgery for women.

## CONCLUSION

In conclusion, this study highlights the natural asymmetry present in the direction of hair growth in the male hairline, particularly the predominant rightward skew. The results suggest that hair transplant surgeons should take this natural asymmetry into account when designing hairlines, as symmetrical designs may not achieve the most natural aesthetic outcome. By incorporating these findings into their practice and ensuring that patients are informed about the benefits of asymmetry, surgeons can improve both the naturalness of the results and patient satisfaction. Further research is warranted to explore the broader implications of hairline asymmetry, including its variability across different ethnicities, skull types, and sexes.

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# Are Submental Flap Reconstructions From Oncological and Reconstructive Perspective Safe? Evaluation and Review of Ipsilateral and Contralateral Submental Flap Reconstructions

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**Abstract:** This study compared the risk of nodal metastasis progression in the submandibular area when using submental flap contralateral (SFC) or submental flap ipsilateral (SFI) relative to the tumor side. Thirty patients underwent treatment for squamous cell carcinoma of the oral cavity. Submental flap ipsilateral and SFC were used in 14 and 16 patients, respectively. After unilateral supraomohyoid neck dissection (levels I–III), the SFC group showed a significantly higher total number of positive lymph nodes removed ( $P = 0.014$ ). In addition, the number of positive lymph nodes in the IB region was significantly higher in the SFC group compared with the SFI group ( $P = 0.001$ ). Tumour relapse was the same in both groups (SFI:  $n = 4$ /SFC:  $n = 4$ ). The authors' results suggest that SFC can be adequately used to reconstruct oral cavity defects because, after rerouting, the rotation arc reaches the upper incisors and covers the arc of SFI rotation in the oral cavity. Moreover, with SFC, a complete neck block dissection and more radical tumor resection can be achieved without limitations.

**Key Words:** Cancer of head and neck, lymphatic metastasis, pedicled flap, reconstructive surgical procedures, neck, squamous cell carcinoma

**P**edicled submental flaps are used to reconstruct oncological defects of the head and neck. Its advantages include vascular

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All procedures performed in this study involving human participants were by ethical standards of the institutional Ethics Committee (Reference number 33/23) and with the Helsinki Declaration and its later amendments or comparable ethical standards.

Informed consent was obtained from all individual participants included in the study.

The authors report no conflicts of interest.

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