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Designing Anterior Hair Line in Male Pattern Baldness: Innovative Method A Study Of 431 Cases

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Abstract:

Introduction *- Anterior hair line (AHL) separates face from scalp. Evidence suggests our perception of physical beauty is based on how closely the features of one's face reflect phi (the golden ratio) in their proportions. Meaning, all faces perceived to be beautiful, each different from the other are united in their adherence to the golden ratio. By that extension, it must certainly be possible to use a mathematical parameter to design AHL in all faces.*

Method *- this is method of designing anterior hair line in patients of male pattern baldness. We need simple a flexible measuring tape and skin marker. A reference point "A" (glabella) is taken in between eyebrows. Mark points E and E' near lateral canthus on either side 8 cm horizontally away from point A. Mid frontal point, (point B) is marked 8 (+/- 1 cm) cm from point A in mid vertical plane. A Fronto-Temporal point, (points C) is marked by intersection of two points. One is 8 cm away in horizontal plane from point B and another is 8 cm away in vertical plane from point E. The Temporal Peak Points (D and D') are marked on line joining fronto temporal peak point (E, E') to lateral canthal points (C C'). This line makes anterior border of temporal triangle. The temporal peak point is taken slightly more than half way towards lateral canthus usually 5 cm away from fronto temporal point.*

Observation *- Author has done a study of 431 cases. All cases were of MPA. The average distance of mid frontal point from glabella was 7.9 cm. the patient satisfaction was 94.7%, few wanted lowering of hair line.*

Conclusion *- Based on study of various hair line, animation model of conversion of anterior hair line on 3D face to 2D, Golden ratio and Leonardo da Vinci concept that a common figure of approximately 8 cm plus minus one centimetre can give design of anterior hair line in cases of male pattern baldness.*

Key points *- male pattern baldness (MPB), anterior hair line (AHL), mid frontal point (MFP), temporal peak point (TP), fronto temporal angle (FTA).*

Introduction

Anterior hair line (AHL) separates face from scalp.[1] Its location and design varies with different facial structures. The significance of designing an aesthetic AHL in hair transplant cannot be stressed enough. The designed hairline should look natural and should be acceptable to the patient. Evidence suggests our perception of physical beauty is based on how closely the features of one's face reflect phi (the golden ratio),[2] in their proportions. Meaning, all faces perceived to be beautiful, each different from the other are united in their adherence to the golden ratio. By that extension, it must certainly be possible to use a mathematical parameter to design AHL in all faces. At the same time if we unwrapped the face 3D image to 2D, a matured face anterior hair line is transformed to a rectangle and then further divide this rectangle to right half and left side half we get two equal square. We all know Leonardo da Vinci[3] concept of facial dimensions that is rule of 1/3. Aesthetics of face is a definite proportion of one structure to another, and somewhere the mathematics lies behind the aesthetic.

The proposed method translates this idea into practical use. Upon studying several matured male faces with aesthetic hairlines, two patterns were observed.

1. All matured male hairlines more or less have two temporal peaks and a frontal dip. In an attempt to decode this pattern, a face with matured aesthetic hairline was chosen and its anterior hairline was marked. Then using 3D reconstruction, this face

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was flattened, upon which it was observed that the angulated pattern got converted into a rectangle. Refer to Figure 2 A and 2 B.

2. A face having broader forehead has shallow fronto-temporal peaks, and a curved forehead has deeper fronto-temporal peaks. Hence it can be said that the curvature of one's face/forehead is reflected in one's hairline.

An explanation for this can be found in the following concept:

"When a string of specific length is used to mark two points, first on a flat surface and then on a curved surface, the distance in space between the two points will be more in the case of a flat surface. The curved surface will bring the two points closer in space. This distance lag is proportional to the curvature. Greater the curvature more will be the distance lag and hence a curved forehead will have deeper temporal peaks whereas a flat forehead will have shallow temporal peaks".

Keeping these two observations in mind the author came up with a method to design anterior hair line (AHL) in cases of male pattern baldness.

It is devised so as to give importance to the curvature of the forehead while designing an AHL. The method is flexible enough to take into consideration the grade of baldness, patient's personal requirements and surgeon's artistic view. The result is an aesthetic anterior hairline which looks natural and appeals to patient satisfaction.

Method- Instruments Needed

A. Flexible measuring tape
B. Skin marker

Procedure

1. A reference point "A" (glabella) is taken in between eyebrows.
2. Mark points E and E' near lateral canthus on either side 8 cm away from point A.
3. A Mid frontal point, (point B) is marked 8 cm (plus /minus 1 cm depending upon grade of baldness, patients and surgeon view point) away from Glabella (point A) in mid vertical plane.
4. Fronto-Temporal point, (points C and C') is marked in fronto temporal area at a distance of 8 cm in horizontal plane from point B and at a distance of 8 cm in vertical plane from point E and E'. So fronto temporal point is point of intersection of two lines taken 8 cm from mid frontal point B and 8 cm from lateral canthal point E.
5. The Temporal Peak Points (D and D') are marked on line joining fronto temporal peak point (C and C') to lateral canthal points (E and E'). This line makes anterior border of temporal triangle. The temporal peak point is taken slightly more than half way towards lateral canthus usually 5 cm away from fronto temporal point.

If existing temporal peak points are touching to the line joining fronto temporal peak to lateral canthal points then reconstruction of temporal peak point is not needed.

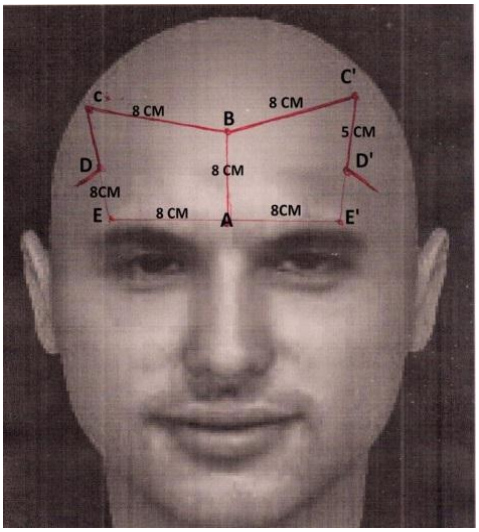
After taking all above points, they are joined as follows:

1. **Reconstruction of ANTERIOR HAIR LINE** - Point B to C on one side and B to C' on other side. So line joining C to B to C' is anterior hair line.
2. **Reconstruction of TEMPORAL TRIANGLE** - Join Point C to Point D. These are anterior temporal lines

Now draw a line from point D downward posteriorly to join remaining temporal hair of sideburn. The angle at temporal point is 100 plus minus 10 degree. So this completes the temporal triangle.

For clarification see figure 1

All distances on surface of forehead by flexible measuring tape AB 8 CM, AE 8 CM, BC 8 CM, CE 8 CM CD 5 CM



Observations

Author has done a study of 431 cases.

In study of 431 cases our observations are as follows.

1. Average distance in midline from glabella (A) to anterior hair line point (B) is 7.9 cm.
2. Average distance from glabella (A) to lateral canthal (E) point is 8 cm

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3. Average distance from mid hairline (B) point to temporal point (C) is 7.9 cm
4. Average distance from Fronto temporal peak (C) to temporal peak (D) 5 cm

Patient's satisfaction was found to be 94.7%.

- 3.7 % i.e. 16 patients asked for lowering of hairline.
- 1.6 % i.e. 7 patients asked for advancement of frontotemporal triangle.

Discussion

When the anterior hairline of the chosen face was marked and the face was flattened using 3D reconstruction, it was found that the angulated pattern got converted to a rectangle. The Figure 2 A shows hair line on normal 3D face which when converted to 2 D, the angulated pattern has been converted to a rectangle shown in Figure 2B. The animation video can be seen on u tube link- https://youtu.be/X8U45-gyj-k for better understanding of concept.

Figure- 2 A. 3D picture of face with hair line

Figure 2B-Conversion by animation of anterior hair line from figure W/M To a rectangle

PLACEMENT OF MID FRONTAL POINT (MFP)

There are few established criteria for placement of mid frontal point. One is a range of 7 to 11 cm from glabella. Another is junction of horizontal surface of scalp and vertical plane of forehead[4,5,7,8]. Third criteria is 1/3rd face height as face is divided in three equal parts. In a patient of Grade VII baldness maximum distance 11 cm was not accepted by any of our patient. While in this approach the range is 8 cm plus minus one cm only, which is relatively much narrow range and guide line to decide is grade of baldness as well as patient and surgeons view point. Usually Lower the Norwood grade of baldness distance is less than 8 cm while in higher grade distance is 8 cm or more. The maximum distance was 9 cm in grade VII in our series which was well accepted and option of more than 9 cm was not at all accepted.

THE PLACEMENT OF FRONTO- TEMPORAL POINT (FTP) and lateral hair line is a bit complicated. All-mature male hairlines have a fronto-temporal angle, which is formed by the junction of the frontal and temporal hairlines. The frontal hairline is the superior border of this angle and the temporal hairline is the inferior border. The apex of this angle moves posterior as the frontal and temporal hairlines thin and recede. Properly positioning this point and recreating a soft frontal temporal angle is one of the more difficult aspects of hairline recreation. Blunting this angle or placing it too low will cause an unnatural look.to place fronto temporal angle draw a line from the lateral epicanthus of the eye back toward a point where it meets the remaining temporal hair[4].

THE POINTS WHICH ARE TO BE SERIOUSLY CONSIDERED - these are 1. Making sure the hairline created by this point does not slope downward toward the ear but looks parallel or slopes upward when viewed from the side[1].

1. In mild-to-moderate hair loss, where there is only a little loss of the temporal hair, these rules work well. The existing temporal hair usually becomes the inferior border of the angle while the "future" anterior hairline will become the superior border of the angle. The apex of the angle lies on the line that was drawn superiorly from the lateral epicanthus of the eye. In more severe degrees of hair loss, where the temporal hair has receded and the lateral fringe has dropped, finding this point will be very difficult because there is no temporal hair with which the lateral epicanthal line can intersect. Visualizing and recreating the "lateral hump" can help in these situations.[1,4] The created fronto temporal point should not be lower than mid frontal point, and should not be placed posterior to a line drawn vertically from tragus. The FTP should be located

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anterior to pre tragal line and 4-7 cm behind the MFP. Certainly it needs lots of measurement and for a novice surgeon it is complicated.

While in this new approach a single measurement of 8 cm from two references point is sufficient enough, which is 8 cm in horizontal plane from MFP and 8 cm from a point E near lateral canthus. By doing so automatically what was explained criteria have already been incorporated and taken well in account.

This we have done in more than 431 patients and realised it is much simpler way to follow.

PLACEMENT OF TEMPORAL PEAK POINT (TP) is a point where two imaginary lines intersect. One line from base of nose to mid pupil and another line is from mid frontal point to ear lobe line. Practically it is not easy to draw such lines. It requires imaginary visual perception to draw it. This needs experience. In my approach it is very convenient to locate temporal peak point. The TP lies over line joining fronto temporal point and lateral canthal point, usually 5 cm below to FTP. It is noteworthy that number 8 and 5 are numbers of Fibonacci sequence and ratio between 5 and 8 is Golden ratio (1.618).[2] These numbers and ratio are found everywhere in nature. This also is seen exactly same when we converted 3D image of face to 2D face image.

Making of hair line zones are same as we have been doing. This method makes a skeletal frame of complete anterior most border of hair bearing scalp separating face. There is always flexibility for surgeon, patient and ethnic /racial variations to be added. As for as racial/ethnic variations are concern there is variation of curvatures of forehead which automatically is taken care by this method. Broader flat forehead will have a flat AHL while more curved forehead will have an oval or round AHL.

In lower Grade of baldness it is less than 8 cm while in higher grade it is 8 or more than 8 cm (8 cm plus Grade of baldness and its significance in making the hairline Minus 1 cm). Comparison of this system of design of hair line and temporal peak was done. There were no significant difference between other traditional systems and this system. The difference was on anterior location of temporal point. When Mayer system[6,9] was followed the TP was slightly anteriorly placed on forehead as compare to this system. The Mayer temporal point (TP) looks better in a young face with lower AHL and youthful face and requires more grafts to be used for temporal reconstruction. Mayer system considers only size of face but not the curvature of forehead. you cannot make AHL and Temporal line of 20 years on 50 years of face.it is unacceptable truth that age related facial changes cannot be avoided and donor grafts are limited whatever system of graft harvesting is followed. So not reconstructing temporal area to full ideal reconstruction we need to follow a midway which also suits to face in relation to age as well as consider donor grafts limitations.

Advantages - there are obvious advantages of this method.it gives a skeletal frame of anterior hair line with minimum need of visual perception and experience of surgeon. It automatically takes care of curvature of forehead. Patient's choice and surgeon's artistic criteria can very well be incorporated in this method of design of anterior hair line.

FOLLOW UP RESULTS - CASE-I-Patient 38 years with Norwood Grade VI baldness. Hair line designed as per method described. 3015 grafts implanted.

CASE II- Patient 28 years, Norwood Grade III baldness. Hair line designed as per method described. 2456 grafts implanted.

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CASE-III- Patient 35 years, Norwood Grade IV baldness. Hair line designed as per method described. 2361 grafts implanted.

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