

Objective Photoanalysis of Feminizing Frontal Cranioplasty Outcomes

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Abstract

Study Design: Retrospective analysis at a tertiary care center.

Objective: This study describes a method of analyzing postoperative results using lateral view clinical photographs to create normalized projection ratios of the glabella and radix.

Methods: We reviewed preoperative and postoperative photographs of 15 patients. All photographs were in the lateral view Frankfort horizontal plane. We calculated the distances between the (a) tragus and cornea, (b) cornea and radix, (c) cornea and glabella, and the (θ) nasofrontal angle.

Results: Fifteen sets of patient photographs were analyzed and found that there was a favorable 14% reduction at the radix and an even greater reduction (78.9%) at the glabella. The nasofrontal angle was improved to a more feminine range from 131.84° preoperatively to 145.86° postoperatively.

Conclusions: Normalized projection ratios of the glabella and radix, along with the nasofrontal angle, can be used to objectively measure outcomes of frontal feminizing cranioplasty.

Keywords

facial feminization, cranioplasty, gender affirmation surgery

Introduction

The sexual differences in the facial skeleton have been extensively studied by anthropologists for decades. The upper facial third may have the greatest impact on gender perception by observers¹ and has become the most commonly addressed area in facial feminization surgery (FFS).² This area has many gender distinguishing features including the hairline, forehead convexity, supraorbital bossing, nasofrontal angle, and brow shape.¹ The frontal bone feminizing cranioplasty was first developed by Dr. Ousterhout in 1987 to feminize these characteristics among transwomen.³ However, subjective and objective outcome measures remain limited in gender-affirming facial surgery. We describe a method of assessing postoperative results using lateral view clinical photographs without additional radiographic imaging/radiation exposure.

Methods

This study was approved by the University of California San Francisco IRB. Subjects included transwomen undergoing

FFS between March 2017 and May 2019 with frontal cranioplasty who had complete sets of standardized preoperative and postoperative photographs. Frontal cranioplasty was performed using a trichophytic incision, and the frontal projection was reduced with either osteoplastic flap or burring.¹

Patients had preoperative and postoperative photos in the standard photo analysis views. In this study, the lateral view was utilized for all measurements. All photos were oriented to the Frankfort horizontal plane, and all linear pixel measurements and angular measurements were made using ImageJ (National Institutes of Health, Bethesda, MD). The features measured were the distances between the (a) tragus

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Figure 1. Features measured on lateral photographs, distance from the (a) tragus to cornea, (b) cornea to radix, (c) cornea to glabella, and the nasofrontal angle (θ).

and cornea, (b) cornea and radix, (c) cornea and glabella, and the (θ) nasofrontal angle (Figure 1). The measurements were normalized between pre and postoperative photos by using the tragus and cornea distance (a) as a reference, and a ratio was calculated for the radix ($b:a$) and glabella ($c:a$).

Results

We analyzed 15 sets of patient photographs. Postoperative photos were taken at 4.67 months after surgery on average, the average patient age was 43.8 years. On average there was a favorable 14% reduction at the radix and an even greater reduction (78.9%) at the glabella. The nasofrontal angle was also improved and brought into a more feminine range from 131.84° preoperatively to 145.86° postoperatively.

Discussion

We demonstrate the feasibility of using lateral photographs for assessing postoperative results that are valid for each patient by using the tragus to cornea distance as a reference point.

There are two studies in the literature that have measured the amount of bony forehead reduction achieved after feminizing frontal cranioplasty. In one study, the thickness of the frontal sinus was assessed by measuring the distance between the anterior and posterior tables before and after surgery on CT scan, showing an average reduction of 8.2 mm (range 4.6–11.9 mm).⁴ In another study, cephalometric radiographs were measured from the frontal prominence to the sella and found a mean frontal set back of 8.68 ± 1.42 mm.⁵ These methods are more accurate since they are direct measurements, but require patients obtain radiographic imaging. However, given differences in head shape and size, our approach utilizes normalized ratios,

which allows greater relative standardization and comparisons despite individual variations. While the nasofrontal angle alone does not adequately assess frontal cranioplasty, we found nasofrontal angle became more obtuse with surgery (from about 130° to 145°) creating a more feminine aesthetic.⁶

Conclusion

A lack of adequate objective outcomes exist to assess GFS. Normalized projection ratios of the glabella and radix, along with the nasofrontal angle, can be used to objectively measure outcomes of frontal feminizing cranioplasty. This allows use of routine photographs without the need for additional radiographic imaging.

Declaration of Conflicting Interests

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