Facial Feminization Surgery: Preoperative Planning and Surgical Technique for a Harmonious Outcome

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Abstract

Feminization of the face is as important as genital or chest surgeries in alleviating gender incongruence in transgender individuals. It comprises a myriad of procedures that address the skeletal and/or soft tissue components to give a harmonious result. The surgeries are custom-tailored for each individual based on facial anatomy as well as her desired changes for optimal results. A thorough understanding of the differences in male and female facial anatomy is crucial.

The use of computed tomographic imaging with three-dimensional reconstruction and stereolithography models can greatly improve the planning as well as execution of these surgeries. There is an increase in demand for these surgeries, with a paucity of centers providing them. The aim of this article is to highlight the comprehensive facial feminization procedures, which have a high patient as well as surgeon satisfaction rate.

Keywords

► facial feminization
► frontoplasty
► V-line surgery
► facial harmonization
► feminizing rhinoplasty

Introduction

Facial feminization surgery (FFS) encompasses a myriad of procedures that utilize craniofacial surgery principles to feminize the masculine face. A comprehensive feminization addresses both the skeletal and soft tissue components of the face, transforming obvious and subtle male facial features to meet necessary changes in gender perception/identity. The importance of FFS, sometimes even more than genital surgeries, has been acknowledged by WPATH (World Professional Association for Transgender Health)¹

Furthermore, the mental health-related quality of life is much more in transgender individuals who underwent FFS compared with those who have not.²³

The foundation for facial feminization was laid by Dr Douglas Ousterhout in the 1980s and has been evolving over the years,⁴ with inclusion of three-dimensional (3D) computed tomography and stereolithographic (SLA) models with the aid of 3D printing technology and virtual planning software. However, many of these facilities are inaccessible to a large percentage of the transgender community due to a variety of reasons. Increased awareness starting from the primary care level is essential to address this issue.⁵

This article will describe the various procedures performed to achieve a comprehensive feminization of the face in our center. Each procedure will be described individually; however, it must be noted that not every procedure needs to be...
performed on every patient. The type of procedures must be customized to the unique needs of that individual.

**Anatomical Differences in the Male and Female Face**

The male and female face presents a variety of differences that are summarized in **Fig. 1A, B** and **Fig. 2A, B**. The aim of facial feminization is to alter the skeletal and soft tissue components to attain a softer feminine look that allows the individual to pass off as a female in the society (*Table 1*).

**Preoperative Evaluation**

A detailed preoperative evaluation is paramount in achieving a harmonious outcome. Multiple sessions of counselling are generally necessary to understand and address the concerns as well as to formulate a surgical plan. Unlike chest or genital surgeries, FFS lacks a set guideline according to the standards of care of WPATH.

It is ideal that the individual is on hormonal therapy for at least a year before the surgery, though it is not mandatory. Many individuals like to undergo surgery upfront or refuse hormone therapy altogether. Also, these procedures do not require any referral letters from mental health professionals, unlike the genital and breast surgeries.

There are many advantages of preoperative hormone therapy:

1. Feminization of the hairline.  
2. Increase in prominence of the cheeks.  
3. Decrease in prominence of the jaw.

The preoperative workup includes a noncontrast 128-slice CT scan of the facial bones and a 3D image is reconstructed with computer software (**Fig. 3**). We also create a SLA model (using ABS plastic, acrylonitrile butadiene

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**Fig. 1** Key skeletal differences in male and female skulls.

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styrene) with the help of 3D printing technology to design prefabricated templates for preoperative planning as well as for bone contouring. Standard preoperative photos are taken. It is important to understand that there is no one size fits all and the procedures are customized to each individual

(► Figs. 4A and 5A)

### Considerations in Staging of Procedures

FFS is usually done in multiple stages, depending upon many determinants including anesthesia time, combination with genital surgeries, and cost and affordability factors. Combining frontopectomy with rhinoplasty has the added benefit of addressing the nasofrontal angle through the coronal incision. Similarly, procedures requiring intraoral incisions like cheek augmentation with silicone implants and jaw contouring are combined so that the patient need not be on diet restriction in the postoperative period twice. Some authors prefer the top-to-bottom approach, while others prefer the bottom-to-top approach as the upper part of the face is not edematous if the lower part is done first. We have no preference of one technique over the other. We generally prefer tracheal shave and voice surgery to be done in the last sitting to minimize further trauma during intubation to the

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**Table 1** The various procedures involved in facial feminization

<table>
<thead>
<tr>
<th>Procedural Type</th>
<th>Procedures in facial feminization</th>
</tr>
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<tbody>
<tr>
<td><strong>First-line procedures</strong></td>
<td>Forehead contouring with orbital widening, Hair line modification, Eyebrow lift, Cheek augmentation (implant and fat grafting), Rhinoplasty, Jaw and chin contouring</td>
</tr>
<tr>
<td><strong>Ancillary procedures</strong></td>
<td>Lip lift, Lip reduction, Dimple creation, Tracheal shave</td>
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![Fig. 2](image) Soft tissue differences in male and female face.
vocal cord repair. However, a surgical plan is charted out taking patients’ wishes into consideration.

**Forehead and Orbital Contouring**

The forehead and orbital contouring have the maximum impact on judging the feminity of faces. Ousterhout has classified the forehead into four types based on the suprorbital bossing and the frontal sinus of which type III accounts for 82% of the cases. It requires osteotomy and setback of the anterior table of the frontal sinus.

We prefer a coronal approach to the forehead, extending from one pinna to the other. The incision is a zigzag line to attain an inconspicuous scar. The pericranial flap is raised and the forehead is exposed. The frontal sinus is marked using one of the following methods:

1. By mapping the sinus using CT scan measurements
2. Using a light source to transilluminate the sinus.
3. Fabricating a template using the CT image.

The anterior table of the sinus is osteotomized using cutting burrs and reciprocating saws, separating the mucosa from the inner surface of the bone. Margins of the cut should not fall inside the sinus but must skirt the borders so that the anterior table does not sink in when placed back. Make a trough around the sinus with an HP 7 burr and then use a 701 or 702 burr to make slanted punch holes. It may not be possible to make punch holes over the glabella, rather run the burr and thin out the margin. The punch holes are connected with same burr and a 6 or 8 mm chisel is used to tap the margins gently and elevate the outer table. A reciprocation saw can also be used. Burr down the bone using a large TC burr as much as the thickness permits and reduce the septae.

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**Fig. 3** Preoperative photograph with corresponding three-dimensional reconstructed image and stereolithographic model. Note the asymmetry of the mandible in all the images.

**Fig. 4** Steps of Thyroid chondroplasty. (A) Skeletonising the thyroid cartilage. (B) Drilling and contouring the acute angulation of the thyroid cartilage. (C) Post chondroplasty.

**Fig. 5** Thyroid chondroplasty—before and after.
from both inner part of outer table and the sinus proper. Burr down the margins of the frontal bone and anterior aspect of the glabella to reduce the nasofrontal depth. The outer table is fixed back to the skull with stainless steel wires or low-profile plates (► Fig. 8).

The supraorbital nerve foramen might need to be osteotomized to free the nerve to widen the orbit. The superolateral aspect of the orbits are widened till the zygomaticofrontal suture to give a softer look to the periorbital region. It also has the added advantage of slightly lifting the lateral eyebrow that is a desirable feminine trait.

**Hairline Feminization**

Feminization of the hairline can be achieved either with a simultaneous hair transplant during a coronal approach frontoplasty, a deferred hair transplant, or by means of a hairline lowering incision in the forehead. Simultaneous hair transplant during frontoplasty has the disadvantage of low graft take (60% graft survival rate as compared with 90% otherwise). We follow a deferred hair transplant over hairline lowering surgery as per the principles elucidated by Capitán et al who uses hair transplant as the primary modality to lower and reshape hairlines due to the following reasons:

1. Many patients who undergo FFS might not have undergone orchidectomy or are not on hormone therapy, which has the increased chance of receding hairline, exposing the forehead scar
2. Presence of thick sebaceous skin in patients in authors’ geographic location leading to prominent hypertrophic scarring on the forehead.
3. Hair transplant gives the benefit to the patient of choosing the desired shape of hairline, rather than a straighter hairline in hairline lowering surgeries.

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**Fig. 6** Preoperative analysis: 1. Prominent supraorbital ridge, 2. Periorbital hollowing, 3. Prominent broad nose with bulbous tip 4. Lack of cheek prominence, 5. Retruded chin with lack of jaw definition.

**Fig. 7** 1. Prominent supraorbital ridge, 2. Prominent nose with hump and acute nasolabial angle, 3. Prominent angle of jaw with bulky masseter, 4. Square jaw with broad chin, 5. Wide midface due to prominent zygoma.
We follow the follicular unit extraction (FUE) method of hair transplant. The hairline is made more natural by incorporating natural breaks like widow’s peak and cowlicks with lateral mounds\(^\text{13}\) (Fig. 9).

**Cheek Augmentation**

The zygoma, though smaller in the female, is wider and has more projection, resulting in a heart shaped cheek–chin complex compared with a flatter appearance in the male. Cheek augmentation aims at creating a more feminine appearance by increasing the width of the zygomatic complex.\(^\text{14}\) This is achieved by many methods—fat grafting, cheek implants, or osteotomies. Our preferred method is augmentation using silicone cheek implants, followed by fat grafting (Fig. 10). Implants are placed through the intraoral route and fixed with screws to minimize migration. Augmentation with implants has associated complication profile including migration, bone resorption, and implant exposure, which might necessitate implant removal. Fat grafting on the other hand is safer, albeit with the inherent possibility of need for multiple sessions depending upon the fat resorption in each individual.

In indicated cases, we perform osteotomy to reposition the entire zygomatic complex assisted by endoscopy through combined intraoral and hair bearing scalp incisions.

A dimpleplasty can also be done in the same sitting as cheek augmentation that significantly feminizes the appearance (Fig. 11).

**Eyebrow Lift**

The ideal eyebrow shape and aesthetics vary between ethnicities and gender (Fig. 2). In males, the brows are thicker and positioned at the level of the orbital rim. They are flatter with minimal arching and less prominent lateral tapering. The female eyebrows are positioned above the rim and it arches laterally to its peak, tapering laterally. Westmore\(^\text{15}\) described the ideal eyebrow position in females (Fig. 12), which has been modified by various authors.

1. The medial brow begins on the vertical line through the lateral ala and the inner canthus (A–B).
2. The brow ends laterally (C) at a line joining the most lateral point of the ala and the lateral canthus.
3. The medial and lateral ends of the brow lie approximately at the same horizontal level.
4. The peak of the brow lies (E) directly above the lateral limbus (D).

However, Whitaker et al describe the ideal peak of eyebrow to be situated at the junction of middle and lateral thirds of the eye, which is more lateral than Westmore’s model.

We follow the modification of the technique described by Alain Fogli. The approach is through a hair bearing scalp incision when done in isolation or via a coronal approach when done along with a frontoplasty. The results are long lasting, reliable, and safe (Fig. 13).

**The Nose**

Rhinoplasty plays an important role in facial feminization of the midface. It is a highly customized surgery that should take into consideration each person’s anatomy and the interplay with the rest of the face. Usually, it is done together with a frontoplasty that gives the added advantage of access to the frontonasal angle through the coronal approach.

Also, rectus fascia and costal cartilage harvest can be done without an additional scar through the previous incision for breast implant placement.

**Anatomy**

The male nose is longer, wider, and has bigger nostrils. The nasolabial angle is more acute (90–95 degrees) as compared with a more upturned angle in females (100–105 degrees).
The alar base is wider, and the tip is more projected than in female noses (►Fig. 2).

There is usually a prominent hump with wide dorsal aesthetic lines as compared with a narrow concave dorsum in females.

Feminization of the nose is in essence, a reduction rhinoplasty, with the aim of giving a softer, gentle concave slope to the dorsum, while narrowing the rest of the nose. The dorsal nasal projection lies around 1 to 2 mm posterior to a line joining the nasion and the nasal tip.  

There is inherent risk of collapse to the internal and external nasal valves, which should be avoided using spreader grafts.

The nasal tip is up rotated, and the tip is made sharper and more defined. The radix is lowered caudally from the level of upper eyelid crease in males to mid-pupil level in females.

The frontonasal angle is burred down during the frontoplasty to give a more obtuse angle approximately 145 degrees as compared with around 130 degrees in males. Wedge resection of the ala is done to narrow the alar base (►Fig. 14). Any other pre-existing functional abnormalities should be evaluated during the rhinoplasty.

**Lips**

Lips vary in size and shape between different ethnicities. The female upper lip is slightly shorter in vertical height (nasal base to cupids bow) than male lip (16mm in females and 17mm in males) in the south Indian population.  

The upper incisor show in repose is higher in females (3mm) than males (1mm).

A lip lift not only reduces the vertical height but it also increases the upper lip vermilion show leading to a more feminine appearance and also increases the incisor show. We follow the bullhorn method of lip lift where around 3 to 5 mm of skin is incised. Overexcision by 1 to −1.5 mm is necessary to account for the stretching of the skin postoperatively (►Fig. 15). Simultaneous lip augmentation can also be performed using fat grafting or hyaluronic acid fillers.

In patients with thick lips, we perform a bikini lip reduction to give more feminine shapely lips. The excision is performed from the junction of dry and wet lip (►Fig. 16). In conjunction with the rest of the facial feminization, even mild improvements in lip femininey can have a substantial role.

**Mandible and Chin**

The male jaw is broader and thicker than females. The angle is less obtuse with prominent oblique ridge. The masseter muscle is also bulkier in the males, which also contributes to
the increased width of the lower face. Contouring the jaw and chin aims at reducing the width of the lower face as well as getting a more feminine V-shaped jaw. This is accomplished by a mixture of many procedures including angle ostectomy with or without masseter reduction, contouring the lower border of the mandible and genioplasty which is together known as V-line surgery.

Through an intraoral approach, the entire mandible is exposed from one angle to the other, taking care to safeguard the mental nerve. Nasal intubation with hypotensive anesthesia is preferred. We prefabricate cutting templates using SLA models to make the cuts more precise and symmetric (Fig. 17). The oblique ridge if prominent can be burr down to decrease the width. A right-angle sagittal saw blade or intraoral vertical ramus osteotomy (IVRO) blade on an oscillating saw can greatly facilitate the angle osteotomies. In patients planned for masseter reduction, the periosteal layer medial to the muscle is incised and the muscle is debulked as necessary.

Chin

The bone cut is marked 5mm below canine root and a middle segment marked. Cut is begun as far back as possible beneath the mental nerve and brought forward and stopped at the site of the middle segment, which is removed. The two lateral segments are then brought together in the midline and plate fixation done, which gives a sharper chin (Figs. 18 and 19). Genioplasty has the added advantage of addressing a retruded or prominent chin. During closure, care should be taken to reattach the mentalis muscles to prevent drooping of chin, otherwise known as witch’s chin deformity, which is difficult to rectify.

Thyroid Cartilage

In patients desirous of decreasing the laryngeal prominence, a thyroid chondroplasty is performed. The incision is made in the submental skin or in a skin crease in the lower border of thyroid cartilage if the surgery is combined with type 4 thyroplasty. The subplatysmal flaps are raised and strap muscles separated in the midline. The anterior part of thyroid cartilage is exposed and the prominence at the upper half of the cartilage is thinned out with a no:11 blade or a drill if this part is ossified (Fig. 20). This gives a more feminine appearance to the neck (Fig. 21). Care should be taken to avoid damage to the anterior commissure by marking the level of vocal fold in the midline. Usually, the thyroid
chondroplasty is performed together with voice feminization surgery.  

Fig. 22–24 shows the results of patients who underwent many of the above mentioned procedures customised on their anatomy as well as individual preferences.

**Conclusion**

Facial feminization is an ideal example of marriage between art and surgery. It comprises many procedures that when performed judiciously give a dramatic result (Fig. 4, 5, 22, 23, 24). Studies have shown the positive impact of these surgeries on the quality of life of the transgender individual.

A thorough understanding of the male and female facial aesthetics and knowledge of anatomy is necessary for a proper execution of these procedures. Use of technological advancements like 3D CT imaging and SLA can aid in planning the bone contouring and reduce complications.

The importance of multiple sessions of counselling to understand the patients’ needs and setting realistic goals cannot be overemphasized. Proper evaluation and planning can lead to a dramatic outcome and a high patient and surgeon satisfaction.
Fig. 22 Postoperative photos of same patient in Fig. 04. Patient underwent Type III frontoplasty, rhinoplasty, fat grafting of cheeks, and periorbital region, jaw contouring with masseter debulking.

Fig. 23 Postoperative photos of same patient in Fig. 05. She underwent type III frontoplasty, rhinoplasty, zygoma contouring, and jaw contouring with masseter debulking.

Fig. 24 Patient underwent Type III frontoplasty, jaw contouring, chin implant, and masseter reduction.
Conflict of Interest
None declared.

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