

Facial Feminization Surgery: A Review of 220 Consecutive Patients

Parag Shashank Telang¹

¹Designer Bodyz, Centre for Advanced Cosmetic Surgery, Mumbai, India

Address for correspondence Parag Shashank Telang, M.Ch (Plastic and Reconstructive Surgery), M.R.C.S. (U.K), M.S (General Surgery), Director and Chief Plastic Surgeon, Designer Bodyz, Centre for Advanced Cosmetic Surgery, A-104, Joy Valencia CHS, Behind Majas Bus Depot, JVLR, Jogeshwari East, Mumbai 400060, Maharashtra, India (e-mail: drparagtelang@gmail.com).

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Abstract

Background Facial feminization surgery (FFS) is a combination of facial bony and soft tissue surgeries designed to modify and convert a masculine face to feminine. One's face plays a very central role in gender incongruence and FFS helps patients overcome this. There are prominent differences between the male and the female facial anatomy (bony and soft tissue) which can be surgically altered to change the visual perception of the face.

Methods The author presents the method used at his center for treating 220 patients of gender incongruence requesting FFS from June 2016 to June 2019. The alterations to known methods of forehead contouring, hairline lowering, and jaw shave adopted by his team are discussed. He also presents the logic of performing the entire FFS in two stages at an interval of 7 to 10 days.

Results A total of 220 cases of FFS are presented, along with surgical details of techniques used, the sequence and staging of procedures performed, and the results obtained. A two-staged approach to FFS is proposed to maximize the recovery and minimize complications and promote faster healing. Different methods of forehead contouring are also explained in detail.

Conclusions FFS is a very rewarding surgery for the plastic surgeon and has high patient satisfaction rate. With proper training in craniomaxillofacial and soft tissue surgery, it is possible for the plastic surgeon to be the main team leader for this procedure. A two-stage approach is highly recommended.

Keywords

- ▶ Type 3 forehead contouring
- ▶ orbital shave
- ▶ V-line jaw shave

Introduction

The face plays an important role in the gender incongruence seen in transsexual individuals. Gender incongruence is currently diagnosed as per the World Professional Association for Transgender Health standard of care 7.¹ It occurs in one in 30,000 male-assigned births and one in 100,000 female-assigned births.² There are prominent differences between the male and the female facial anatomy (bony and soft tissue) which can be surgically altered to change the visual perception of the face.

Facial feminization surgery (FFS) comprises a series of bony and soft tissue surgeries designed to modify masculine features and create a feminine appearance, which helps transgender patients overcome their gender incongruence. Significant differences exist between male and female facial skeletons, which are influenced strongly by hormonal and genetic factors.³⁻⁶ Secondary facial features such as the type or pattern of the hairline, facial hair, and facial fat distribution also play an important role in gender identification.⁷⁻⁹ The surgical principles of FFS can be applied to male-to-female transsexual patients and also to





Fig. 1 A typical trans male with masculine attributes: note the forehead, supraorbital rims, and jaw width.

cis-females who just want to feminize certain aspects of their face.

In the frontal view, the male face appears square and muscular with strong supraorbital ridges and jawline (►Fig. 1), while the female face appears more oval with a smooth forehead and small, pointed chin. In the lateral view, men exhibit frontal bossing, while females have sloped foreheads. Hence the FFS surgeries comprise frontal bossing correction, rhinoplasty, jaw and chin contouring, and Adam's apple shave.

FFS can be a very satisfying surgery for the patient. The aim of this article is to create awareness about this surgery and standardize the steps. In this article, the technique used by the author for facial feminization is described. The face has been divided into three halves and the approach for each one-third of the face—upper, middle, and lower thirds—is described.

Materials and Methods

The author presents the method used for FFS at his center for treating 220 consecutive male-to-female transgender patients of diagnosed gender incongruence from June 2016 to June 2019. All medically fit trans-females between age 21 and 74 years were included in this study. There were two exclusions who were not found to be mentally fit. Preoperative work-up of all patients included routine hematology, chest

X-ray and three-dimensional (3D) computed tomography (CT) scans of the skull and midface along with sagittal cuts to check the thickness of the frontal sinus (►Fig. 2a, b). Most of the patients in the series opted for the entire gamut of surgeries for the upper, middle, and lower third of the face (►Table 1).

The Technique

For the sake of explanation, I have broken down the surgeries into upper, middle, and lower third surgeries.

Upper One-third Surgeries: Forehead Contouring, Orbital Shave and Hairline Advancement

There are two skin approaches to forehead contouring: a coronal approach and a hairline approach.¹⁰⁻¹² In majority of patients in our study (85%), I had to use a hairline approach to address the receding hairline or M-pattern hairline.

In a hairline approach, the distance from the glabella to central part of forehead is measured and marked at around 5.5 cm (►Fig. 3a). The remaining incision is marked as a circular design and curved on either side inside the temporal hairline (►Fig. 3a). Another incision is marked cranial to the previous one at the junction of good density of scalp hair after assessing scalp laxity clinically.

In a coronal approach, a standard coronal incision is taken from the upper end of ear pinna to the opposite pinna.

In either case, the incision is first infiltrated with a solution of 2% xylocaine with 1:200,000 epinephrine along with 0.9% normal saline in a 1:1 ratio. The bevel of the knife is beveled at 45° angle to preserve the hair roots and allow the scar to be covered by new hair later on. The dissection proceeds in a subgaleal plane till 2 cm cranial to the supraorbital ridge. This gives a bloodless plane and preserves pericranial tissue for use if required to cover the forehead reconstruction. The periosteum is then incised and remaining dissection is then done subperiosteally. Both the supraorbital rims up to each lateral canthal area are exposed (►Fig. 4a). The supraorbital nerves are carefully dissected out of their foramina and preserved.

The extent of the frontal sinus can be seen intraop by using transillumination using a light source. The margins of the frontal sinus and the extent of orbital shave planned are marked on the bone using a pencil. The anterior table of the frontal sinus is osteotomized by a combination of a sagittal saw and a fissure burr. The anterior table is removed as a single piece preserving the mucosa of the frontal sinus (►Fig. 4d). The nasofrontal angle is then reduced by a contouring burr to change the inclination of the forehead. The outer table is first thinned and contoured on a working table. It is then reattached with the help of titanium screws,^{10,11} or using a titanium mesh (►Fig. 4e, f). In some cases of extreme hypertrophy of frontal sinus, the author has partly removed the anterior wall of the sinus, removed the mucosa of the sinus, and then used a titanium mesh alone fixed with 1.3-mm self-drilling titanium screws to set back the forehead maximally (►Fig. 5a-e). This is covered with a turn-down pericranial flap to provide an additional vascularized layer over the titanium mesh. This cranialization of frontal sinus has been previously described by neurosurgeons.¹³

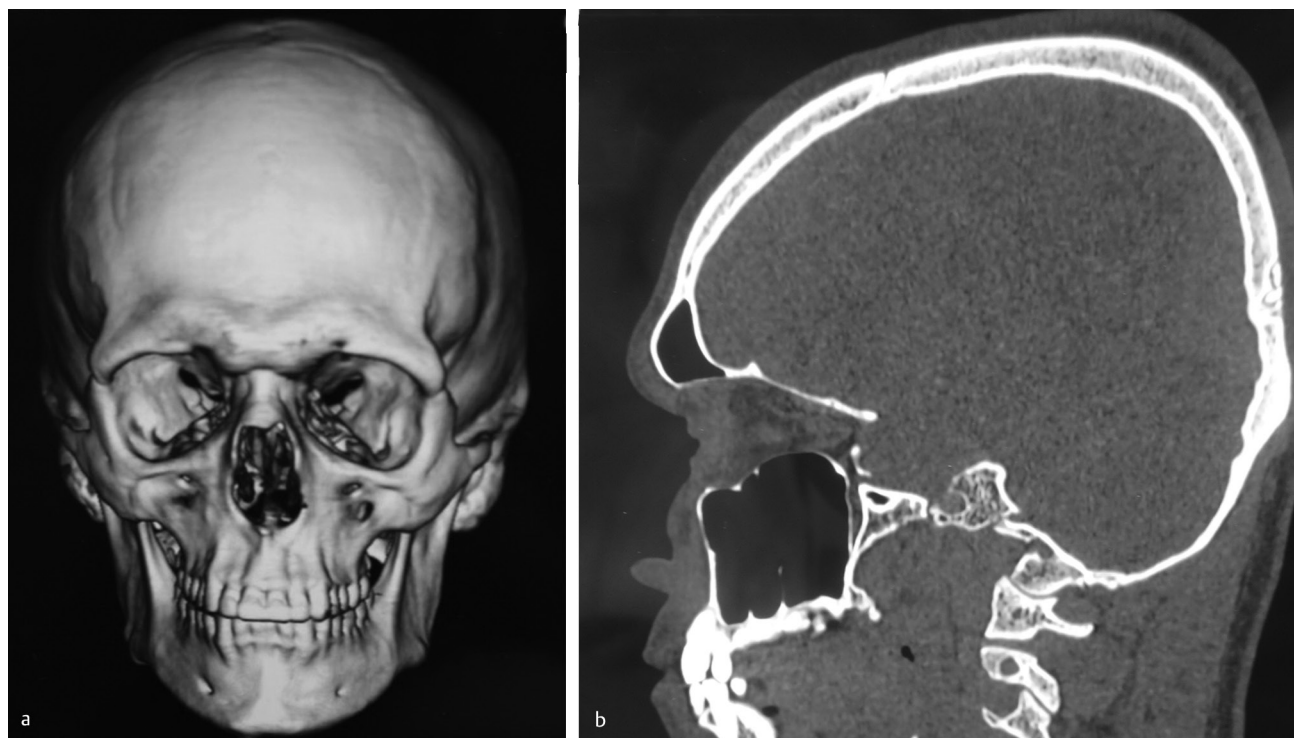


Fig. 2 (a) Preoperative 3D CT scan showing supraorbital bossing. (b) Sagittal section showing inner and outer tables of frontal sinus. This helps in planning the cuts safely. CT, computed tomography.

Table 1 Numbers of individual procedures done in all FFS surgeries

Procedure	Total number (n = 220)
Hairline incision with advancement	187
Coronal incision	33
Type 3 forehead contouring	150
Type 1 forehead contouring	70
Orbital shaving	160
Open rhinoplasty	155
Upper eyelid blepharoplasty	70
Lower eyelid blepharoplasty	125
Cheek augmentation with implants	40
Cheek augmentation with fat	120
Upper lip lift	85
V-line Jaw shave	145
Sliding genioplasty	35
Neck lift	110
Tracheal/Adam's apple shave	55

The edges of the frontal bone are smoothed using a contouring burr. Then attention is given to orbital shaving. The previously marked portion of the orbital bone (► Fig. 4b) is osteotomized and smoothed. The inner aspect of the lateral part of supraorbital rims is especially contoured to expand orbital size, which makes the eyes look bigger and more feminine.

The posterior hair-bearing scalp is then mobilized in a subgaleal plane. The nonhair bearing strip of the scalp skin between the two markings is removed after scalp advancement (► Fig. 3b, c). I do not use any devices such as Endotine to fix the advanced scalp. I always use the trichophytic method of closure. A wash is given with a dilute solution of betadine. I close the scalp incision in two layers using 3-0 vicryl followed by 3-0 monocryl, taking care not to close under undue tension to minimize scar stretching and hypertrophy. We do not use any drains in forehead contouring. A padded dressing of soft cotton and compression using crepe bandage is applied.

Middle One-third Surgeries: Rhinoplasty, Blepharoplasty, and Cheek Augmentation

Rhinoplasty

Nose occupies a central location on the face. Therefore, a feminizing rhinoplasty plays an important role in FFS. I use only the open rhinoplasty approach in all our patients. The nose width is reduced by low-to-low osteotomies, dorsum made slightly concave, tip upturned, and nostril base width is reduced by alar wedge excision.

Eyelids

Blepharoplasty of upper and lower eyelids is performed if required, more as an aesthetic procedure for facial rejuvenation. Upper eyelid blepharoplasty may not be needed after the eyebrow elevation has been done as it pulls up lax upper eyelid skin cranially.



Fig. 3 (a–c) Design of a hairline advancement incision. The central point is marked at 5.5 cm from the glabella.

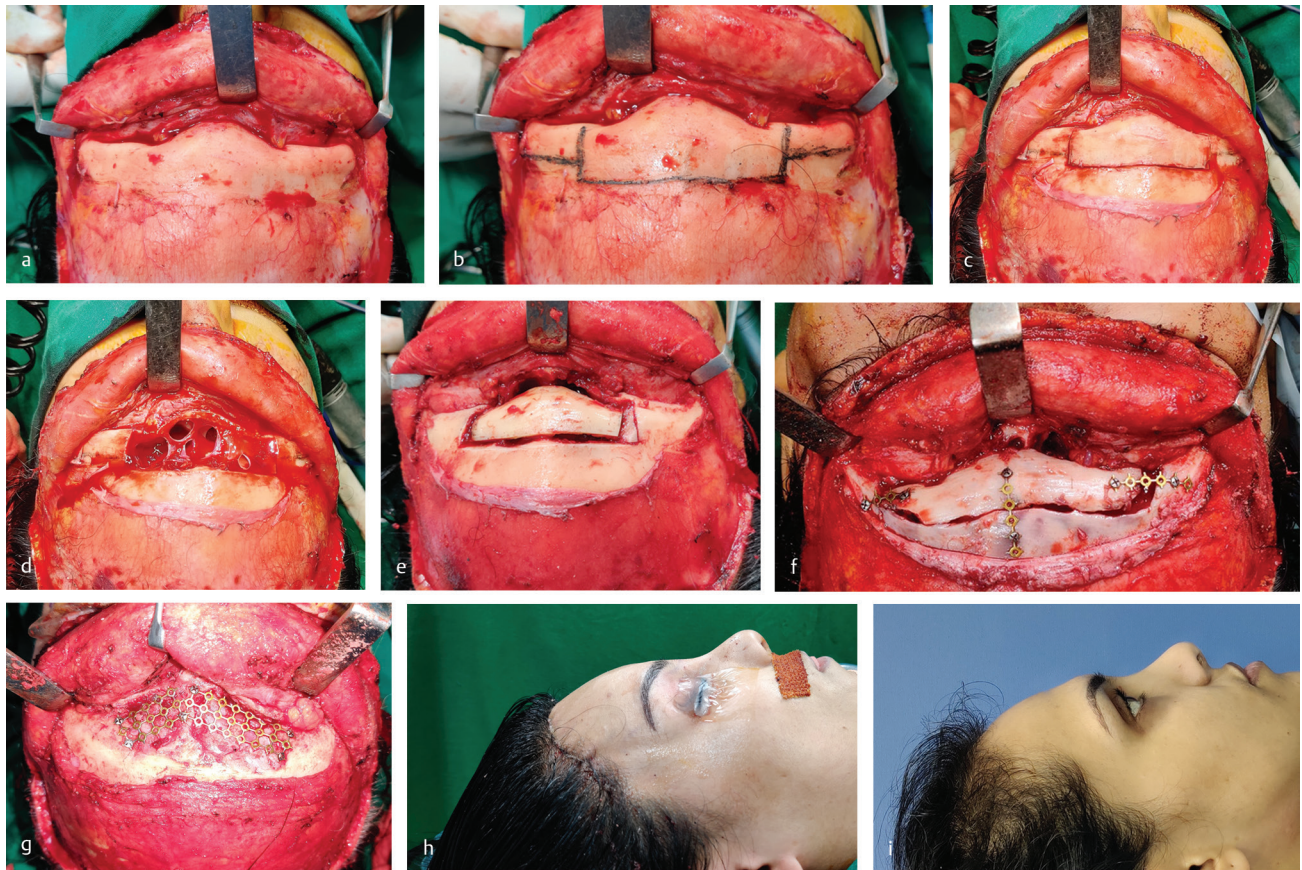


Fig. 4 (a) Extent of exposure done for forehead and orbital contouring. (b) The margins of the frontal sinus have been marked with a pencil along with areas of orbital shave. (c) Cuts marked using a fissure burr. (d) Outer table of frontal sinus removed showing mucosa of frontal sinus cavity. (e) Outer table being put back in place after contouring and reduction of nasion. (f) Fixation using 1.3-mm titanium plates and 3-mm self-drilling titanium screws. (g) Use of 1.4-mm titanium mesh instead of titanium plate. (h) Forehead profile seen intraoperative. (i) Preoperative forehead profile for comparison.

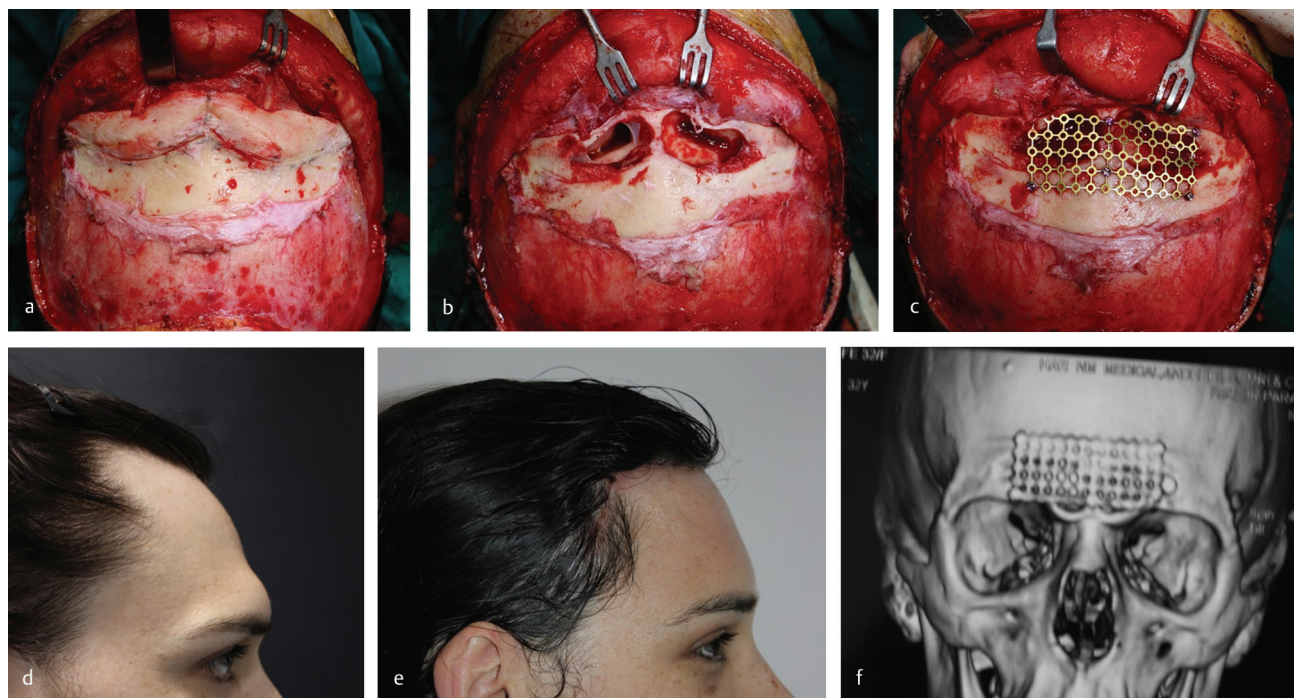


Fig. 5 (a) Severe hypertrophy of frontal sinus; osteotomy cuts marked for frontal sinus and orbital rim shave. (b) Outer table removed and nasion area bone remodeling done. (c) Titanium mesh fixed over the defect after sinus exteriorization. (d) Clinical profile before. (e) Clinical profile after. (f) Postoperative CT scan. CT, computed tomography.

Cheek Augmentation

Cheeks exhibit certain differences in both genders.¹⁴ I perform feminization of the cheeks using either silicone implants through an intraoral approach or purified fat injection. Contours of the zygoma are marked preoperatively and enhancement is mainly on the upper and lateral aspects of the cheekbone area. I harvest fat using a multihole 2-mm cannula from the inner aspect of the thigh, centrifuge it at 3,000 rpm for 2 minutes, and decant the supernatant fluid. For injection, I make a puncture in the skin using a 18G needle and inject fat via the withdrawal technique through a 1-mm blunt tip cannula. If silicone cheek implants are used, I always fix them to the malar bone using 2 mm × 10 mm titanium screws. I am more in favor of fat injection for cheeks these days due to higher problems of asymmetry, displacement, and infection with cheek implants.

Lower One-third Surgeries: Jaw Shave, Gonial Angle Shave, Chin Reduction, Neck Lift, and Adam's Apple Shave:

V-line Jaw Shave and Gonial Angle Reduction

I always perform a V-line jaw shave via an intraoral approach. The incision is in the lower gingivobuccal sulcus from angle to angle and can be extended vertically along the ramus on each side. The mandible is exposed with care to preserve both the mental nerves. The area to be contoured is marked with a pencil. Use of fiberoptic illumination and an oscillating saw greatly helps in this surgery. Once the gonial angles and mandible inferior border have been shaved, I proceed to reduce the chin in both vertical and horizontal planes (►Fig. 6a-f).

Occasionally I perform a sliding genioplasty in patients with retrogenia or micrognathia. If the chin is very small, I use a silicone chin implant fixed with titanium screws to give more projection to the chin. The incision is closed in layers using 3-0 vicryl continuous suture to obtain a watertight seal.

Neck Lift

In older individuals with pre-existing neck laxity, a jaw shave results in significant laxity of neck muscles and skin. This is because all suprahyoid muscles are attached to the lower border of the mandible. In these patients, I perform a neck lift through a postauricular incision extending onto the hairline to remove this excess skin. Most of the earlier publications^{10,15-18} did not address this important issue, leaving it to be addressed later on. Doing a neck lift at same the time obviates the need for an additional surgery at a later date.

Lip Lift and Lip Augmentation

A lip lift is performed through a bull-horn incision concealed in the groove under the nostrils. The skin removal is maximum in the central part (5-7 mm) and tapers at either end. This procedure has a strong and permanent feminizing effect on the upper lip in trans-females (►Fig. 7a, b). At the same time, lip augmentation can be performed using either hyaluronic acid fillers or purified fat injection.

Adam's Apple Shave

The prominence of the male larynx or Adam's apple makes many patients request for a feminizing chondroplasty.^{19,20} In my approach, I now take a submental incision and then

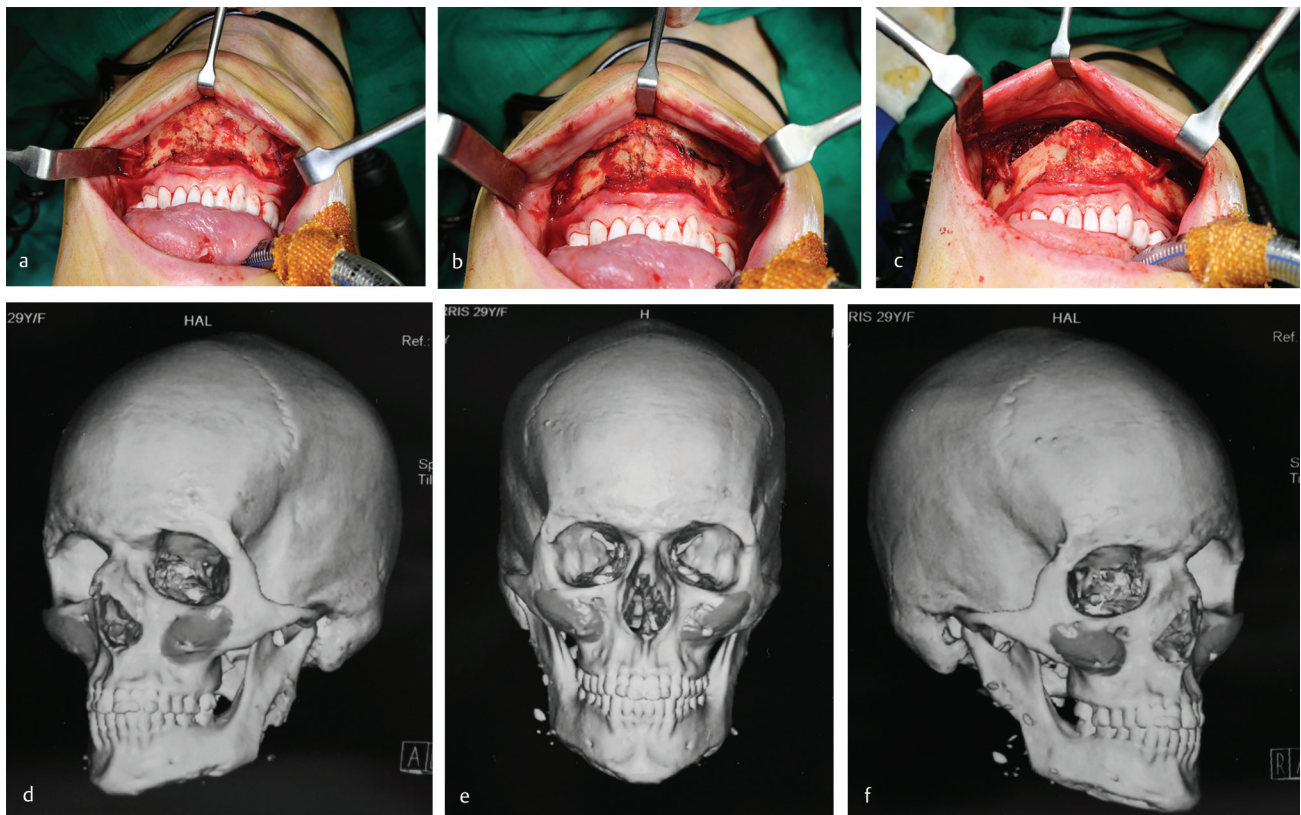


Fig. 6 V-line jaw shave. (a) Mandible body exposed. (b) Pencil marking of osteotomy. (c) After mandibular contouring showing preserved mental nerves on either side. (d-f) Postoperative CT scans showing reduction in front and side views. CT, computed tomography.

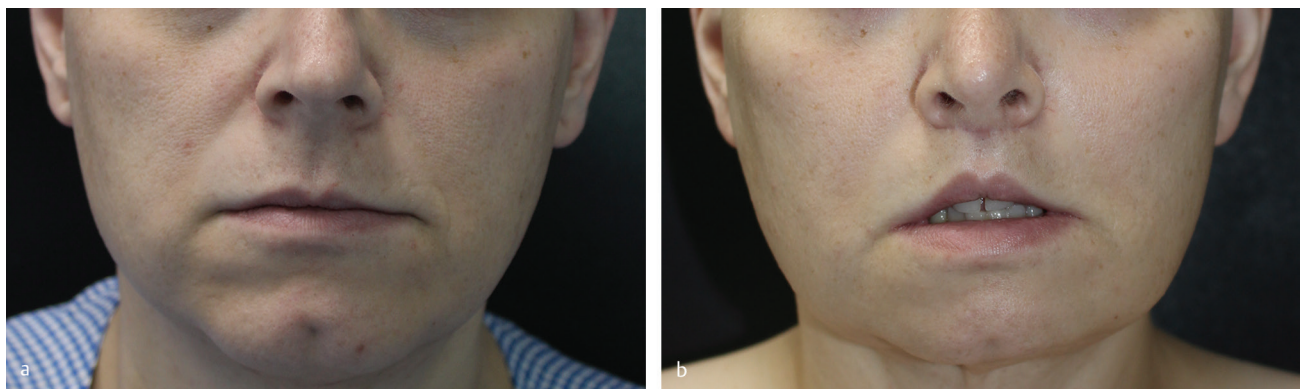


Fig. 7 Upper lip lift (a) before and (b) after.

tunnel down to the thyroid cartilages. I find that the submental scar is better concealed than a skin crease scar directly over the thyroid cartilage. The most prominent portion of the thyroid cartilage is shaved obliquely on either side from the thyroid notch using a 21 No. scalpel or a bone nibbler in older patients with calcified cartilages (►Fig. 8a, b).

All patients are provided with an appropriate-size chin strap to wear 24/7 for 6 weeks post surgery.

Results

All 220 patients in this series had an uneventful recovery (►Fig. 9a-f). The average follow-up was 40 months postop. The most common postoperative problem reported in all

patients of jaw surgery was numbness over the lower lip (mental nerve territory) with drooling of saliva. This settled spontaneously in 4 to 6 weeks post surgery. Most of the patients of forehead reconstruction also reported numbness in the supraorbital nerve territory, which recovered spontaneously in 2 to 3 weeks. Two patients had a minor gape of the hairline incision requiring resuturing under local anesthesia. There were two palpable contour irregularities in the forehead which were not seen on inspection but could be palpated. This was before the author started using a pericranial flap to cover the forehead reconstruct. There were two cases of minor gape of intraoral suture line which healed with conservative treatment. One patient had a hematoma in the postauricular area after neck lift which needed aspiration



Fig. 8 Adam's apple shave (a) before and (b) after. (c) 1 year postop. Note the submental location of the incision for better concealment.



Fig. 9 (a–c) Preoperative views before FFS. (d–f) 10th day postoperative views after FFS. FFS, facial feminization surgery.

after it liquefied. There was one case of asymmetry after malar silicone implants, which were removed at patient's request and fat injection was done instead. There were no complications related to type 3 forehead contouring such as cerebrospinal fluid leak as reported by Capitán et al,¹⁰ infection, or hematoma. The hairline, submental, and retroauricular

scars healed well over 3 to 6 months and did not bother the patients later on due to proper preop counseling. Forehead contouring, hairline advancement, and jaw contouring were the most commonly performed procedures in our study (–Table 1). The age range was from 21 to 74 years (average age 38 years). Most of the surgeries were performed

in two stages as per the author's technique. All operated patients reported satisfaction with the overall outcome. They reported significant improvement in their feeling of gender incongruence or being mis-gendered by others in the society and many came forward for other body procedures later on.

Discussion

We encounter an increasing number of cases of gender incongruence these days due to improved social acceptance. FFS contributes greatly toward the integration of a trans-female in the society as a female.²¹ It was pioneered by Ousterhout in 1987.³ Subsequently, many publications by Spiegel,⁶ Capitán et al,^{10,22} and others have described their methods of performing FFS.

The pioneering work on forehead contouring was done by Dr. Douglas Ousterhout.³ He has described four types of foreheads and four different approaches.^{3,23}

Type 1: 5% of foreheads have absent or minimal frontal sinus so these can be treated just by burring and reducing the outer table.

Type 2: some foreheads (around 7.5%) have protruding frontal sinus walls but normal frontonasal angles and can be treated by augmenting the area above the supraorbital projection using bone cement.

Type 3: majority of foreheads (86.5%) have overprojected anterior walls of the frontal sinus due to pneumatization. They need osteotomy of the anterior wall, reduction of the frontonasal junction, and reattachment of the anterior table using titanium screws.

Type 4: 1% of foreheads are small and underprojected. These can be contoured using bone cement for augmentation of the entire forehead.

It is not only the forehead which shows a gender-specific structure. Male noses are broader, with stronger nasal bones, flatter nose dorsum, and wider alar size. Female noses tend to be smaller overall, with slight concavity of the dorsum and smaller alar width. The nasolabial and nasofrontal angles are more obtuse in the female.¹⁴

Feminine cheeks are higher with more lateral projection and taper toward the chin giving a triangular or oval look to the face. Male cheeks are flatter and broader with a squarish relation with the jaw angles.

Differences in male and female jaws and chin have been reported in detail.¹⁴ The male jaw is stronger and broader with heavy gonial angles and bulkier masseter muscle mass.

The female face also has a shorter distance from the base of nose to the upper lip with a slight upward slant in the middle. The central incisor show is also more in females than in males.

The male larynx enlarges in size during puberty under hormonal influence.^{19,20} The size of the thyroid cartilage enlarges and its anterior borders can be easily seen in males.

Each of these facial features can be modified during a FFS by making an individualized plan for the patients.

In our series, unlike in the series reported by Capitán et al,¹⁰ the majority of patients were treated using the hairline approach (85%).

I have found that the hairline approach gives a very nice lifting effect to the eyebrows. The hairline advancement obtained also exerts a great feminizing effect on the face.^{11,24} The scar of the hairline incision can be concealed later on by either hair transplant or microblading if the scar visibility is an issue after 3 to 6 months. I do not recommend simultaneous hair transplant in the scar unlike Capitán et al²² as the growth of transplanted follicles is not optimal. Hence now I advise a hair transplant 3 to 6 months after forehead contouring. This helps in designing the hairline in a better manner.¹²

The differences in authors' approach include: hairline versus coronal incision, single stage versus two stages, and addition of soft tissue work (neck lift) to the bony work (→ Fig. 10a–m). Removal of a portion of the outer table of frontal sinus and covering it with a titanium mesh and precranial flap have not been published in previous articles on FFS.

Most of the current publications^{10,17,25,26} have reported complete FFS as a single surgery. This involves 8 to 9 hours of surgery under general anesthesia. Since 2016, I have started performing FFS in two stages separated by 1-week interval. I perform upper face procedures such as forehead contouring, orbital shave, hairline advancement, rhinoplasty, blepharoplasty, and cheek augmentation first. Then after a week, I do lower face procedures: V-line jaw shave, chin reduction, Adam's apple shave, lip lift, and neck lift together. There are many advantages in this two-stage approach: (1) each stage is around 4 hours long, (2) in 1-week interval most of the upper face swelling subsides, the nose splint is removed, and the patient has to wear only a chin strap after the second surgery. This helps in easier postoperative recovery with less discomfort. Most of our patients have been from out of city or from other countries and hence they do not have relatives to help in postoperative nursing care and find it easier when we separate the procedures in two parts. (3) From anesthesia point of view, if rhinoplasty and jaw shave are done together then extubation becomes difficult as the nose is packed and also the jaw is tightly bandaged. Hence it is easier for the anesthesiologist and the patient if these procedures are done separately. (4) I try to avoid doing intraoral procedures in the first stage to prevent contamination. This may explain our negligible surgical site infection rate (0%). I perform upper face and lower face procedures together only when a patient needs only a few of them instead of the complete FFS.

Amongst all procedures, forehead contouring and jaw reshaping remain the most commonly requested procedures in our series. I believe that a type 3 forehead contouring with modification of nasofrontal angle is the single most important procedure to feminize a face. I recommend a top-to-down approach in FFS procedures as the swelling reduces in a top-to-down manner due to gravity. This is contrary to the article by Raffaini et al,²⁵ who recommend a down-to-up approach.



Fig. 10 (a–f) Preoperative views before FFS. (g–m) Postoperative views 1 year after FFS. FFS, facial feminization surgery.

Conclusion

As someone trained in aesthetic surgery and craniomaxillofacial surgery, the plastic surgeon is perfectly capable of becoming a team leader for FFS procedures. By following the current guidelines, it is possible to give predictable excellent results in FFS. The use of the author's two-stage technique ensures smoother recovery and less discomfort for the patient. Advances such as 3D printing, virtual planning,²⁷ and intraop imaging can aid in obtaining symmetry and in safeguarding important neurovascular structures.

Declaration

This document conforms to the Declaration of Helsinki.

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None declared.

Conflict of Interest

None.

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