



Forehead reduction and orbital contouring in facial feminisation surgery for transgender females

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Abstract

Forehead reduction and orbital contouring form a considerable component of the procedures available to feminise the face in transgender females. In this paper I shall discuss the history and development of techniques to reduce bossing of the forehead and contour the orbits, and describe their classification, assessment, surgical approach, and complications.

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Introduction

Facial feminisation surgery was pioneered by Dr Douglas Ousterhout of San Francisco, USA, in the 1980s and 1990s.¹ He examined several hundred dried skulls in the Atkinson collection at the University of San Francisco to identify male and female characteristics of the forehead, and so was able to develop treatment protocols based on the different features.

As a consequence, surgical techniques were developed that could be completed in transgender as well as cisgender women who required reshaping or contouring of the superior forehead, supraorbital ridge, and lateral orbital rim subunits.

Anthropologically, the male forehead often exhibits appreciable frontal bossing, which may partly be caused by a large frontal sinus, but may also be because of thick supraorbital ridges. In addition, where there is considerable bossing because of a large frontal sinus, there is more of an acute angle between the forehead and the nose, which is a particularly masculine feature.²

In men the eyebrows are at the level of the supraorbital ridges, and in women they are raised above the ridges and are arched. Men often exhibit an ‘M’-shaped hairline in association with recession at the temples. Many patients who have forehead reduction and orbital contouring also have a brow lift to raise and arch the eyebrows and a hairline advance to attempt to eradicate male-pattern recession.^{3,4}

Forehead reduction

In his analysis of several dried skulls, Ousterhout looked for patterns of shape and recognised anthropological features that differentiated the female from the male skull.¹ Differences were noted and compared with patients with different facial contours. As a consequence of this study, he classified the shape of the forehead into three distinct groups (Table 1).¹

Orbital contouring

All groups of patients have orbital contouring, in which the outer third of the supraorbital ridge and lateral orbital rim subunits are reduced to increase the dimensions of the anterior orbital rim and, therefore, the perimeter.⁵

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Table 1
Classification of different shapes of forehead.

Patient groups	Shape of forehead
Group I	Mild to moderate excessive projection of the brow and abnormal bossing. No frontal sinuses, or the bone anterior to the frontal sinuses is so thick that its reduction will not compromise the air space.
Group II	The brows are normal, mildly or moderately projected and there is thick bone anterior to the frontal sinuses.
Group III	Excessive fullness of the brows. The anterior table of the frontal sinus needs to be set back into a more retruded position.

Assessment

Assessment is done both clinically and with imaging. During clinical assessment it is necessary to identify the degree of frontal bossing and to assess the angle formed between the forehead and the radix of the nose. Normal nasofrontal (glabellar) angles are mean (SD) 130° (7°) in men and 134° (7°) in women.⁶ In the glabellar region the male profile characteristic has more of an acute angle between the anterior wall of the frontal sinus and nasal dorsum. With a larger frontal sinus, the nasofrontal angle tends more towards a right angle. This area of the forehead must be reduced to a more oblique angle to make it appear more feminine. The superior orbital ridges and lateral orbits are also assessed for prominence.

In addition, the inclination or slope of the forehead, which refers to the inclination of the anterior surface of the superior forehead subunit in profile view, tends to be more vertical in women and has a relatively greater posterior inclination in men. When measured relative to a true vertical plane through the glabella the male inclination is mean (SD) 10° (14°) (inclined posteriorly), while in women it is 6° (5°).⁶

Planning

In Group III patients, planning of the osteotomies is done using computed tomography (CT) or cone-beam CT to examine the anatomy of the frontal sinus and to measure its dimensions precisely (Fig. 1).

It is important to appreciate that the frontal sinus is often not symmetrical and one side may be larger than the other or even aplastic.

Operation

In Group I patients the forehead reduction is done with a pear bur to achieve the desired contour. This group constitutes 12.5% of my series of 64 forehead reduction patients.

In Group II patients the bone can be reduced as in Group I, but may become quite thin. When the bossing is reduced there may be a concavity in the forehead superior to the bossing,

which may require filling. Ousterhout originally described the use of methylmethacrylate onlay implants in this group of patients, which has now been superseded by bone cement.⁷ However, the volume of cement that may be used is limited because of breakdown and fragmentation if it is too thick.

In Group III cases, the only method by which satisfactory forehead contour can be achieved is by osteotomising the anterior table, reshaping it, and fixing it in its new position with osteosynthesis using miniplates. It is essential to osteotomise the inferior aspect of the anterior table of the frontal sinus precisely at the glabella and immediately above the radix of the nose. In my experience, this group of patients forms the largest number, (88%) and will require reshaping and contouring of the forehead.^{8,9}

In all operations access is through a coronal flap. The principal decision in terms of design of the flap relates to whether a hairline advance is required. If it is not required, then a standard coronal incision is made parallel to the hair follicles using a scalpel. In patients who require advance of the hairline I make a trichophytic incision (as opposed to a pretrichial incision) tangentially through the hair follicles 4–5 mm behind the hairline to encourage hair to grow through the resulting scar.^{3,4,8,9}

The incision follows the hairline and the receded areas of the temples and then runs posteriorly into the hair-bearing area of the temples, parallel to the hair follicles, and towards the ears. Hair is not shaved, but it can be parted and tied up in bunches if required.

Tumescent solution of 0.5% bupivacaine with adrenaline, hyaluronidase, 1:1000 adrenaline, methylprednisolone (20–30 mls in 500 mls of normal saline) is injected and the scalp flap is raised in the subgaleal plane (making sure to avoid injury to the frontal branches of the facial nerve, which is rare). The dissection proceeds in the subperiosteal plane about 4–5 cm superior to the glabella, to expose the entire frontal area down to the glabella, including the frontal processes of the zygomas and the superior orbital rims (up to 1 cm into the roof of each orbit is dissected). At this point the supraorbital nerves may need to be dissected or osteotomised out of their foramina to completely expose the superior rims for contouring. I then contour the superolateral aspects of the orbital rims to expand the orbital perimeter.

By definition, Group III patients all require osteotomy of the anterior table of the frontal sinus. The dimensions of the anterior table cuts are marked out on the bone from measurements taken from the cone-beam CT, and any asymmetry of the frontal sinus is taken into account. Before I begin the osteotomy of the anterior table, I contour the anterior table, supraorbital bone, and the frontal processes of the zygomas and orbits. Thinning of the anterior table facilitates subsequent osteotomy and eradicates some of the bossing.

I make the bony cuts with a Toller fissure bur that is inclined obliquely at an angle greater than 45° to the bony surface, and faces towards the sinus at all times to ensure safe entry into it. Once the cuts are completed, a fine osteotome is

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