

Facial Masculinization Surgery and its Role in the Treatment of Gender Dysphoria

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Background: Interest in facial masculinization surgery is expected to increase as gender-affirming surgery becomes more widely accepted and available. The purpose of this study is to summarize the current literature describing operative techniques in facial masculinization surgery and provide an algorithmic approach to treating this patient population.

Methods: PubMed, EMBASE, and Medline databases were queried for literature on operative techniques and outcomes of facial masculinization surgery in transgender and cisgender patients, published through July 2018. Data on patient demographics, follow-up, operative techniques, complications, and outcomes were collected.

Results: Fifteen of the 24 identified studies met inclusion criteria. Two studies discussed the outcomes of 7 subjects (6 trans-male and 1 cis-male) who underwent facial masculinization procedures. No objective outcomes were reported in either study; however, subjects were generally satisfied and there were no complications. The remaining studies reviewed operative techniques utilized in the cisgender population.

Conclusion: A summary of considerations for each facial anatomic subunit and respective operative techniques for facial masculinization is presented. Current facial masculinization procedures in cisgender patients may be considered in the transgender patient population with favorable outcomes. However, further research is needed on techniques and objective outcome measures of facial masculinization procedures in the transgender population.

Key Words: facial masculinization, female-to-male, forehead augmentation, gender dysphoria, rhinoplasty

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Male and female facial features have been studied and discussed extensively.^{1–9} Briefly, male faces are characterized by a square-shape jaw, a wider forehead, a wider nose and mouth, prominent supraorbital ridge, and facial hair. Female faces are characterized by a heart-shape jaw, shorter foreheads, arched eyebrows, small narrow noses, prominent cheekbones, and fuller lips.¹⁰ To achieve a masculine-appearing face, procedures that alter the characteristics of the bony framework and soft tissues of each facial subunit are necessary.

The number of individuals undergoing male-to-female (MtF) gender affirmation exceeds that which are undergoing female-to-male (FtM).¹¹ This is reflected in the literature, which provides more information regarding techniques for facial feminization compared to masculinization.^{12–21} However, it is likely that interest in facial masculinization procedures will increase as gender-affirming surgery becomes more widely accepted and available.^{11,22} Patients with gender dysphoria may desire masculine facial features that cannot be achieved with hormone therapy alone.

Gender-affirming surgery has been shown to have favorable aesthetic outcomes, high patient satisfaction, and improves quality of life for transgender and gender diverse patients.^{22–29} Moreover, gender-affirming surgery is increasingly being reimbursed by health insurance entities in the United States.³⁰ Given the increasing number of transgender and gender diverse (those who do not abide by the binary roles of gender) patients seeking gender-affirming treatment and its concomitant benefits, surgical specialists must understand the important role of facial masculinization in the gender-affirmation process.

The purpose of this study was to summarize the current literature on operative techniques in facial masculinization surgery and discuss their applications to the transgender and gender diverse patient population. The authors hypothesized that current masculinization procedures in cisgender patients can also be employed in the transgender patient population. The specific aims were to: review the literature on operative techniques and outcomes of facial masculinization surgery, discuss current literature on facial masculinization in the transgender patient population in particular, and provide a platform to guide further surgical innovation and research in facial masculinization surgery in the transgender patient population.

MATERIALS AND METHODS

The investigators conducted a comprehensive review of the literature. A search of the PubMed, Medline, and EMBASE databases was conducted for all manuscripts published through July 2018 for techniques and outcomes of facial masculinization surgery using a combination of controlled vocabulary, subject headings (MeSH, Emtree) and text words. To find literature pertaining to

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transgender patients in particular, subject headings such as Gender Reassignment Surgery, Cosmetic Techniques, Rhinoplasty, Rhytidoplasty were combined with text words or phrases such as “female to male,” masculin* (truncated to include masculine, masculinize, among others), esthetic, aesthetic, transsexual, transgender. The same subject headings were used without concomitant transgender keywords to find literature pertaining to cisgender patients. Given the presumed lack of primary evidence on facial masculinization surgery, the search strategy was designed to be broad, including primary evidence in addition to reviews of the literature, book chapters, or opinion articles. Data on techniques, outcomes, complications, and patient satisfaction were collected, as available. Only English language articles were included. Conference abstracts if available were included. To reduce the risk of bias, 2 independent reviewers screened the titles, abstracts, and full texts of the articles identified (authors FS and KV). Additional articles were selected after reviewing references of identified articles. Disagreement between the reviewers was resolved by discussion and consensus. All results were downloaded into the bibliographic citation manager EndNote X7 (Clarivate Analytics), and duplicate records removed.

RESULTS

In total, 24 articles were identified from the primary database query and the full texts of these articles were reviewed in detail. Of these, 9 were excluded because they did not specifically comment on facial masculinization surgery. Fifteen full-text articles were included in the literature review (Fig. 1). Of the 15 articles included, 2 directly pertained to outcomes of facial masculinization surgery. Of the 2 articles pertaining to facial masculinization surgery, one discussed trans-male masculinization, and one discussed facial masculinization of cis-males.^{31,32} A description of all 15 articles can be found in Table 1.^{10,31–44} The search did not yield any randomized or prospective studies that focused solely on facial masculinization surgery.

In the 2 studies that discussed outcomes of facial masculinization surgery, 7 subjects underwent facial masculinization that involved multiple surgical procedures. One subject underwent facial masculinization that included thyroid cartilage augmentation, chin augmentation with multi-segment osteotomy, forehead augmentation with methylmethacrylate (MMA), and rhinoplasty with septal cartilage graft to increase nasal dorsum projection.³² Six subjects underwent facial masculinization that included forehead augmentation with MMA, chin augmentation with sliding genioplasty, and mandibular angle augmentation using either bone graft (two subjects) or implant placement (four subjects).³¹ No complications were reported in either study, but it should be noted that one of the studies did not specify a follow-up period.³¹ Patient satisfaction was found to be favorable, although neither study used a quantifiable approach to report this metric.

In addition to the subjects who underwent multiple procedures as part of their facial masculinization, 10 additional subjects underwent isolated forehead augmentation with MMA, 42 underwent chin augmentation with multisegment osteotomy, 4 underwent mandibular angle augmentation with bone grafting and “many more” with Medpor implants.³¹ There were no complications related to forehead augmentation. Three subjects had temporary and 1 had permanent neurosensory changes related to chin augmentation. There were no complications reported with mandibular angle augmentation. There were also no objective measures of patient satisfaction for these additional subjects.

DISCUSSION

Given the increasing number of individuals seeking facial masculinization, practitioners must become familiar with available

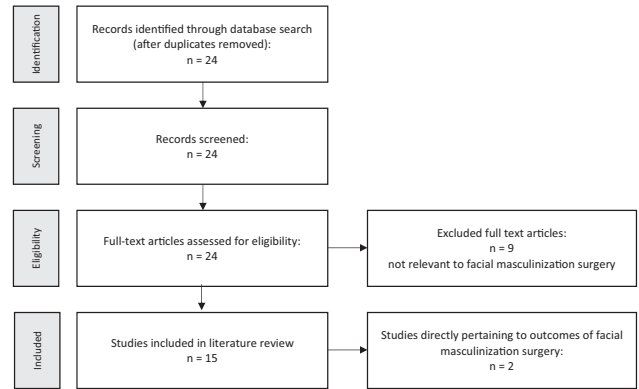


FIGURE 1. Literature search results.

techniques for facial masculinization surgery. We aimed to perform a review of the literature on operative techniques and outcomes of facial masculinization surgery and provide a platform to guide practices in facial masculinization in the transgender and gender diverse patient population. The following is a summary of the considerations for each facial anatomic subunit and respective operative techniques in facial masculinization. We also present an algorithm for approaching facial masculinization surgery (Fig. 2).

Forehead

The male forehead can be distinguished from the female forehead by the presence of supraorbital skeletal bossing, along with flat and straight eyebrows that project anterior to the eyes. The upper face can be masculinized by altering these features (Fig. 3). Surgical augmentation of the forehead, or supra-orbital ridge, has been accomplished by application of malleable synthetic materials, such as MMA, directly to the forehead through a bi-coronal incision.^{45–48} MMA can be stabilized to the skull using surgical fixation.³¹ Ousterhout uses this technique for facial masculinization on 6 subjects with “satisfying” outcomes and no major complications, but provides no objective surgical outcome data.³¹ In 98% of his patients who had a coronal incision, numbness behind the coronal incision resolved within 6 to 9 months, and in 1% to 2% of patients, sensation did not return.

An important consideration is the exothermic reaction the MMA undergoes as it polymerizes, leading to necrosis of the underlying bone. It is therefore important to continuously irrigate the implant with cooled saline as the MMA hardens.^{44,45} Other complications include infection, development of seromas over the implant which resolves with aspiration or compression, and conjunctival burning, which can be prevented by increasing the amount of irrigation used after contouring to prevent residual MMA in the wound.^{46–48}

Additional methods to augment the forehead include the use of hydroxyapatite granules and calvarial bone grafting, both of which have not been studied extensively. Moreira-Gonzalez et al studied 180 patients undergoing craniomaxillofacial augmentation using hydroxyapatite granules, of which 2% of patients had augmentation of the frontal bone.³⁶ The granules were placed in a subperiosteal plane and the authors recommended an overcorrection of 15% to account for compaction and compression of the granules. Although calvarial bone grafting is not subject to granule compression or compaction, it carries the added risk of a second surgical site. Both techniques, however, are fraught with unpredictable tissue resorption rates and the need to undergo operative revision for under or overcorrection and contour irregularity.³⁶

TABLE 1. Studies Included in the Literature Review.

First Author	Study Type	Topic	No. of Subjects	Follow-up Period	Complication Rate	Outcome Measurement
*Ousterhout (2011) ³¹	Case series	Forehead masculinization Chin masculinization Mandibular angle masculinization	6	N/A	None	Subjective patient satisfaction
*Deschamps-Braly (2017) ³²	Case report	Thyroid cartilage masculinization	1	6 mo	None	Subjective patient satisfaction
Colebunders et al (2017) ¹⁰	Review	Facial masculinization	N/A	N/A	N/A	N/A
De Maio (2017) ³³	Review	Facial injectable use in male patients	N/A	N/A	N/A	N/A
Deschamps-Braly (2018) ³⁴	Review	Facial gender confirmation surgery	N/A	N/A	N/A	N/A
Farhadian et al (2015) ³⁵	Review	Male facial aesthetics	N/A	N/A	N/A	N/A
Keaney (2015) ³⁶	Review	Facial injectable use in male patients	N/A	N/A	N/A	N/A
Moreira-Gonzalez et al (2003) ³⁷	Retrospective Cohort Study	Craniomaxillofacial augmentation using porous hydroxyapatite crystals	180	Median = 12 mo	5.6% (contour irregularity, infection, extrusion of granules, seroma)	Subjective patient satisfaction
Rohrich et al (2003) ⁴⁹	Review, Case Report	Rhinoplasty in male patients	2	1) 6 mo 2) 2 y	N/A	N/A
Rossi et al (2017) ³⁹	Review	Facial injectable use in male patients for soft tissue augmentation	N/A	N/A	N/A	N/A
Scherer (2016) ⁴⁰	Expert Commentary	Facial injectable use (botulinum toxin A and fillers) in male patients	N/A	N/A	N/A	N/A
Scheuer et al (2017) ⁴¹	Review	Periorbital surgical rejuvenation procedures	N/A	N/A	N/A	N/A
Springer et al (2008) ³⁸	Survey	Measurements for rhinoplasty	N/A	N/A	N/A	N/A
Sykes and Suarez (2016) ⁴²	Review	Chin advancement, augmentation and reduction	N/A	N/A	N/A	N/A
Terino and Edwards (2008) ⁴³	Review	Mandibular contouring	N/A	N/A	N/A	N/A

*Reported outcomes of facial masculinization procedures.

Maxilla

Augmentation of the maxilla also creates a masculine appearance (Fig. 4). Maxillary augmentation can be achieved with the use of calcium phosphate, manufactured as hydroxyapatite granules, the main component of bone. These granules can be used on any bony area of the craniomaxillofacial skeleton. Moreira et al reported in their study of 180 patients undergoing 393 procedures, the maxilla (44.3%) was the most common site of augmentation with hydroxyapatite, followed by the mandible (21.6%) and the zygoma (15.4%).³⁷ Hydroxyapatite offers the benefit of promoting new bone formation. Complications of augmentation with hydroxyapatite granules were contour irregularity (overcorrection or undercorrection), infection, extrusion of the granules, and seromas; the mandible is particularly susceptible to these complications. Satisfactory cosmetic outcomes were obtained in nearly all of

the procedures that were performed, as determined by the surgeon’s and patients’ subjective evaluations.³⁷

Orthognathic surgery, which includes the 3-dimensional manipulation of the maxilla and mandible, is used to correct skeletal and dental irregularities. When considering maxillary augmentation, surgical augmentation, through maxillary advancement in the anterior-posterior direction, may be considered, taking into context the patients’ occlusion and mandibular positioning. This may necessitate single-jaw (maxilla only) or bimaxillary surgery (maxilla and mandible). The use of orthognathic surgery for facial masculinization has not been studied, however.

Nose

The male nose is larger and longer, with broader nasal bones, more fullness in the dorsal aspect, and more convexity than the female nose (Fig. 4). The nasofrontal angle of the male nose is also more acute than the female nose.³⁸ A supratip break is not preferred for men, as it is for women.⁴⁹ Optimal male noses have a relatively higher nasion and a straight profile.⁴⁹ There is no well-described process for masculinization of the nose for gender dysphoria.^{31,38} When performing aesthetic male rhinoplasties in patients wishing to achieve masculine features, care must be taken to avoid excessive dorsal reduction or tip refinement. Spreader grafts obtained from septal cartilage can be utilized to preserve the dorsal aesthetic lines.⁴⁹ The caudal ends of the grafts are placed at the septal angle if no change to nose length is desired or extending past the septal angle if lengthening of the nose is desired.⁴⁹ Tip grafts can be utilized if needed to accentuate the tip-defining points and enhance

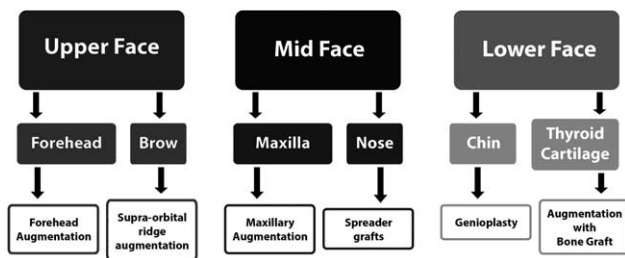


FIGURE 2. Algorithm for approaching facial masculinization surgery for each facial esthetic subunit.

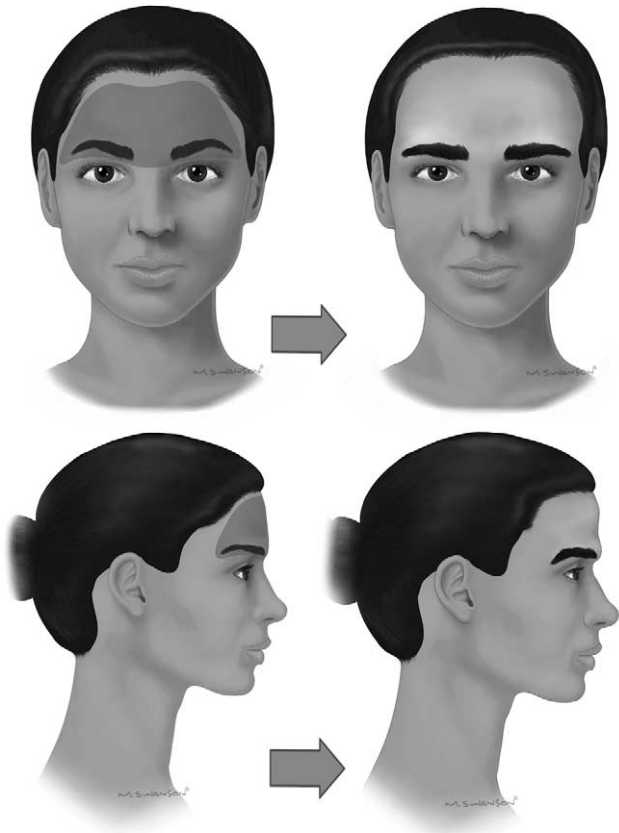


FIGURE 3. Masculinization of the upper face depicting forehead and supra-orbital ridge augmentation.

projection.⁴⁹ Infralobular grafts, onlay grafts, and combination grafts have been described.⁴⁹ Special caution must be taken to avoid an over-refined nasal tip, which would be feminizing.⁴⁹

Soft tissue fillers can also be useful in augmenting the radix and nasal dorsum for patients wishing to avoid surgical rhinoplasty.^{35,50} Injections of the radix can be used to increase convexity of the nasal shape; however, overcorrection here will lead to an unnatural appearance. Complications of soft tissue fillers in the nose include vascular occlusion and pressure necrosis, which can be avoided by injection onto the periosteal/perichondrial planes and by aspiration before injection.

Lips

Males tend to have thinner lips, with a longer upper lip, less vermilion, and less maxillary incisor tooth show when compared to females. Decreased lip redness is also associated with masculinity.^{51,52} Currently, there are no reported surgical techniques to masculinize the lips. The use of injectable fillers to create a more masculine lip appearance has been reported for cis-males; however, caution must be exercised to avoid unnatural results.³³

Mandible

The male face is square-shaped with a larger, prominent jaw (Fig. 5).^{33,35} The mandibular angle is more acute and more prominent than in females. To recreate this characteristic, the lateral projection of the mandible should be in proportion to the lateral projection of the zygoma.³⁹ Two methods for mandibular angle augmentation can be used—implants and bone grafts. Ousterhout

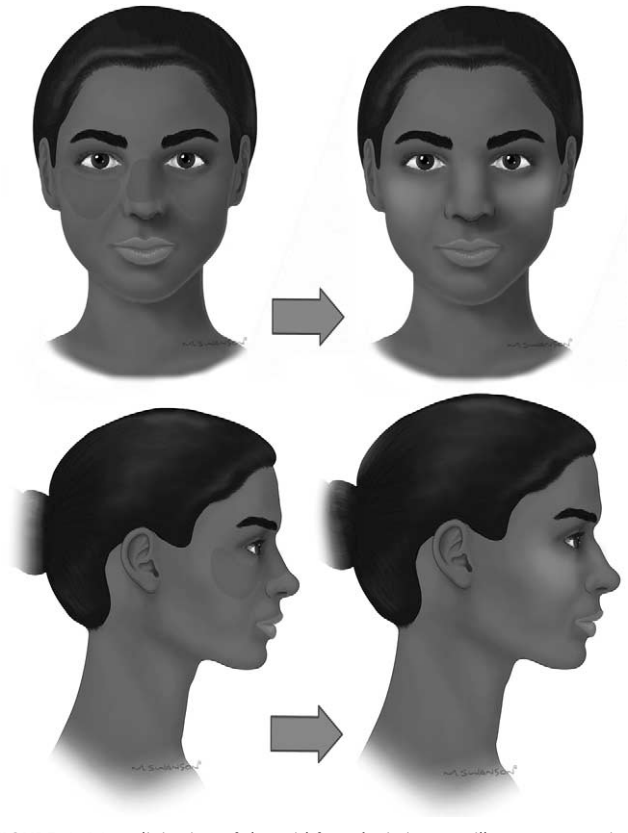


FIGURE 4. Masculinization of the mid face depicting maxillary augmentation and rhinoplasty.

described his preferential use of a mandibular angle implant, stating that Medpor (Stryker Corporation, Kalamazoo, MI) porous implants are easier to use relative to silicone implants.³¹ Porous implants allow for bony ingrowth, making removal of the implant challenging in cases of infection. Silicone implants, however, are less likely to become infected than porous implants.⁴³ Infections of silicone implants can be treated with antibiotics and drainage; removal of the implant is typically not indicated.⁴³ An intraoral approach is used to place the implants underneath the masseter muscle. The most common complication is swelling, which lasts longer with Medpor implants than with silicone implants.³¹

A bone graft placed on the lateral border of the mandible under the masseter may also be used for those who wish to avoid implant placement. This option may not be a permanent solution because of bony resorption.³¹ Ousterhout performed mandibular angle augmentation using a graft situated between the lateral cortex and the medial two-thirds of the mandibular angle, without dissecting the masseter muscle off of the lateral mandible. No plates or screws were used to stabilize the bone graft, as the masseter muscle provides lateral support through its attachment to the bone and the pterygomasseteric fascial sling. Bone grafts were harvested from either calvarial or iliac crest bone. Ousterhout described using the bone graft technique in 6 patients with no major complications, and subjective patient satisfaction was high.³¹

Mandibular augmentation, in general, can also be obtained with the use of hydroxyapatite crystals. This technique is described above for augmentation of the forehead and maxilla. Contour irregularity, infection, granule extrusion, and seroma are more common when using this technique on the mandible when compared to other sites for unknown reasons.³⁷

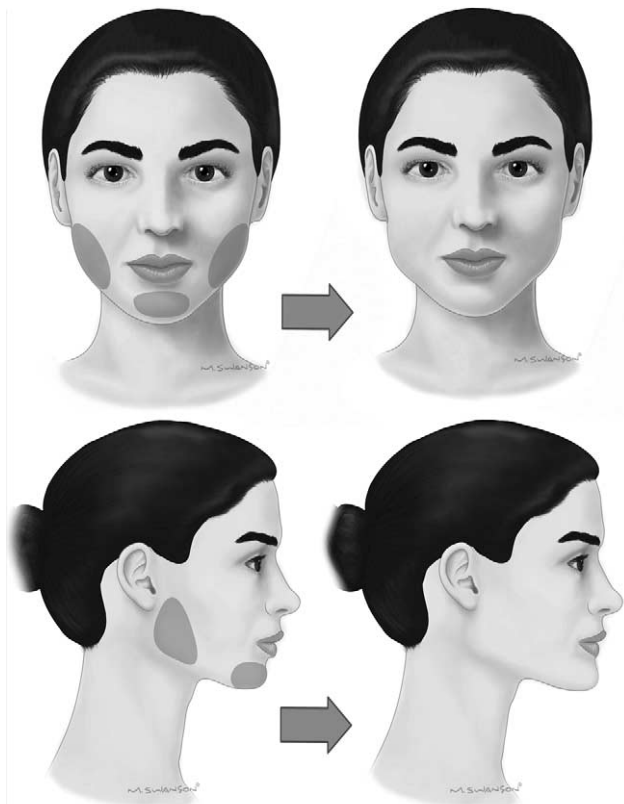


FIGURE 5. Masculinization of the lower face depicting mandibular angle augmentation and genioplasty.

When mandibular augmentation is being considered, surgical augmentation by means of mandibular advancement in the anterior-posterior direction may be considered, as for the maxilla. Again, orthognathic surgery for mandibular advancement must be done in the context the patients' dental occlusion and maxillary positioning. The use of orthognathic surgery for manipulation of the mandible with the goal of facial masculinization has not been studied, however.

Fat grafting can be used in various subunits of the face; this has been extensively described in cis-gender patients.⁵³ Injections of autologous fat graft in the mandible can create a robust, square-shaped masculine jaw. Autologous fat graft can also augment the chin in transmen.⁵⁴ Factors such as the size of the cannula and the volume injected are typically chosen based on surgeon preference; in addition, among transgender patients, no volume standardization has been described.⁵⁰ The greatest benefit of fat grafting is its improvement of facial contour; however, its major limitation is unpredictable long-term volume retention and take.

Chin

The male chin is vertically higher, broader and wider compared to the female chin. A sliding genioplasty can be used for chin augmentation to achieve a more masculine appearance (Figure 5).³¹ This approach permits a more customized outcome for each patient than with traditional chin implants. Multiple plates and screws are used to stabilize the segments. The space in between the bony segments is filled with a mixture of hydroxyapatite granules, the patient's blood, and microfibrillar collagen hemostat, an active absorbable collagen hemostat. This technique was performed in

42 patients seeking facial masculinization without any major complications.³¹ Patient satisfaction is reported to be high, however no objective data was collected.³¹ Surgeons should be aware that an hour-glass deformity, or unwanted tapering of the mandible a few centimeters posterior to the chin, can develop in some patients requesting a wider gonial aspect. In these cases, correction of the deformity, can be completed after the patient has completely healed from the original procedure. Other complications that can occur during genioplasty include injury to the mental nerve, and rarely, malunion of the bone segments.⁴²

Chin augmentation can also be achieved with the placement of an implant. This method is more effective for augmenting in the horizontal direction of the chin than the vertical direction. The implant can be placed through either an intraoral or submental approach. A submental incision is made 2 mm behind the submental crease and extended through the dermis and subcutaneous fat. The mentalis muscle is then separated to access a dissection plane superficial to the periosteum. The implant can be placed either in the subperiosteal plane or the suprapariosteal plane. Subperiosteal placement provides enhanced fixation although it may lead to erosion of the anterior mandible. Alternatively, to maximize implant fixation and minimize erosion of the mandible, suprapariosteal dissection can be performed centrally with subperiosteal placement of the implant laterally. Care must be taken during the lateral subperiosteal dissection to identify and preserve the mental nerves. The implant is placed along the inferior border of the mandible and should be placed below the exit of the mental nerve if it laterally extends past the mental foramina. Fixation of the implant is performed either with screws or sutures to the underlying mandible. The mentalis muscle is then re-approximated to avoid a witch's chin deformity and the soft tissue is re-suspended. A chin-strap dressing is placed for 3 days postoperatively to prevent movement of the implant. Use of chin implants is limited by the available implant shapes and sizes. Custom chin implants may be fabricated to create a more precise fit. Complications associated with chin implants include the implant becoming malpositioned or palpable with thin overlying soft tissue, which may lead to additional operative intervention.⁴²

Injectable fillers and autologous fat injections can be used to augment the chin and allow for a more customized result, although the results are not permanent. Soft tissue fillers are injected deep to the mentalis muscle centrally.⁵⁰ Advantages of using fillers to augment the chin include the avoidance of surgical scars and manipulation of the mentalis muscles and the ability to augment the chin in 3 dimensions.^{39,42}

Cervical Region

The first reported facial masculinization surgery performed in a female-to-male transgender patient describes thyroid cartilage augmentation to create an "Adam's Apple" (Fig. 6).³² A submental incision is made, the skin and fat are dissected off of the platysma and midline structures, and a vertical incision is made between the strap muscles for visualization of the thyroid cartilage. The perichondrium is then incised and the anterior surface of the cartilage is dissected. A medial inframammary crease incision is used in order to harvest cartilaginous rib, which should be 3 centimeters long and full thickness. The cartilage graft is shaped into a narrow oblique pyramid and the base is three-fourths of the width of the patient's existing thyroid cartilage, to resemble the anatomically correct male thyroid prominence. The cartilage graft is secured to the native cartilage using permanent sutures. The platysma is closed over the cartilage, followed by skin closure. The most concerning complication of this procedure is pneumothorax; therefore, a postoperative chest radiograph is recommended. Complications such as changes

in voice or hoarseness can occur with injury to the recurrent laryngeal nerves. Possible injury to the larynx should also be considered. This procedure has been completed successfully in one patient with no complications at a 6-month follow-up visit.³²

Surgery to decrease vocal pitch in transmale patients is not well described. The majority of patients achieve a masculine, low-pitch voice on testosterone therapy alone.⁵⁵ Adjunct treatments include speech and language therapy. These modalities are often sufficient to achieve a masculine voice, however the effect of testosterone on the voice is neither uniform nor consistent, and patients may desire further intervention.⁵⁶ There is evidence of transmale patients who are not satisfied with the masculinity and voice pitch changes from hormone therapy.^{57,58} Current literature provides evidence of request for laryngeal surgery in transmale patients,^{56,58} and to our knowledge there are 3 reported cases of phonosurgery in transmale patients who underwent a type 3 thyroplasty.⁵⁹⁻⁶¹ In all 3 cases, the patient successfully achieved a lower-pitched voice and subjective quality of life was improved. Type 3 thyroplasty is a well-established surgical technique to lower pitch in cis-gender patients; its application to transgender patients needs to be clearly elucidated.⁶²⁻⁶³

Special Considerations

We present a discussion of surgical facial masculinization procedures that have primarily been performed in the cisgender population. Although these techniques can be applied to the transgender patient population, it is important to recognize and consider anatomical differences in transgender patients. Although transmale patients may have more feminine facial features at baseline compared to cisgender male patients, transmale patients on hormone therapy may also develop masculinized facial features. This creates

a balance that must be taken into consideration when performing facial masculinization surgery in this patient population. transmale patients may also seek nonsurgical masculinization methods with injectables (eg, botulinum toxin or fillers); however, this should not preclude future surgery.⁵⁰ Lastly, although the long-term effects of hormone therapy (eg, exogenous testosterone) have been studied, the effect on the outcomes of gender-confirming surgery is unknown.⁶⁴

Furthermore, we acknowledge that transgender patients are faced with significant financial and social difficulties.⁶⁵ Transgender patients may not be able to pay for facial masculinization surgery and may not have the social support necessary to assist with postoperative care. Greater resources are necessary to assist transgender patients in achieving their surgical goals.

Limitations

The present review is chiefly limited by the lack of primary literature describing facial masculinization surgery in transgender patients. We encourage surgeons to publish their techniques and experiences with facial masculinization surgery in this patient population. Our review is also limited by the absence of clinical and operative images depicting the discussed procedures; however we provide illustrations that portray ideal results. Lastly, the present study is limited by the lack of objective measures of patient satisfaction. Current reports state that subjective patient satisfaction is high following these procedures; however, this is inadequate and more defined measures of satisfaction are necessary.

Future Directions

Novel uses and improvements in alloplastic implant materials may affect surgical practices in both cis-gender and transgender patients. Na et al describe alloplastic implants such as silicone, Gore-Tex (W.L., Gore & Associated), and Medpor (Porex) to be used in the nasal dorsum of Asian noses, rather than traditional autologous cartilage grafts.⁶⁶ They emphasize that choice of implant and optimal results depend on surgeon experience and proficiency. Three-dimensional imaging and printing can also be used to create custom-fitted implants in the face; this approach has demonstrated minimal complications and high satisfaction rate.^{67,68}

Goals of future research in this field include reporting of long-term outcomes of these procedures, developing objective measures of patient-reported outcomes and satisfaction, and development of surgical techniques. Given that facial masculinization surgical procedures are novel and less commonly performed, we anticipate a delay in reporting of long-term outcomes. Furthermore, many of the articles in this review describe patient satisfaction subjectively, in a nonstandardized fashion. A patient-reported outcome tool is needed to measure objective quality-of-life in the transgender patient population.⁶⁹⁻⁷² We define a successful outcome as the patient’s ability to live and be perceived as their true gender. Lastly, as an increasing number of patients present for facial masculinization surgery, we expect refinement and development of surgical technique in the transgender patient population. Some surgical procedures, such as laryngeal surgery and thyroid cartilage augmentation, are limited to case series and case reports. Optimal surgical technique needs to be further developed.

CONCLUSION

The authors hypothesized that current practices in facial masculinization for cisgender patients can be applied to patients undergoing facial masculinization because of gender dysphoria, which was supported in this review. For example, forehead, chin, and mandibular angle augmentation, which have been successfully used in cisgender patients, are now being applied to those undergoing facial

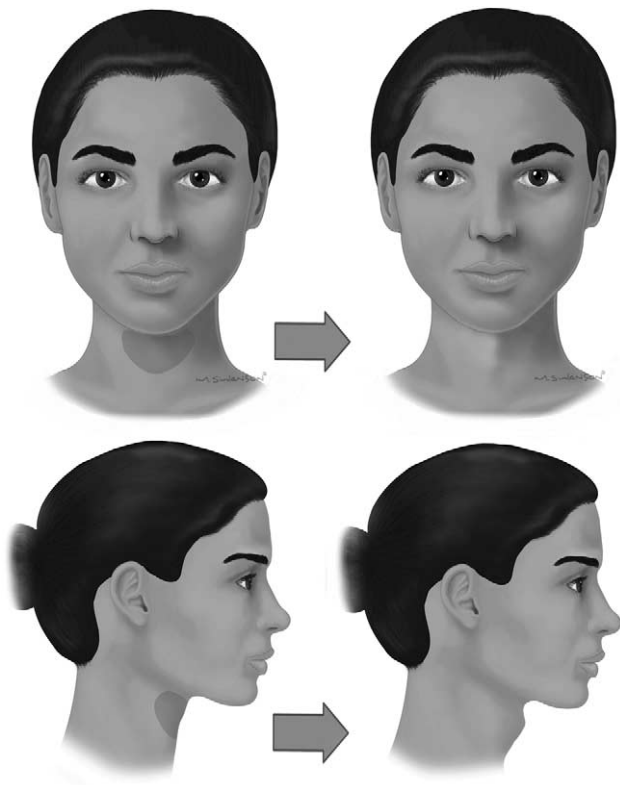


FIGURE 6. Masculinization of the cervical region depicting thyroid cartilage augmentation.

masculinization for gender dysphoria with favorable results and low rates of complication.^{31,37} Further research is needed on objective outcomes of masculinization procedures in the transgender population.

Given the complex nature of the face and its subunits, and the host of surgical options available, a comprehensive and thoughtful analysis should be performed by those managing patients who are considering facial masculinization. Any treatment plan should include a consideration of each facial subunit and be directed by the goals of the patient.^{72–75} Furthermore, it is important to appreciate that facial masculinization procedures are but one component of the gender-affirmation process.

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