



REVIEW

Techniques and Applications of Lower Extremity Feminization and Masculinization

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Abstract

Background: Significant differences exist between feminine and masculine lower extremities, and this region contributes to gender dysphoria in transgender and nonbinary individuals.

Methods: A systematic review was conducted for primary literature on lower extremity (LE) gender affirmation techniques as well as anthropometric differences between male and female lower extremities, which could guide surgical planning. Multiple databases were searched for articles before June 2, 2021 using Medical Subject Headings. Data on techniques, outcomes, complications, and anthropometrics were collected.

Results: A total of 852 unique articles were identified: 17 met criteria for male and female anthropometrics and 1 met criteria for LE surgical techniques potentially applicable to gender affirmation. None met criteria for LE gender affirmation techniques specifically. Therefore, this review was expanded to discuss surgical techniques for the LE, targeting masculine and feminine anthropometric ideals. LE masculinization can target feminine qualities, such as mid-lateral gluteal fullness and excess subcutaneous fat in the thigh and hips. Feminization can target masculine qualities like a low waist-to-hip ratio, mid-lateral gluteal concavity, calf hypertrophy, and body hair. Cultural differences and patient body habitus, which influence what is considered “ideal” for both sexes, should be discussed. Applicable techniques include hormone therapy, lipo-contouring, fat grafting, implant placement, and botulinum toxin injection, among others.

Conclusions: Due to lack of existing outcomes-based literature, gender affirmation of the lower extremities will rely on application of an array of existing plastic surgery techniques. However, quality outcomes data for these procedures is required to determine best practices.

Keywords: body contouring; fat grafting; gender-affirming surgery; liposuction; lower extremity; transgender

Introduction

Typically, gender dysphoria is discussed in the context of incongruence between an individual’s gender identify and their facial features, chest/breast anatomy, and/or genitalia. However, the lower extremity (LE), especially the hips, thighs, and feet, also carry considerable dysphoria for many.¹

Similar to the upper extremity, the LE, which for the purposes of this review includes all structures caudal to and inclusive of the hips, excluding the genita-

lia, has been overlooked as a major contributor to gender dysphoria.² However, it is a highly sexually dimorphic region. Wide hips in transgender men, like large feet in transgender women, may reveal a patient’s sex assigned at birth and cause dysphoria. This review will explore sexually dimorphic features of the hips, buttocks, thighs, knees, legs, ankles, and feet, and also discuss surgical and nonsurgical techniques that may afford feminization and masculinization of these areas.

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Methods

A literature review of gender-affirmation surgery (GAS) of the LE was conducted. A survey of PubMed, EBSCO, and LILACS databases was performed for articles published before June 2, 2021. Search terms were chosen based on each database's index of search terms and/or researcher consensus as pertinent to GAS of the LE and/or anthropometric norms and ideals of masculine and feminine lower extremities (Supplementary Content S1). Results were screened by two independent reviewers (I.T.N. and E.S.), first by title and abstract and then by full text.

Articles were included if they were primary English-language literature detailing outcomes of gender-affirming surgery for the lower extremities. As secondary inclusion criteria, articles were included if they discussed (1) primary outcomes of surgical techniques applicable to LE feminization and/or masculinization; and (2) if they provided primary outcomes of studies regarding actual or ideal anthropometric measurements of male versus female lower extremities. Data on study methods, surgical techniques, outcomes and complications of surgical procedures, and anthropometric parameters were gathered. As this was a systematic review, this research was IRB exempt.

Results

From our preliminary search, 852 articles were identified after removing duplicates. After screening by title, abstract, and full text, there were no articles that reported primary outcomes of LE GAS (Fig. 1). However, 17 articles met secondary inclusion criteria for anthropometric measurements of the LE in men and/or women; and 1 article met inclusion criteria for surgical techniques applicable to LE feminization and/or masculinization. Our search was further expanded to include additional data, including primary academic literature, review articles, and nonacademic literature. Ultimately, our expanded search identified 29 articles meeting inclusion criteria (i.e., primary literature) for our discussion of anthropometrics and 23 that met criteria for our discussion of surgical techniques (Tables 1 and 2).

Masculine and feminine qualities of the LE

The LE is a highly sexually dimorphic region (Fig. 2). The male LE extends essentially in a straight vertical line from hip to ankle, while the female leg is angled slightly valgus from hip to knee.^{3,4} The female LE also features a medial convexity that spans from the groin to the ankle.⁴ The difference in shape is in part created by bony differences, such as a wider pelvis

and more angled femurs in females, and also in part due to differences in fat and muscle distribution.

In general, the male LE has increased muscle mass and less subcutaneous fat than the female LE.^{5–8} Women tend to deposit fat in areas such as the iliac crests, trochanteric region, and superior medial thigh over the adductor muscles.⁴ Men typically do not have significant LE fat deposits.⁴ Women are more prone to cellulite in the LE, due to increased superficial fat deposits and the presence of fewer but larger subcutaneous fat lobules in females even at equal body mass index.^{9,10} Women also typically have increased propensity for varicose veins.^{11,12}

Of note, there has recently been increased diversity in what body proportions are considered to be “ideal.” Particularly, increased media presence and acceptance of fuller buttocks and thighs in women has been noted. Variety in ideal male body proportions of the LE also exists, for example between muscular athletes and fashion models, while both may be considered “ideal.”^{13,14} Therefore, esthetic ideals for the LE in transgender and nonbinary patients are multifactorial.¹⁵

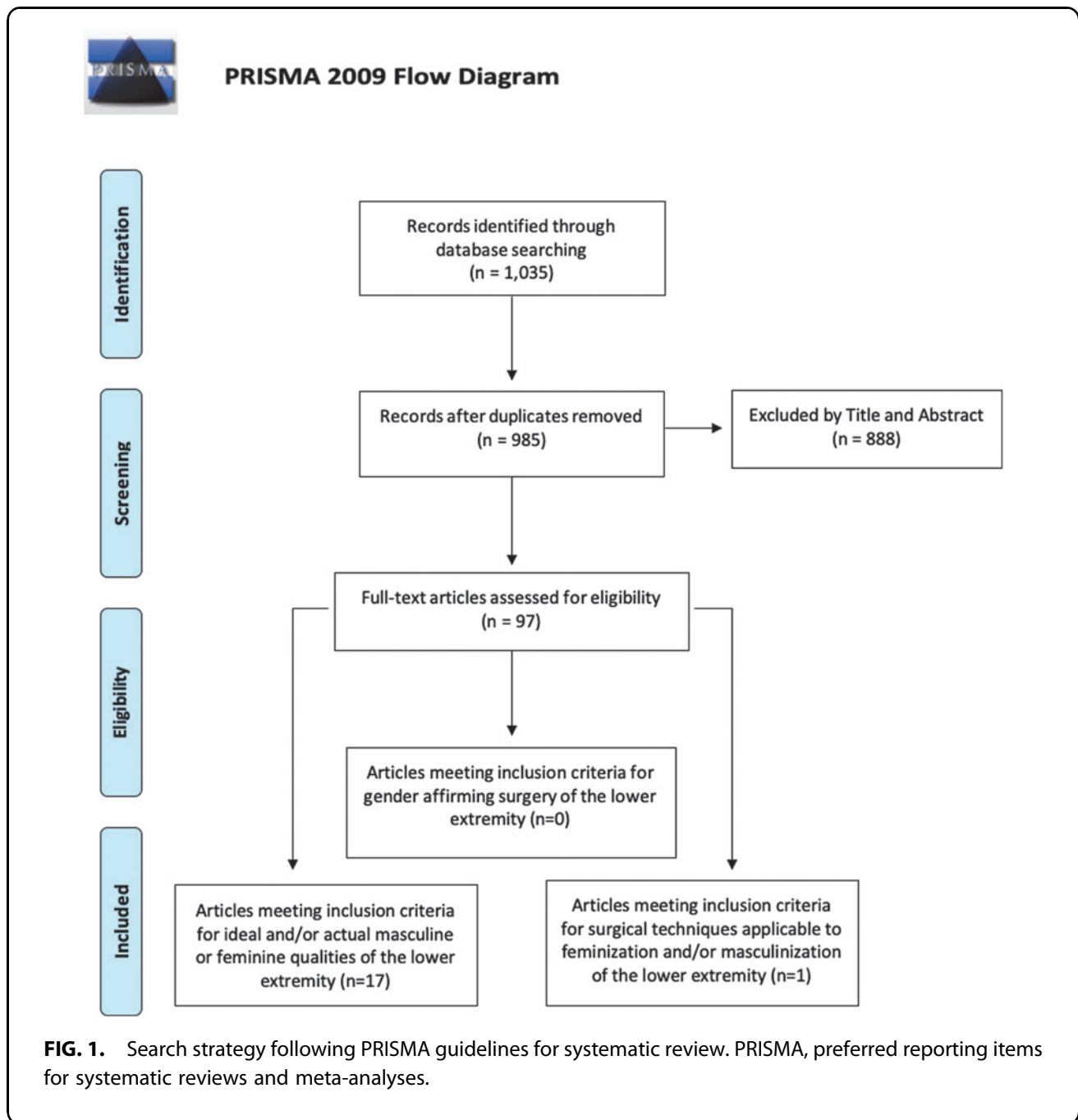
Hips and buttocks. Transgender men and women both have relatively high levels of gender dysphoria attached to their hips and buttocks, although transgender men tend to be more dissatisfied than transgender women.¹

Several features of an attractive buttock are relatively sex independent. These include a curved infragluteal fold, maximum projection between the middle and upper thirds, and absence of ptosis below the infragluteal crease.^{6,16}

The ideal female buttock is rounder and fuller at the mid- and lower-lateral regions, lacks a lateral convexity, and has a short intergluteal fold, which results in increased buttock separation both superiorly and inferiorly (Fig. 3).^{6,16,17} The area immediately above the intergluteal crease also features a prominent divot in females termed the “Michaelis rhomboid.”⁴ The ideal male buttock is characterized by a flatness or concavity of the mid-lateral buttock and relative absence of lateral hip fullness.⁶

Hips also differ between sexes, with women having wider hips as a result both of a wider bony pelvis and of increased fatty deposition. Typical ranges for waist-to-hip ratio (WHR) are 0.65–0.8 in premenopausal women and 0.85–0.96 in men.⁶ Ideal WHR is around 0.9 in men and 0.7 in women, with significant variability between studies and regions.^{18–22}

Thigh. The female thigh is characterized by a medial longitudinal convexity that results from an angled



femur and also proportionally more prominent lateral than medial musculature (Fig. 4).²³

The ideal feminine thigh size should be considered in proportion to the buttocks. The angle of the thigh–buttock junction viewed posteriorly is ideally around 170°.²⁴ When viewed laterally, the thigh is ideally 0.7 or 0.8 times the anterior–posterior length of the buttock.²⁴

In contrast, the male thigh is characterized by increased muscle mass and decreased subcutaneous

fat.^{25,26} Desired proportions and level of muscular development may vary considerably between patients. However, the ideal thigh circumference has been described as ~1.47 times that of the calf, 0.60 times that of the hips, and 0.53 times that of the chest.^{13,27}

Knee, leg, and ankle. The knee is a site of cosmetic concern, particularly among women. Ideally, bony landmarks of the knee should be visible, if permitted by the

Table 1. Included Studies Discussing Anthropometrics of Lower Extremity

First author ^{Ref.}	Year	Study population	Characteristic described
Maughan ²⁵	1983	25 Cisgender women, 25 cisgender men	Female lower extremity, actual; male lower extremity, actual
Singh ²⁰	1994	Survey respondents (physicians)	Female lower extremity, ideal
Singh ¹⁸	1995	Survey respondents (females)	Male lower extremity, ideal
McLean ⁵	1998	16 Cisgender women, 15 cisgender men	Female lower extremity, actual; male lower extremity, actual
Tsai ³¹	2000	Survey respondents	Female lower extremity, ideal
Swami ¹⁴	2006	Survey respondents	Female lower extremity, ideal; Male lower extremity, ideal
Zifchock ⁴⁰	2006	77 Cisgender women, 68 cisgender men	Female foot, actual; male foot actual
Voracek ³⁶	2007	75 Cisgender women, 75 cisgender men	Female foot, ideal; male foot, ideal
Krauss ³⁵	2008	397 Cisgender women, 398 cisgender men	Female foot, actual; male foot actual
Maurins ¹¹	2008	3072 Cisgender women and men	Female lower extremity, actual; male lower extremity, actual
Ruckley ¹²	2008	867 Cisgender women, 699 cisgender men	Female lower extremity, actual; male lower extremity, actual
Voracek ⁴²	2010	69 Cisgender women, 59 cisgender men	Female foot, actual; male foot actual
Sorokowski ¹⁹	2012	Survey respondents	Female lower extremity, ideal; male lower extremity, ideal
Sorokowski ²²	2012	Survey respondents	Female lower extremity, ideal; male lower extremity, ideal
Sanchez ³⁹	2013	199 Cisgender women, 201 cisgender men	Female foot, actual; male foot actual
Ahmed ³⁴	2014	376 Women and men	Female lower extremity, actual; male lower extremity, actual
Sherk ³⁰	2014	76 Cisgender women, 82 cisgender men	Female lower extremity, actual; male lower extremity, actual
Tomassoni ³⁷	2014	528 Cisgender women, 577 cisgender men	Female foot, actual; male foot actual
Aenumulapalli ³⁸	2017	250 Cisgender women, 250 cisgender men	Female foot, actual; male foot actual
Heidekrueger ²¹	2017	1032 Survey respondents	Female buttocks, ideal
Behan ²³	2018	34 Cisgender women, 32 cisgender men	Female thigh, actual; male thigh, actual
Otsuka ²⁶	2018	6 Female cadavers, 6 male cadavers	Female thigh, actual; male thigh, actual
Şaylı ³²	2018	Survey respondents	Female foot, actual; male foot actual
Vartanian ²⁴	2018	Survey respondents	Female buttocks, ideal
Rudolph ⁹	2019	10 Female cadavers, 10 male cadavers	Female buttock, actual; male buttock, actual
Bank ¹⁷	2020	40 Cisgender women, 48 cisgender men	Female lower extremity, actual; male lower extremity, actual
Cotofana ¹⁰	2020	75 Cisgender women, 75 cisgender men	Female lower extremity, actual; male lower extremity, actual
Wiik ⁴⁵	2020	11 Transgender women, 12 transgender men	Female lower extremity, actual; male lower extremity, actual
Zhao ⁴¹	2020	74 Cisgender women, 99 cisgender men	Female foot, actual; male foot actual

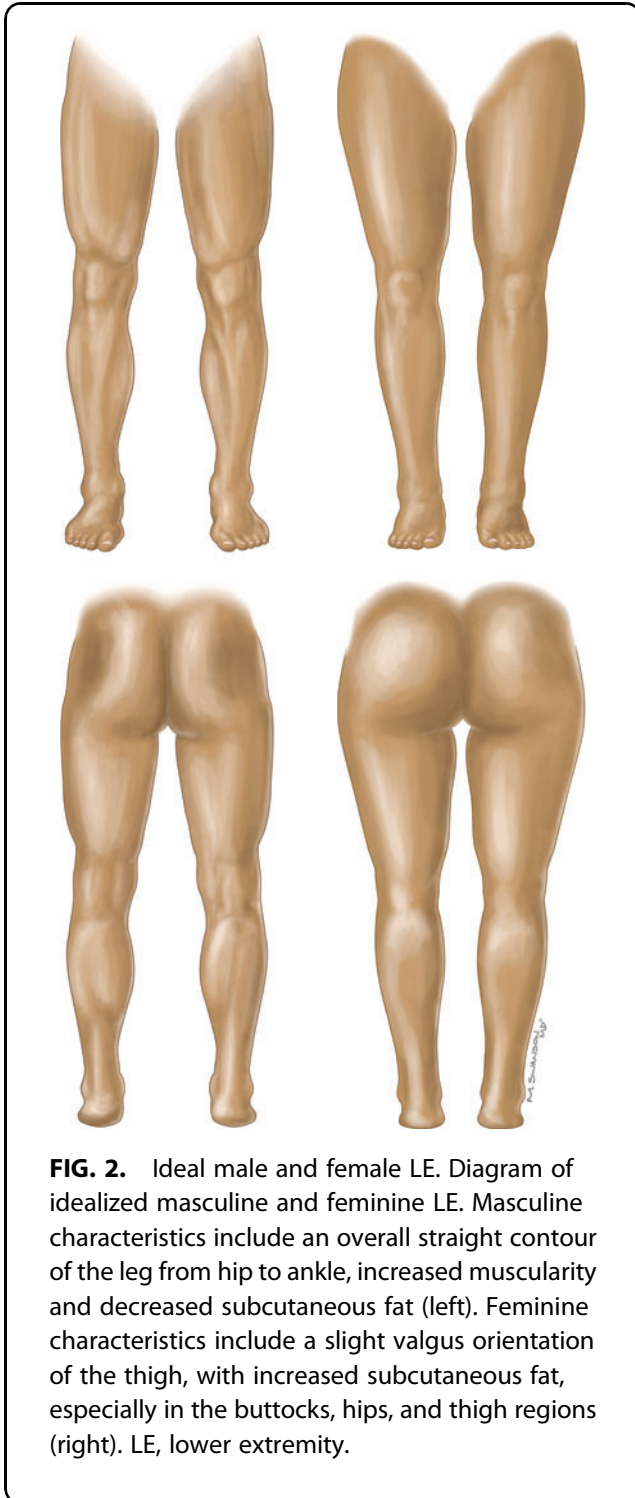
patient's body habitus. Fat deposition in a number of areas can limit this. For example, fat deposits superior to the patella can create an unsightly “upside-down banana” appearance, and fat deposits flanking the knee, along the upper medial leg and the lateral ankle can create “tubular” legs.²⁸ Similar esthetic ideals of the

knee hold true for men, however, men typically do not carry enough fat in this area for it to be a common esthetic concern.

A particular contour of an ideal calf has been described, consistent between sexes (Fig. 5).³ Medially, a convexity spans the upper half of the leg, while a

Table 2. Included Studies Discussing Lower Extremity Treatments Applicable to Gender Affirmation Surgery

First author ^{Ref.}	Year	Study population	Technique discussed
Chamosa ²⁸	1997	108 Cisgender women	Liposuction of knee
Chamosa ⁷¹	1997	113 Cisgender women	Liposuction of ankle
Lemperle ⁶⁰	1998	15 Cisgender women	Calf contouring through gastrocnemius resection
Coughlin ³³	2000	53 Cisgender women, 10 cisgender men	Hammertoe correction
Lee ⁵⁹	2006	20 Cisgender women	Calf contouring through gastrocnemius resection
Kim ⁶¹	2008	20 Cisgender women	Calf contouring through sural neurectomy
Veber ⁶⁶	2010	77 Cisgender men and women	Fat grafting to calf
Chugay ⁵⁵	2011	18 Cisgender women	Implants to thigh
Hurwitz ⁵⁰	2012	17 Cisgender women	Liposuction of thigh
Aboueldahab ⁵³	2013	25 Cisgender women	Liposuction of inner thigh
Hoppmann ⁶⁵	2013	3 Cisgender women, 2 cisgender men	Fat grafting to calf
Karacaoglu ⁶⁹	2013	23 Cisgender women, 2 cisgender men	Implants to calf; fat grafting to calf
Zelickson ⁴⁷	2015	42 Cisgender women	Cryotherapy to inner thigh
Gusenoff ⁷⁸	2016	19 Cisgender women, 6 cisgender men	Fat grafting to foot
Mundinger ⁶⁸	2016	10 Cisgender women, 3 cisgender men	Fat grafting to calf
Bogari ⁵⁷	2017	18 Cisgender women	Botulinum injection to calf
Niechajev ⁶²	2017	31 Cisgender women, 19 cisgender men	Implants to calf
Skorobac ⁶⁷	2017	48 Cisgender women	Fat grafting to calf
Klaver ⁴³	2018	179 Transgender women, 162 transgender men	Hormone therapy
Minteer ⁷⁷	2018	23 Cisgender women, 8 cisgender men	Fat grafting to foot
Wanitphakdeedecha ⁵⁸	2018	22 Cisgender women	Botulinum injection to calf
Farber ⁷⁶	2019	23 Cisgender men and women	Fat grafting to foot
Melita ⁶⁴	2019	13 Cisgender women, 33 cisgender men	Implants to calf



concavity spans the lower half. Viewed laterally, a posterior convexity spans the upper two thirds, while a concavity spans the lower third. The widest anteroposterior and lateral projection of the calf should present at the junction of the proximal and middle thirds of the leg.²⁹

The calf is more muscular and less fatty in men than in women.^{28,30} For both sexes, a calf that is ~ 1.62 times the circumference of the ankle is traditionally considered esthetic.²⁷ However, some males may also prefer larger, stronger-appearing calves (approximately the same circumference as the flexed bicep is considered aesthetic by bodybuilders).²⁷ In women, and especially in certain demographic groups, such as subsets of Asian women, a small calf that affords a straight medial leg contour may be considered more desirable.³¹

Foot. Feet are also sexually dimorphic.^{32,33} Men tend to have wider and longer feet, and wider ankles as well (Fig. 6).³⁴⁻³⁶ In contrast, high arches can lend a feminine appearance to the foot, although it is unclear whether women actually tend to have higher arches.³⁷⁻⁴²

Feminizing and masculinizing techniques for the LE

As evidenced by our literature review, no surgical literature exists detailing outcomes of GAS of the LE. Therefore, this discussion of gender-affirming techniques for the LE will largely be an application of existing medical and surgical treatments aimed toward bringing patients' lower extremities more in line with the esthetic norms and ideals discussed above.

Nonsurgical techniques for masculinization and feminization of the LE. Nonsurgical techniques involve hormone therapy as well as minimally invasive treatments typically indicated for improved cosmesis in cisgender patients.

Hormone therapy has demonstrated efficacy in both feminization and masculinization of the LE.^{43,44} Patients who seek LE GAS will likely have had some amount of hormone therapy. After 1 year on hormone therapy, transgender women can expect increased subcutaneous fat deposition, particularly in the leg and gynoid regions, as well as a decreased WHR, largely from increased hip circumference.⁴³ In contrast, testosterone therapy reduces subcutaneous fat in the leg and gynoid region, decreases hip circumference, and slightly increases WHR.^{43,45}

Noninvasive body contouring techniques may be used strategically to achieve a more masculine or feminine LE. Fatty tissue volume reduction can be achieved by radiofrequency, mechanical forces, ultrasound, lasers, thermal energy, although evidence levels are limited, and generally only a modest change in circumference is observed.^{46,47} Various nonsurgical hair removal techniques may also be utilized to feminize the LE.

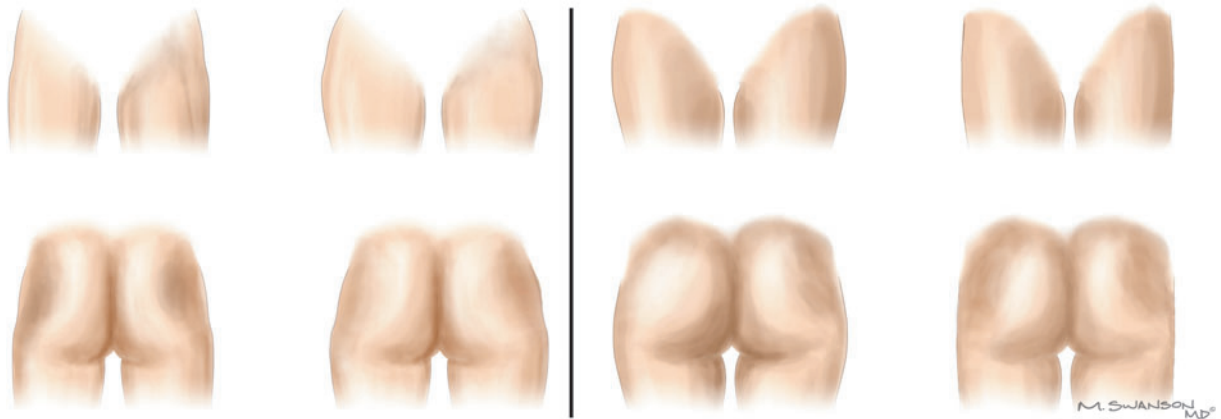


FIG. 3. Masculinization and feminization of the buttock and hip. Diagram showing feminization of masculine buttocks and hips from anterior and posterior views (left); as well as masculinization of feminine buttocks and hips from anterior and posterior views (right).

Surgical techniques for masculinization and feminization of the LE. Cosmetic and reconstructive techniques, such as liposuction, fat grafting, and implants, may be used in various combinations for LE GAS.⁴⁸

Hips and buttocks. Traditionally speaking, feminization of the LE will likely involve augmentation of the hips and/or buttocks, while masculinization of the LE will likely involve reduction of these areas. Details of hip and buttocks techniques for transgender patients

have been described in detail elsewhere, but we provide a brief overview⁶:

Fat grafting to the buttocks can achieve a more feminine appearance, especially if volume is preferentially added to areas of typical gynoid fat distribution, including the mid-lateral buttock convexity, lateral thighs, and hips.⁶ Buttock implants and the so-called “Brazilian Butt Lift” may also provide desired gluteal augmentation, however, these procedures are associated with significant complications.⁴⁹

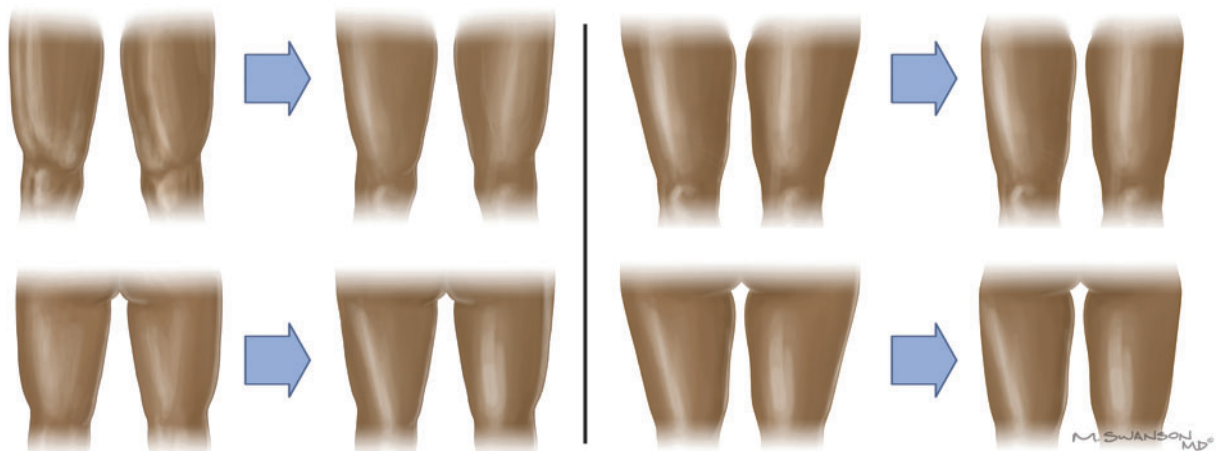


FIG. 4. Masculinization and feminization of the thigh. Diagram showing feminization of masculine thighs from anterior and posterior views (left); as well as masculinization of feminine thighs from anterior and posterior views (right).

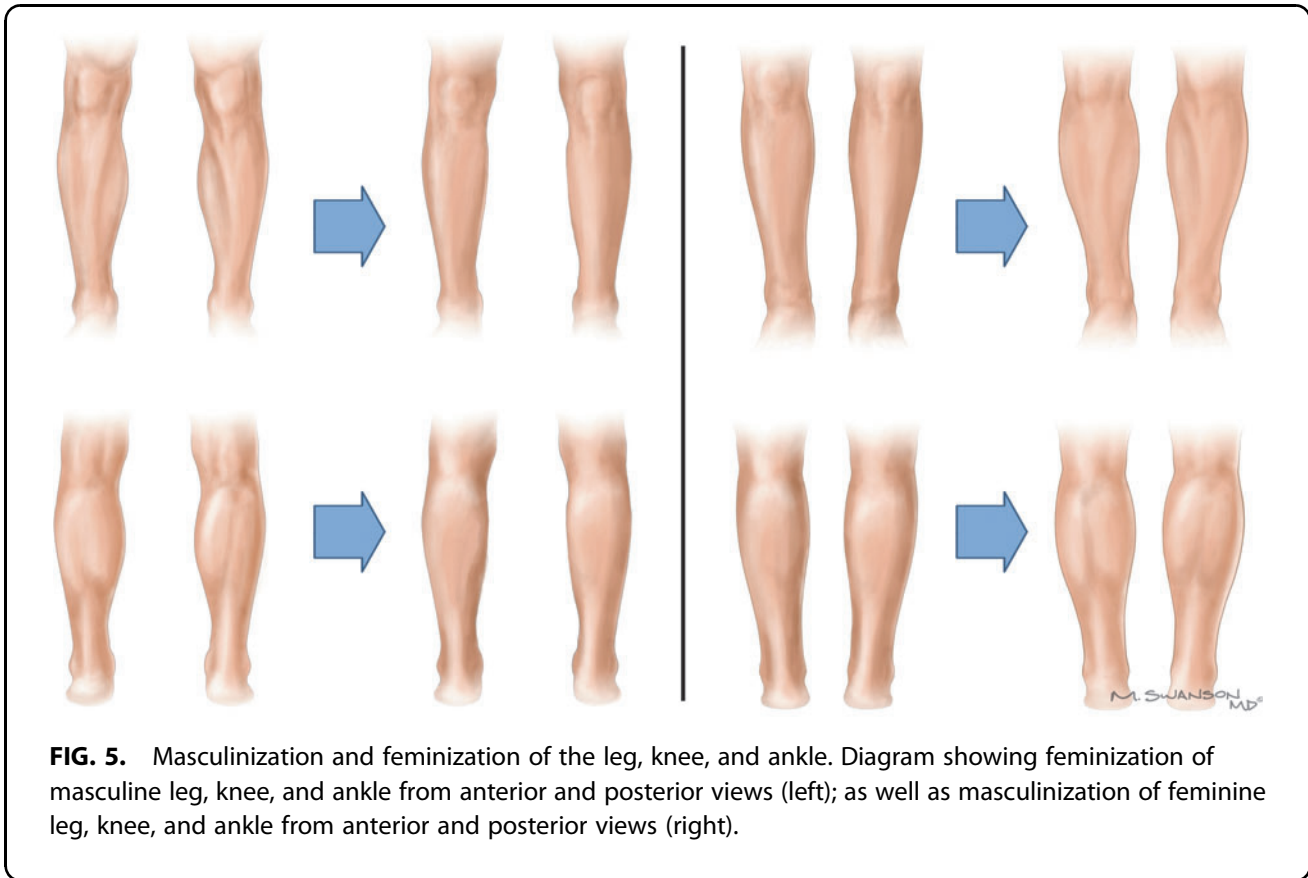


FIG. 5. Masculinization and feminization of the leg, knee, and ankle. Diagram showing feminization of masculine leg, knee, and ankle from anterior and posterior views (left); as well as masculinization of feminine leg, knee, and ankle from anterior and posterior views (right).

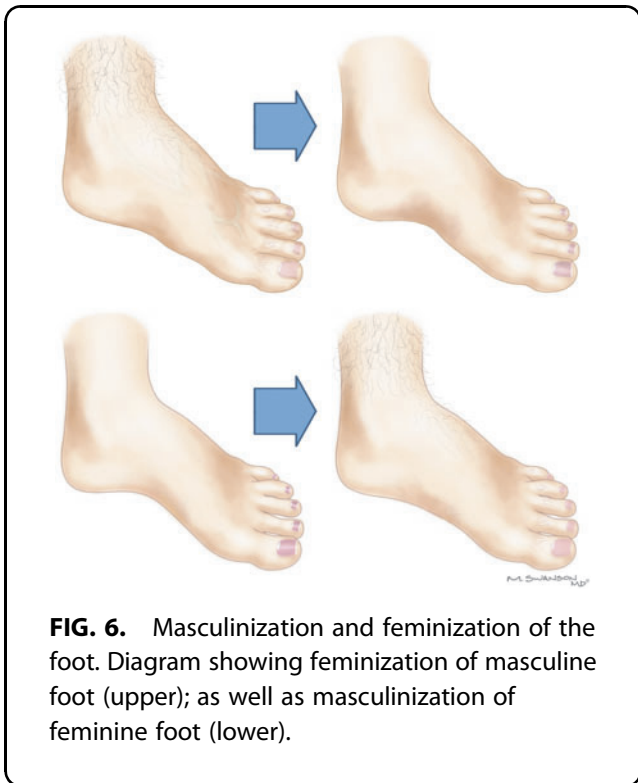


FIG. 6. Masculinization and feminization of the foot. Diagram showing feminization of masculine foot (upper); as well as masculinization of feminine foot (lower).

Masculinization of the hips and buttocks should aim to increase the WHR toward male ranges, and/or to contour the buttocks and thighs into a more typically male shape. Liposuction or noninvasive body contouring of the hips may help to reduce the WHR by decreasing hip size.⁴⁸ Targeted liposuction of the lower lateral buttock may recreate a masculine separation between the buttocks and hip. Additionally, targeting of cellulite may also help to masculinize the thigh.

Thigh. Hormone therapy may sufficiently alter fatty deposition and musculature of the thigh for some patients. Others may desire further intervention. The best-established techniques for the thigh are reductive and include liposuction and thigh lift.

Liposuction to the thigh can reduce stereotypically feminine fat deposition in the lateral thigh.⁵⁰ In transgender men, the technique may be similar to the analogous procedure in cisgender women, but with a more pronounced end esthetic result as transgender men will likely desire further fatty reduction.

Another reductive option is the medial thigh lift, with or without liposuction, which has traditionally been used in bariatric patients and those with excessive medial thigh skin laxity.^{51–53} This procedure may play a role for transgender men with thigh laxity. However, complication rates are very high (43%, according to a recent review).⁵⁴

Feminization of the thigh involves augmentation of the lateral thigh to create an hourglass figure. As with other body regions, augmentation with fat grafting and/or implants can be considered, although these are typically not performed. Fat grafting to the thigh is typically not performed due to the large volume of fat that would be required to significantly augment such a large region of the body. Lateral thigh augmentation through implant is also not typically attempted, although a very small cohort does exist of cisgender women undergoing placement of a silicone implant into a plane beneath the tensor fascia lata.⁵⁵ All women reported high satisfaction and no major complications were confirmed.

Knee, leg, and ankle. Desired calf esthetics may vary considerably between patients of similar gender identity. Nonetheless, feminization generally may be achieved by reducing the muscular appearance of the calf, and masculinization may be achieved by enhancing the appearance of musculature.

Liposuction to the calf can decrease its size, which is feminizing.⁴⁸ In liposuction of the leg and ankle, special care must be taken to avoid the saphenous veins and sural nerve, which lie in the subcutaneous plane of liposuction.⁵⁶ Additionally, the fat of the medial leg is typically softer compared with the lateral subcutaneous fat, and force used during canalization should be modified accordingly.⁵⁶

Modest calf size reduction may also be achieved through botulinum toxin injection, which induces gastrocnemius atrophy, although this procedure needs to be repeated frequently.^{57,58} Proper technique causes only nominally decreased calf strength and does not meaningfully affect gait. More invasive techniques, such as total gastrocnemius resection and sural nerve resection, have been reported for large-volume cosmetic calf reduction in cisgender women, but these are likely impractical due to relative morbidity.^{59–61}

Calf augmentation, which may be masculinizing due to the appearance of increased muscular volume, may be accomplished by fat grafting and/or implants.

Calf implants may be symmetric or cigar shaped, and asymmetric or anatomic.^{29,62,63} They may be

placed in subfascial or submuscular (between the soleus and gastrocnemius) planes. Complication rates are relatively low, but are higher for subfascial implants (5.7%) than submuscular (0.92%).⁶⁴ Reported complications of subfascial implants include seroma (2%), migration (0.8% vs. 0.2% in submuscular placement), dehiscence (0.6% vs. 0.2%), and infection (0.3%); patients likely should also be monitored for compartment syndrome.⁶⁴

Fat grafting to the calf can provide more modest increases in calf size.^{65–68} Fat may be injected intramuscularly or subcutaneously.⁶⁷ Rates of fat resorption appear to be low, at least to 6 months follow-up.⁶⁷ Complications are rare (around 1.5%), most commonly including hyperpigmented scar formation (1%) and hypoesthesia (0.4%), without any major complications being reported for these procedures.^{64,69}

Liposuction of the knee has also been described in cisgender women, and may create a less characteristically feminine leg shape for transgender men.²⁸ Fatty deposits of the superior, medial, and lateral knees may be targeted. This technique should be performed in a plane tangential to the joint capsule and may require multiple incisions to do so. Similarly, liposuction of the ankle may be performed, targeting four typical areas of fat deposition: anteriorly over the lateral and medial malleolus, and posteriorly on either side of the Achilles' tendon.^{56,70,71}

Foot. Cosmetic foot surgery is typically not advocated by professional societies due to relatively high risk for morbidity related to mobility and foot function.^{72–74} However, no professional societies have released position statements regarding gender-affirming foot surgery.¹ Feminization will most commonly depend on relatively noninvasive methods like skin treatments, chemical peels, hair removal, and grooming.^{75–78}

Discussion

As evidenced by our systematic literature search, there is currently no primary academic plastic surgery literature detailing gender-affirming surgery of the LE. However, as is true for all of surgery, practice precedes evidence. Therefore, this discussion is largely a consideration of adaptations of familiar cosmetic and reconstructive techniques for use in transgender patients. Such adaptations will likely require special technical and esthetic considerations.

For example, transgender men may desire a greater degree of thigh reduction through liposuction than

cisgender women would, due to the esthetic ideals of male versus female legs (male legs being less fatty, generally). Similarly, a transgender woman undergoing hip or buttocks augmentation may require a greater degree of augmentation to achieve the same end cosmesis, since transgender women will likely start with a smaller bony and soft tissue architecture to the hip preoperatively than cisgender women would. However, further outcomes-based study is required to determine whether these technical adaptations are safe and/or effective.

The role of LE GAS will likely be different for each patient, depending on their body habitus, gender identity, and specific areas that contribute most to their gender dysphoria. The timing of LE GAS relative to other forms of GAS (genital, facial, and breast/chest) will also vary. However, transmasculine patients should be counseled that reductive manipulation of the thigh through liposuction may preclude anterolateral thigh (ALT) flap phalloplasty in some cases. For these patients, alternatives such as radial forearm free flap should be considered. ALT phalloplasty donor-site closure may also slightly reduce the width of the thigh, which may address dysphoric thigh width, but also will likely result in a slightly asymmetric outcome that may require contralateral reduction for balancing.

Additionally, as is the case for most other domains of GAS, the effects of hormone therapy on long-term outcomes of LE masculinization and feminization are unknown. There exists no algorithm for timing of LE surgery after hormones. Most transgender patients will see significant changes in body composition after about 1 year of hormone therapy.⁴³ For this reason, it is generally recommended that any transgender body contouring surgery be deferred until hormones are administered for at least 1 year. However, it is unclear whether fatty and muscular changes stabilize after this period, or if changes will continue. It is therefore difficult to make informed medical and surgical algorithms regarding optimal LE masculinization and feminization.

Further expansion our methods to include additional primary literature, review articles, and nonacademic literature augmented our systematic search. Therefore, our review of LE techniques as applicable to gender affirmation is not exhaustive. Throughout, we have cited high-quality review articles, which will provide readers with a more comprehensive understanding of applicable techniques than what could be provided within the scope of this review.

Conclusion

Despite the highly sexually dimorphic nature of the lower extremities and their documented contribution to gender dysphoria, no literature exists regarding outcomes of gender-affirming procedures for this region. Therefore, feminization and masculinization of the lower extremities will rely on application of an array of existing plastic surgery techniques to achieve the ideal thigh, knee, leg, and ankle contours of a patient's identified gender. Techniques, such as lipocontouring, fat augmentation, and soft tissue rearrangement, may be used to achieve a more "hourglass" figure in transfeminine patients or straighter, more muscular legs in transmasculine patients. However, lack of studies providing outcomes evidence of gender-affirming surgery to the LE limits conclusions.

Authors' Contributions

Each listed author contributed significantly to this article. Specific tasks for each author include: I.T.N.: Conceptualization, literature search, data analysis, and article preparation. E.S.: Conceptualization, literature search, data analysis, and article preparation. M.S.: Conceptualization, article preparation, and figure preparation. S.D.M.: Conceptualization and article preparation. A.H.: Conceptualization and article preparation.

Author Disclosure Statement

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Supplementary Material

Supplementary Content S1

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Abbreviations Used

ALT = anterolateral thigh
 GAS = gender affirmation surgery
 LE = lower extremity
 WHR = waist-to-hip ratio