SUMMARY OF CLINICAL EVIDENCE FOR GENDER REASSIGNMENT SURGERIES

Outline

Compiled by Transgender Medicine Model NCD Working Group

Contact: Anand Kalra, Transgender Law Center, anand@transgenderlawcenter.org

Introduction, Background, and Terminology

Gender Dysphoria (previously named Gender Identity Disorder, sometimes used synonymously with Transsexualism) refers to "discomfort or distress that is caused by a discrepancy between a person's gender identity and that person's sex assigned at birth (and the associated gender role and/or primary and secondary sex characteristics)."[1] Distress can be severe, resulting in higher prevalence of depression and anxiety.[1–5] Global prevalence is difficult to ascertain, but recent estimates approximate that transgender people make up 0.3%-0.5% of the total U.S. population.[6] Treatment for gender dysphoria varies based on individualized assessment for each patient, but generally includes some combination of psychotherapy, cross-sex hormonal therapy, and sometimes surgical intervention.[1,2,7–10] The goals of treatment for Gender Dysphoria are to minimize dysphoria and help patients function in society in their desired gender role.

In the last 10 years, many professional associations, including the American Medical Association, American Association of Family Physicians, the Endocrine Society, American Psychiatric Association, American Psychological Association, American College of Obstetricians and Gynecologists, and the American Public Health Association, have issued statements or guidelines supporting effective treatment protocols and insurance coverage for this care provided to people with Gender Dysphoria.[11] Clinical trials, meta-analyses, and review articles have been published in major peer-reviewed journals such as *the Journal of the American Medical Association*[8], *Nature*[12], *British Medical Journal*[13], the *Journal of Clinical Endocrinology*[5], *Pediatrics*[14], and *Archives of Pediatric and Adolescent Medicine*[15], among others. In addition, the World Professional Association for Transgender Health (WPATH, formerly the Harry Benjamin International Gender Dysphoria Association) has issued global standards of care since 1979; currently, the seventh version is under revision. The WPATH Standards of Care are internationally recognized as the most comprehensive and evidence-based set of recommendations for treating gender dysphoria.

The following summarizes clinical evidence of necessity, effectiveness, and safety for surgical procedures for treatment of gender dysphoria. The essential purpose of transition-related treatment, whether it is genital reconstruction, hormone replacement therapy or any other gender-confirming procedure, is to therapeutically treat Gender Dysphoria, not to improve a person's appearance. The evaluation of medical necessity must be individualized to each patient and take into account the totality of the patient's total appearance and transition-related needs. Transgender people have unique clinical needs that are distinct from those of non-transgender people, and individualized assessments should be based on their symptoms, functionality, and the totality of their gendered appearance. As such, an individual may require none, some, or (rarely) all of the surgical procedures described in order to effectively treat their gender dysphoria.

Gender reassignment is the only treatment for gender dysphoria that has shown significant benefits in numerous research trials and meta-analyses over the past half century.[16] Overall, gender reassignment surgeries have been found safe, effective, and necessary in treating gender dysphoria.[1,8,9,16–19] Feelings of regret are extremely rare and, where present, mostly transient.[20–25] Access to transition-related care not only results in reduction of dysphoria and improved psychological outcomes,[26] but is also linked to improved primary care outcomes. Transgender women who accessed transition-related care were less likely to have injected silicone[27] or to have HIV-associated illnesses.[28] HIV-positive transgender women who receive transition-related care are more likely to be engaged in HIV primary care, have higher antiretroviral adherence and achieve undetectable viral loads.[28] Utilization of transition-related medical care has been associated with significantly lower rates of suicide, binge drinking, and non-injection drug use.[29]

Categories of Gender Reassignment Surgery

The category of Gender Reassignment Surgery (GRS) includes:

1. Breast/chest surgeries;
2. Genital surgeries;
3. Other surgeries.

For the Female-to-Male (FTM) patient, surgical procedures may include the following:

1. Breast/chest surgery: subcutaneous mastectomy, nipple grafts, chest reconstruction;
2. Genital surgery: hysterectomy/salpingo-oophorectomy, metoidioplasty, phalloplasty (employing a pedicled or free vascularized flap), reconstruction of the fixed part of the urethra, vaginectomy, vulvectomy, scrotoplasty, and implantation of erection and/or testicular prostheses;
3. Other: voice surgery (rare), liposuction and lipofilling.

For the Male-to-Female (MTF) patient, surgical procedures may include the following:

1. Breast/chest surgery: mammaplasty;
2. Genital surgery: orchiectomy, penectomy, vaginoplasty, clitoroplasty, vulvoplasty, labiaplasty, urethroplasty, prostatectomy;
3. Other surgeries: reconstructive facial feminization surgery, liposuction, lipofilling, voice surgery, thyroid cartilage reduction, electrolysis or laser hair removal, and hair reconstruction.

Summaries of Clinical Evidence for Gender Reassignment Surgeries

Surgeries for Female-to-Male (FTM) individuals

Breast/Chest Surgery

Mastectomy for transgender men is necessary for many in order to resolve Gender Dysphoria.[1,8,9,18,30,31] When bilateral (double-incision) mastectomy is performed, nipple grafts are a necessary component of the surgery; when "keyhole" (periareolar incision) is performed, nipple grafts are less likely necessary, but may be required in some cases.[18,31] Both procedures are highly effective, and in either type, reconstruction of the chest to approximate a normal male chest is a necessary component.[18,30–32] In follow-up studies, transgender men who have undergone mastectomy report very low rates of complication and high rates of satisfaction; scarring is generally within expected limits and necrosis of nipple grafts is rare.[1,8,16,22,30,33–37] Chest reconstruction surgery in combination with hormone therapy has been shown to be more effective in alleviating gender dysphoria than hormones alone.[38] Quality of life is higher among transgender men who have undergone chest reconstruction than those who have not.[39,40]

Genital Surgeries

Three procedures may be indicated for transgender men whose gender dysphoria affects the genitals. Hysterectomy may be performed with or without salpingectomy and oophorectomy; the procedures are safe, with complication rates comparable to the non-transgender population, and effective in reducing gender dysphoria.[18,41–45] If dysphoria related to external genitals is present, patients should receive individualized assessment to determine if metoidioplasty or phalloplasty will be more effective in reducing gender dysphoria.[2,17,18] Both procedures are highly effective in treating gender dysphoria and have acceptable complication rates when weighed against the benefits for some patients; when complications do occur, they are often relatively minor and can be easily treated.[17,18,25,36,40,46,47] Phalloplasty may be safely performed using either a free or pedicled flap technique.[18,46,48–53] Urethral lengthening is required as a component of phalloplasty and is often necessary for metoidioplasty.[18,46,54–58] Scrotoplasty and testicular implants may be necessary components of phalloplasty and metoidioplasty if individualized assessment determines the results would better resolve dysphoria.[47,59]

Surgeries for Male-to-Female (MTF) individuals

Breast/Chest Surgery

In transgender women who undergo hormone therapy, maximal breast development is generally reached within 2 years; while in some hormone therapy alone is sufficient to achieve breast size appropriate to age and body habitus, in 40-70%, breast reconstruction may be necessary in order for the individual to pass as female and thereby reduce or resolve gender dysphoria.[60–63] Mammaplasty in transgender women serves a primarily therapeutic purpose and should be considered reconstructive rather than cosmetic.[9,24,64] In a recent cohort study, psychosocial wellbeing improved after breast reconstruction, indicating that the procedure is effective in reducing gender dysphoria.[24] Safety is a paramount issue underscoring the necessity of access to breast reconstruction as well, as transgender women who are unable to access safe methods of breast reconstruction sometimes resort to injection of non-medical grade silicone to obtain breast shape and size. In one recent report of complications related to silicone injection, transgender women, who overall represent less than 1% of all women in the general population, accounted for 45% of cases in a recent review article.[65] One argument that is made to deny medically necessary transition services to patients with GD is to state that an specific physical characteristic that requires surgery falls within the "broad range of normal" (BRN) for individuals of the gender to which the patient is transitioning. For example, it is quite obvious that small breasts are within the BRN for cisgender (non-transgender) women. However, perceptions of a person's gender are not based on a single characteristic but rather look at the totality of a person's gendered characteristics. It is inappropriate to solely consider individual characteristics such as breast size in isolation: a breast size that may be sufficient to allow a cisgender woman to be perceived as female may not produce the same result in a transgender woman, whose other gendered characteristics may be less likely to fall in the typical range for female appearance. Based on medical standards of care, it is essential that the totality of an individual's appearance and gendered presentation be considered rather than the individual treatments in isolation.

Adhering to the medical requirement of considering a patient's overall appearance and social functioning – rather than focusing on specific individual characteristics considered in isolation from one another and from the person's overall medical needs and treatment goals – is particularly critical in light of the unique challenges faced by transgender women. While transgender men often (but not in all cases) are able to develop a conventionally masculine appearance and be accepted as men in society with access to hormonal treatment and mastectomy, the process for transgender women who transition after undergoing a male puberty is more complicated due to the difficulties of overcoming the physical impact of testosterone. The individual characteristics of many transgender women may fall within the BRN for cisgender women; however, many transgender women are unable to safely live and be accepted as women without the assistance of medical and surgical treatments. The inability to be perceived as women results in disproportionately increased rates of discrimination, job loss and unemployment, interpersonal violence, imprisonment, and suicide among transgender women. A national survey of over 6,454 transgender Americans demonstrated that visual non-conformity (inability to "pass" as male or female) was "a risk factor in eliciting anti-transgender bias and its attendant social and economic burdens."[66] The authors also demonstrated that visual non-conformers were more likely to attempt suicide (44%) and were less likely to receive medical care at a primary care provider's office. Subsequent analysis of their data demonstrated that visual non-conformers were more likely to be homeless. They were also more likely to be denied access to a homeless shelter, to be assaulted by shelter staff or residents, and to be forced to leave shelters due to poor treatment and/or unsafe conditions.[67] Another study of young transgender women in Los Angeles found that "[t]ransgender women, particularly those who have difficulty 'passing,' or looking like biologic females, report problems obtaining gainful employment because of transgender-related discrimination."[68] Thus inability to "pass" not only worsens patients' dysphoria and other mental health symptoms as evidenced by increased suicide rates, but also increases risk for harassment, violence, unemployment, and decreased access to services such as primary care and homeless shelters.

Denial of care based on the assumption that care is purely cosmetic particularly fails to recognize that transgender women can have individual characteristics within the BRN for that specific characteristic, and yet still have an overall gendered appearance that falls far outside of the BRN and that prevents them from living and being accepted by others as women. As the medical framework recognizes, people perceive gender conformity based not on a single characteristic but the totality of a person's appearance. Assuming that individual characteristics like breast size, thyroid cartilage size, jaw size and angle, voice pitch, male pattern baldness, and facial hair fall along a random bell curve in women, it would not be unusual for a woman to have a single characteristic such as very small breasts that places her at the 10th percentile for breast size – meaning that 10% of women would have the same or a smaller breast size. But if one considers what percentage of women would randomly fall at the 10th percentile for all six characteristics, the number would be 0.0001% (or one in a million) – well outside of even a very broad range of normal variation. So while it might well be within the BRN for a woman to have small breasts, it would be decidedly outside of that range for a woman to be balding, have a deep voice, large jaw, tiny breasts, a protruding thyroid cartilage, and dense beard growth. It is these kinds of odds that many transgender women face when they are unable to access medically necessary procedures designed not to make them look cosmetically flawless but simply to give them the typical appearance associated with women.

Genital Surgeries

Genital surgeries for transgender women generally fall into two types: orchiectomy, performed alone or as part of vaginoplasty, and procedures associated with vaginoplasty (penectomy, vaginoplasty, clitoroplasty, vulvoplasty, labiaplasty, urethroplasty, and rarely prostatectomy). Whether or not assessment indicates vaginoplasty is necessary to resolve an individual's gender dysphoria, orchiectomy may be indicated separately.[1,7,18,69,70]

Vaginoplasty has been shown to be necessary, safe, and effective in treating gender dysphoria. The procedure may be performed using skin grafts or flaps; the most common technique involves inversion of an anteriorly pedicled penile skin flap in combination with a small dorsally based scrotal flap.[9,17–19,71] Follow-up studies indicate high satisfaction, improved sexual, physical, and psychosocial health, and reduction of gender dysphoria.[16,20,21,23,25,35,36,36,37,71–77] Follow-up studies have found complications including dehissance, prolonged vaginal bleeding, vaginal pain, anorgasmia, rectal-vaginal fistula, vaginal stenosis, urethral stenosis, clitoral necrosis, vaginal prolapse, and vaginal hair; complication rates are acceptable when weighed against the benefits for some patients.[18,19,21,23,25,71] Pre-vaginoplasty electrolysis is necessary to prevent vaginal hair.[21,78]

Other Surgeries

Other surgeries or procedures that may be necessary to resolve gender dysphoria and allow transgender women to navigate the world as women include facial and body hair removal, reconstructive facial feminization surgery, reduction thyroid chondroplasty, vocal surgery, and hair reconstruction.[1,16,18,19] These procedures are not cosmetic, but rather serve a primarily reconstructive purpose by allowing transgender women whose overall physical appearance otherwise prevents them from being perceived as female.

A recent review article defines reconstructive facial feminization surgery as "a broad range of cranio-maxillofacial surgical procedures and techniques with the sole objective of converting a masculine face to a more feminine one. There is no attempt to convert the face into that of a fashion model as all that is usually desired by the individual is to pass as a female in everyday society and to integrate as well as possible into the community."[79] Facial cues serve as a primary basis for making a determination of gender, and these determinations take just over one hundredth of a second to make.[64,80] As hormone treatment and other surgical interventions provide no significant changes to facial structure,

reconstructive facial feminization is a critical component of transition for many transgender women, in order to participate in society as a woman and avoid gender-based violence and discrimination.[81–85]

Facial feminization is highly effective, with high rates of satisfaction;[64,79,80,82,83,85–88] in one study, it was associated with higher quality of life, compared to transgender women who had undergone no surgery or only genital surgery.[64] In another, participants were asked to determine the gender of a person based on photographs of the upper, middle, or lower regions of the face; participants correctly identified the gender of transgender women who had undergone reconstructive facial feminization more than 80% of the time, compared to expected values of 4% for those who had not undergone the surgery.[80] The same study found that less than 2% of 168 transgender women who had undergone reconstructive facial feminization experienced complications. Another study analyzed the results of 214 transgender women who had undergone reconstructive facial feminization and found no serious complications, no new emergency surgical operations, and no necessity to drain seromas or hematomas; one patient had a fistula along an incision, which resolved on its own.[86] Removal of facial and body hair through electrolysis or laser instruments provides another necessary treatment that allows perceptions of gender based on secondary sex characteristics, and particularly facial cues, to correctly identify transgender women as women.[1,18,19,89] One study noted a mean of 90% hair clearance using an Intense Pulsed Light Source (laser) and that clearance rates did not differ based on whether the individual had undergone any hormone therapy.[89]

Bibliography

1. Coleman E, Bockting W, Botzer M, et al. Standards of care for the health of transsexual, transgender, and gender-nonconforming people, version 7. *Int J Transgenderism*. 2012;13(4):165–232.

2. Byne W, Bradley SJ, Coleman E, et al. Report of the American Psychiatric Association task force on treatment of gender identity disorder. *Arch Sex Behav*. 2012;41(4):759–796.

3. Colizzi M, Costa R, Todarello O. Transsexual patients' psychiatric comorbidity and positive effect of cross-sex hormonal treatment on mental health: Results from a longitudinal study. *Psychoneuroendocrinology*. 2014;39:65–73.

4. Gorin-Lazard A, Baumstarck K, Boyer L, et al. Hormonal therapy is associated with better self-esteem, mood, and quality of life in transsexuals. *J Nerv Ment Dis*. 2013;201(11):996–1000.

5. Murad MH, Elamin MB, Garcia MZ, et al. Hormonal therapy and sex reassignment: a systematic review and meta-analysis of quality of life and psychosocial outcomes. *Clin Endocrinol (Oxf)*. 2010;72(2):214–231.

6. Gates GJ. How many people are lesbian, gay, bisexual and transgender? 2011.

7. Hembree WC, Cohen-Kettenis P, Delemarre-van de Waal HA, et al. Endocrine treatment of transsexual persons: an Endocrine Society clinical practice guideline. *J Clin Endocrinol Metab*. 2009;94(9):3132–3154.

8. Spack NP. Management of transgenderism. *JAMA*. 2013;309(5):478–484.

9. Gooren LJ. Care of transsexual persons. *N Engl J Med*. 2011;364(13):1251–1257.

10. Knezevich EL, Viereck LK, Drincic AT. Medical management of adult transsexual persons. *Pharmacother J Hum Pharmacol Drug Ther*. 2012;32(1):54–66.

11. Lambda Legal. Professional Organization Statements Supporting Transgender People in Health Care. *Lambda Leg*. 2013.

12. Kreukels BP, Cohen-Kettenis PT. Puberty suppression in gender identity disorder: the Amsterdam experience. *Nat Rev Endocrinol*. 2011;7(8):466–472.

13. Roehr B. Comfortable in their bodies: the rise of transgender care. *The BMJ*. 2015;350:h3083.

14. de Vries AL, McGuire JK, Steensma TD, Wagenaar EC, Doreleijers TA, Cohen-Kettenis PT. Young adult psychological outcome after puberty suppression and gender reassignment. *Pediatrics*. 2014;134(4):696–704.

15. Olson J, Forbes C, Belzer M. Management of the transgender adolescent. *Arch Pediatr Adolesc Med*. 2011;165(2):171–176.

16. Gijs L, Brewaeys A. Surgical treatment of gender dysphoria in adults and adolescents: Recent developments, effectiveness, and challenges. *Annu Rev Sex Res*. 2007;18(1):178–224.

17. Selvaggi G, Bellringer J. Gender reassignment surgery: an overview. *Nat Rev Urol*. 2011;8(5):274-282.

18. Ettner R, Monstrey S, Eyler AE. *Principles of Transgender Medicine and Surgery*. Haworth Press Binghamton, NY; 2007.

19. Kreukels BP, Steensma TD, De Vries AL. *Gender Dysphoria and Disorders of Sex Development*. Springer; 2014.

20. Lawrence AA. Factors Associated with Satisfaction or Regret Following Male-to-Female Sex Reassignment Surgery. *Arch Sex Behav*. 2003;32(4):299-315.

21. Lawrence AA. Patient-reported complications and functional outcomes of male-to-female sex reassignment surgery. *Arch Sex Behav*. 2006;35(6):717–727.

22. Nelson L, Whallett EJ, McGregor JC. Transgender patient satisfaction following reduction mammaplasty. *J Plast Reconstr Aesthet Surg*. 2009;62(3):331-334.

23. Rehman J, Lazer S, Benet AE, Schaefer LC, Melman A. The reported sex and surgery satisfactions of 28 postoperative male-to-female transsexual patients. *Arch Sex Behav*. 1999;28(1):71–89.

24. Weigert R, Frison E, Sessiecq Q, Al Mutairi K, Casoli V. Patient Satisfaction with Breasts and Psychosocial, Sexual, and Physical Well-Being after Breast Augmentation in Male-to-Female Transsexuals. *Plast Reconstr Surg*. 2013;132(6):1421–1429.

25. Berg JEA, Gustafsson M. Long term follow up after sex reassignment surgery. *Scand J Plast Reconstr Surg Hand Surg*. 1997;31(1):39–45.

26. Vries ALC de, McGuire JK, Steensma TD, Wagenaar ECF, Doreleijers TAH, Cohen-Kettenis PT. Young Adult Psychological Outcome After Puberty Suppression and Gender Reassignment. *Pediatrics*. September 2014:peds.2013-2958.

27. Wilson E, Rapues J, Jin H, Raymond HF. The Use and Correlates of Illicit Silicone or "Fillers" in a Population-Based Sample of Transwomen, San Francisco, 2013. *J Sex Med*. 2014;11(7):1717–1724.

28. Deutsch M, Chakravarty D, Rebchook G, Shade S, Sevelius J, Maiorana A. Associations Between Self-Reported Hormone Use Patterns and Indicators of HIV Care among Transgender Women of Color in Four US Cities. *Natl HIV Prev Conf*. 2015;(Abstract 1886).

29. Wilson EC, Chen Y-H, Arayasirikul S, Wenzel C, Raymond HF. Connecting the Dots: Examining Transgender Women's Utilization of Transition-Related Medical Care and Associations with Mental Health, Substance Use, and HIV. *J Urban Health*. 2015;92(1):182–192.

30. Richards C, Barrett J. The case for bilateral mastectomy and male chest contouring for the female-to-male transsexual. *Ann R Coll Surg Engl*. 2013;95(2):93.

31. Hage JJ, van Kesteren PJ. Chest-wall contouring in female-to-male transsexuals: basic considerations and review of the literature. *Plast Reconstr Surg*. 1995;96(2):386–391.

32. Hage JJ, Bloem JJ. Chest wall contouring for female-to-male transsexuals: Amsterdam experience. *Ann Plast Surg*. 1995;34(1):59–66.

33. Colić MM, Colić MM. Circumareolar mastectomy in female-to-male transsexuals and large gynecomastias: A personal approach. *Aesthetic Plast Surg*. 2000;24(6):450–454.

34. Berry MG, Curtis R, Davies D. Female-to-male transgender chest reconstruction: A large consecutive, single-surgeon experience. *J Plast Reconstr Aesthet Surg*. 2012;65(6):711–719.

35. Johansson A, Sundbom E, Höjerback T, Bodlund O. A five-year follow-up study of Swedish adults with gender identity disorder. *Arch Sex Behav*. 2010;39(6):1429–1437.

36. Cuypere GD, TSjoen G, M.Sc RB, et al. Sexual and Physical Health After Sex Reassignment Surgery. *Arch Sex Behav*. 2005;34(6):679-690.

37. Dhejne C, Lichtenstein P, Boman M, Johansson AL, L\a angström N, Landén M. Long-term follow-up of transsexual persons undergoing sex reassignment surgery: Cohort study in Sweden. 2011.

38. Davis SA, Colton Meier S. Effects of Testosterone Treatment and Chest Reconstruction Surgery on Mental Health and Sexuality in Female-To-Male Transgender People. *Int J Sex Health*. 2014;26(2):113–128.

39. Newfield E, Hart S, Dibble S, Kohler L. Female-to-male transgender quality of life. *Qual Life Res*. 2006;15(9):1447–1457.

40. Wierckx K, Van Caenegem E, Elaut E, et al. Quality of life and sexual health after sex reassignment surgery in transsexual men. *J Sex Med*. 2011;8(12):3379–3388.

41. Ott J, van Trotsenburg M, Kaufmann U, et al. Combined Hysterectomy/Salpingo-Oophorectomy and Mastectomy is a Safe and Valuable Procedure for Female-to-Male Transsexuals. *J Sex Med*. 2010;7(6):2130–2138.

42. Weyers S, Selvaggi G, Monstrey S, et al. Two-stage versus one-stage sex reassignment surgery in female-to-male transsexual individuals. *Gynecol Surg*. 2006;3(3):190–194.

43. Ergeneli MH, Duran EH, Özcan G, Erdogan M. Vaginectomy and laparoscopically assisted vaginal hysterectomy as adjunctive surgery for female-to-male transsexual reassignment: preliminary report. *Eur J Obstet Gynecol Reprod Biol*. 1999;87(1):35–37.

44. Perrone AM, Scifo MC, Martelli V, et al. Hysterectomy and bilateral salpingoovariectomy in a transsexual subject without visible scaring. *Diagn Ther Endosc*. 2010;2010.

45. Bartos P, Struppl D, Popelka P. [Role of total laparoscopic hysterectomy in genital reconstruction in transsexuals]. *Ceska Gynekol Lek Spolecnost J Ev Purkyne*. 2001;66(3):193–195.

46. Morrison SD, Perez MG, Nedelman M, Crane CN. Current State of Female-to-Male Gender Confirming Surgery. *Curr Sex Health Rep*. 2015;7(1):38–48.

47. Hage JJ, van Turnhout AA. Long-term outcome of metaidoioplasty in 70 female-to-male transsexuals. *Ann Plast Surg*. 2006;57(3):312–316.

48. Matti BA, Matthews RN, Davies DM. Phalloplasty using the free radial forearm flap. *Br J Plast Surg*. 1988;41(2):160–164.

49. Hage JJ, Winters HA, Van Lieshout J. Fibula free flap phalloplasty: modifications and recommendations. *Microsurgery*. 1996;17(7):358–365.

50. Descamps MJL, Hayes PM, Hudson DA. Phalloplasty in complete aphallia: pedicled anterolateral thigh flap. *J Plast Reconstr Aesthet Surg*. 2009;62(3):e51–e54.

51. Felici N, Felici A. A new phalloplasty technique: the free anterolateral thigh flap phalloplasty. *J Plast Reconstr Aesthet Surg*. 2006;59(2):153–157.

52. Fang RH, Kao YS, Ma S, Lin JT. Phalloplasty in female-to-male transsexuals using free radial osteocutaneous flap: a series of 22 cases. *Br J Plast Surg*. 1999;52(3):217–222.

53. Fang R-H, Lin J-T, Ma S. Phalloplasty for female transsexuals with sensate free forearm flap. *Microsurgery*. 1994;15(5):349–352.

54. Djinovic RP. Surgical Therapy: Metoidioplasty Technique and Results. In: *Management of Gender Dysphoria*. Springer; 2015:257–266.

55. Perovic SV, Djordjevic ML. Metoidioplasty: a variant of phalloplasty in female transsexuals. *BJU Int*. 2003;92(9):981–985.

56. Lebovic GS, Laub DR, Ozek G, others. Metoidioplasty. *Reconstr Plast Surg Extern Genitalia Phila WB Saunders Co*. 1999:355–60.

57. Djordjevic ML, Bizic MR. Comparison of two different methods for urethral lengthening in female to male (metoidioplasty) surgery. *J Sex Med*. 2013;10(5):1431–1438.

58. Djordjevic ML, Bizic M, Stanojevic D, et al. Urethral lengthening in metoidioplasty (female-to-male sex reassignment surgery) by combined buccal mucosa graft and labia minora flap. *Urology*. 2009;74(2):349–353.

59. Selvaggi G, Hoebeke P, Ceulemans P, et al. Scrotal reconstruction in female-to-male transsexuals: a novel scrotoplasty. *Plast Reconstr Surg*. 2009;123(6):1710–1718.

60. Wierckx K, Gooren L, T'sjoen G. Clinical Review: Breast Development in Trans Women Receiving Cross-Sex Hormones. *J Sex Med*. 2014;11(5):1240–1247.

61. Gooren L. Hormone treatment of the adult transsexual patient. *Horm Res Paediatr*. 2005;64(Suppl. 2):31–36.

62. Gooren L, Asscheman H. Sex reassignment: endocrinological interventions in adults with gender dysphoria. In: *Gender Dysphoria and Disorders of Sex Development*. Springer; 2014:277–297.

63. Kanhai RC, Hage JJ, Asscheman H, Mulder JW. Augmentation mammaplasty in male-to-female transsexuals. *Plast Reconstr Surg*. 1999;104(2):542-549; discussion 550-551.

64. Ainsworth TA, Spiegel JH. Quality of life of individuals with and without facial feminization surgery or gender reassignment surgery. *Qual Life Res*. 2010;19(7):1019–1024.

65. Schmid A, Tzur A, Leshko L, Krieger BP. Silicone embolism syndrome: a case report, review of the literature, and comparison with fat embolism syndrome. *CHEST J*. 2005;127(6):2276–2281.

66. Jaime Grant, Lisa Mottet, Justin Tanis. *National Transgender Discrimination Survey Report on Health and Health Care*. Washington, D.C.: National Center for Transgender Equality and National Gay and Lesbian Task Force; 2011.

67. Begun S. Conforming for Survival: Associations Between Transgender Visual Conformity/Passing and Homelessness Experiences. In: *Society for Social Work and Research 19th Annual Conference: The Social and Behavioral Importance of Increased Longevity*. Sswr; 2015.

68. Wilson EC, Garofalo R, Harris RD, et al. Transgender female youth and sex work: HIV risk and a comparison of life factors related to engagement in sex work. *AIDS Behav*. 2009;13(5):902–913.

69. Asscheman H, Giltay EJ, Megens JA, van Trotsenburg MA, Gooren LJ, others. A long-term follow-up study of mortality in transsexuals receiving treatment with cross-sex hormones. *Eur J Endocrinol*. 2011;164(4):635–642.

70. Futterweit W. Endocrine therapy of transsexualism and potential complications of long-term treatment. *Arch Sex Behav*. 1998;27(2):209–226.

71. Krege S, Bex A, Lümmen G, Rübben H. Male-to-female transsexualism: a technique, results and long-term follow-up in 66 patients. *BJU Int*. 2001;88(4):396–402.

72. Imbimbo C, Verze P, Palmieri A, et al. A report from a single institute's 14-year experience in treatment of male-to-female transsexuals. *J Sex Med*. 2009;6(10):2736–2745.

73. Jarolim L, Sedỳ J, Schmidt M, Nanka O, Foltan R, Kawaciuk I. Gender reassignment surgery in male-to-female transsexualism: A retrospective 3-month follow-up study with anatomical remarks. *J Sex Med*. 2009;6(6):1635–1644.

74. Lobato MII, Koff WJ, Manenti C, et al. Follow-up of sex reassignment surgery in transsexuals: a Brazilian cohort. *Arch Sex Behav*. 2006;35(6):711–715.

75. Mate-Kole C, Freschi M, Robin A. A controlled study of psychological and social change after surgical gender reassignment in selected male transsexuals. *Br J Psychiatry*. 1990;157(2):261–264.

76. Vujovic S, Popovic S, Sbutega-Milosevic G, Djordjevic M, Gooren L. Transsexualism in Serbia: A Twenty-Year Follow-Up Study. *J Sex Med*. 2009;6(4):1018–1023.

77. Weyers S, Elaut E, De Sutter P, et al. Long-term Assessment of the Physical, Mental, and Sexual Health among Transsexual Women. *J Sex Med*. 2009;6(3):752–760.

78. Suchak T, Hussey J, Takhar M, Bellringer J. Postoperative trans women in sexual health clinics: managing common problems after vaginoplasty. *J Fam Plann Reprod Health Care*. 2015:jfprhc–2014.

79. Altman K. Facial feminization surgery: current state of the art. *Int J Oral Maxillofac Surg*. 2012;41(8):885–894.

80. Spiegel JH. Facial determinants of female gender and feminizing forehead cranioplasty. *The Laryngoscope*. 2011;121(2):250–261.

81. Van de Ven B. Facial feminisation, why and how? *Sexologies*. 2008;17(4):291–298.

82. Becking AG, Tuinzing DB, Hage JJ, Gooren LJ. Transgender feminization of the facial skeleton. *Clin Plast Surg*. 2007;34(3):557–564.

83. Nouraei SR, Randhawa P, Andrews PJ, Saleh HA. The role of nasal feminization rhinoplasty in male-to-female gender reassignment. *Arch Facial Plast Surg*. 2007;9(5):318–320.

84. Operario D, Nemoto T. HIV in transgender communities: syndemic dynamics and a need for multicomponent interventions. *J Acquir Immune Defic Syndr 1999*. 2010;55(Suppl 2):S91.

85. Gerhardstein KR, Anderson VN. There's More Than Meets the Eye: Facial Appearance and Evaluations of Transsexual People. *Sex Roles*. 2010;62(5-6):361-373.

86. Capitán L, Simon D, Kaye K, Tenorio T. Facial Feminization Surgery: The Forehead. Surgical Techniques and Analysis of Results. *Plast Reconstr Surg*. 2014;134(4):609–619.

87. Habal MB. Aesthetics of feminizing the male face by craniofacial contouring of the facial bones. *Aesthetic Plast Surg*. 1990;14(1):143–150.

88. Ousterhout D. *Feminization of the Transsexual*. Retrieved; 2002.

89. Schroeter CA, Groenewegen JS, Reineke T, Neumann HAM. Ninety percent permanent hair reduction in transsexual patients. *Ann Plast Surg*. 2003;51(3):243–248.